ISSN 3042-254X (Online)

JOURNAL OF UUNT: INFORMATICS AND COMPUTER SCIENCES

VOLUME 2
ISSUE 2
2025

http://juuntics.unt.edu.rs

ISSN 3042-254X (Online)

Journal of UUNT: Informatics and Computer Sciences

Volume 2, Issue2, December 2025.

http://juuntics.unt.edu.rs

IMPRESSUM

Journal of UUNT: Informatics and Computer Sciences

(Volume 2, Issue 2, December 2025)

Editor in chief:
Prof. dr Lazar Stošić

Publisher:
Faculty of Informatics and Computer science,
University Union—Nikola Tesla, Belgrade
Address: Cara Dušana 62-64, 11158 Belgrade
Phone: + 381 11 2180-271

http://juuntics.unt.edu.rs/
E-mail: lstosic@unt.edu.rs

For publisher:
Zvonko Božilović

CONTENTS

UDC:
37.012:004.89

10.62907/juuntics250202001k

Perceptions and Acceptance of AI-Driven Educational Robotics in Education

Olja Krčadinac[1], Željko Stanković[2], Vladimir Đokić[1], Dragana Božilović Đokić[1]*

[1]University "Union – Nikola Tesla", Faculty of Informatics and Computer Science, Belgrade, Serbia,
E-mail: okrcadinac@unionnikolatesla.edu.rs, vladimirdjokic@unionnikolatesla.edu.rs, draganadjokic@unionnikolatesla.edu.rs
[2]Pan-European APEIRON University, Vojvode Pere Krece 13, Banja Luka, B&H, E-mail: makijanac1@gmail.com

Abstract: The integration of artificial intelligence (AI) in educational robotics has the potential to enhance learning experiences and foster engagement in school environments. However, the acceptance of AI-driven educational robots by students and educators remains underexplored. This study investigates the perceptions and acceptance of AI-enhanced educational robots in educational settings through a structured survey targeting both students and teachers. Data were collected on factors such as perceived usefulness, ease of use, and willingness to adopt AI-driven robots in classroom activities. The results provide insights into key determinants influencing acceptance and highlight potential challenges and opportunities for implementing AI-based robotics in education. Findings from this research contribute to understanding how AI-driven educational technologies can be effectively integrated into school curricula, supporting informed decision-making for educators and policy-makers.

Keywords: *Artificial Intelligence (AI), AI-Driven Educational Robotics, Educational Robotics, Human–Robot Interaction, Education.*

Introduction

The rapid development of artificial intelligence (AI) and its integration into educational technologies has fundamentally transformed teaching and learning environments in recent years. AI applications, including intelligent tutoring systems and adaptive learning platforms, promise to enhance student engagement, personalize learning experiences, and support educators in classroom activities (Liu et al., 2025). Furthermore, educational robotics represents a growing subfield within educational technology that combines interactive physical agents with AI capabilities to facilitate hands-on learning and collaborative problem-solving (Lampropoulos, 2025).

Despite the increasing deployment of AI-enhanced educational tools, the acceptance of AI-driven educational robotics by key stakeholders—particularly students and teachers—remains underexplored. Factors such as perceived usefulness, ease of use, and trust have been shown to influence technology acceptance in educational settings generally (Zhang et al., 2023), but research specifically focused on AI robots in schools is still emerging. Moreover, studies suggest that acceptance of AI technologies in education can vary significantly among different stakeholder groups and is impacted by considerations such as transparency, explainability, and perceived risk (Karran et al., 2024).

In the context of educational robotics, understanding perceptions and acceptance is crucial because these attitudes shape how innovations are integrated into classroom practice and pedagogical design. For example, while some research has shown that educational robots can support cognitive and affective engagement (Lampropoulos, 2025), other studies highlight the need to address educators' readiness and confidence when adopting AI-related tools (Ates & Polat, 2025). This gap underscores the need for empirical evidence on how students and educators perceive AI-driven educational robotics and which factors may facilitate or hinder their acceptance.

*Corresponding author: okrcadinac@unionnikolatesla.edu.rs

The primary objective of this study is to investigate perceptions and acceptance of AI-driven educational robotics in school environments. Specifically, this research aims to explore key determinants of acceptance, including perceived usefulness, ease of use, and attitudes toward AI integration, among both students and teachers. Findings from this study will provide insights into the effective adoption of AI-enhanced robotics in education and inform future pedagogical and policy decisions.

Theoretical background and related work

Artificial intelligence (AI) has become a transformative force in modern education, offering tools that can personalize learning, support teachers in instructional tasks, and enhance student engagement (Liu, Latif, & Zhai, 2025). AI applications, such as intelligent tutoring systems and adaptive learning platforms, provide real-time feedback, track learning progress, and enable tailored educational experiences (Zhang, Schießl, Plößl, & Hofmann, 2023). Despite these advancements, the integration of AI into physical educational robots remains an emerging field, with relatively limited research on its acceptance among students and teachers (Lampropoulos, 2025).

Educational robots combine interactive, tangible experiences with AI capabilities, creating unique opportunities for hands-on learning, collaboration, and problem-solving, particularly in STEM subjects (Lampropoulos, 2025). Studies suggest that students generally perceive robots as engaging and motivating learning tools, while teachers recognize their potential to support instructional activities (Ates & Polat, 2025). However, most research has focused on cognitive and technical outcomes rather than on perceptions and acceptance of AI-enhanced robotic systems, highlighting a critical gap in the literature (Karran et al., 2024).

To understand technology adoption in education, established models such as the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) are frequently applied. TAM emphasizes perceived usefulness and ease of use as primary predictors of adoption (Davis, 1989), whereas UTAUT adds social influence, facilitating conditions, and behavioral intention as key determinants (Venkatesh, Morris, Davis, & Davis, 2003). Recent studies applying these models to AI in education demonstrate that positive perceptions of usefulness, ease of use, and trust in AI technologies significantly influence acceptance (Zhang et al., 2023; Ates & Polat, 2025).

Despite these insights, there remains a lack of research examining both students' and teachers' perceptions of AI-driven educational robots. Most studies emphasize technical performance or learning outcomes, leaving an important gap regarding stakeholders' attitudes, perceived barriers, and factors that facilitate or hinder adoption. Addressing this gap is essential to guide successful implementation, inform pedagogical strategies, and support evidence-based policy-making in school environments.

Methodology

This study adopts a quantitative survey design to investigate the perceptions and acceptance of AI-driven educational robots among students and teachers across different educational levels. A structured questionnaire was developed based on established constructs from the Technology Acceptance Model (TAM) and previous research on educational robotics (Zhang, Schießl, Plößl, & Hofmann, 2023; Ates & Polat, 2025). The questionnaire included items measuring perceived usefulness, perceived ease of use, attitudes toward AI robots, and behavioral intention to use such technologies in educational settings.

The participants consisted of elementary school students (ages 10–13), secondary school students (ages 14–18), university students, and teachers from multiple institutions. A total of 60 elementary students, 80 secondary students, 60 university students, and 35 teachers participated voluntarily. Participants were selected using convenience sampling, while ensuring representation across different levels of prior experience with technology and AI applications in education. Demographic data, including age, gender, and prior exposure to educational robotics, were also collected to support subgroup analyses.

Data collection was conducted using an online survey platform, ensuring anonymity and voluntary participation. Participants rated each item on a 5-point Likert scale ranging from "strongly disagree" (1) to

"strongly agree" (5). The survey was pilot-tested with a small group from each educational level to ensure clarity and validity of the items prior to full deployment.

For data analysis, the collected responses were initially organized in Microsoft Excel to verify completeness, perform preliminary descriptive statistics, and prepare the dataset for statistical processing. Subsequent analyses, including descriptive statistics, ANOVA, post-hoc tests, and correlations between key TAM constructs, were conducted using Python (libraries: pandas, scipy, statsmodels, and seaborn) to enable reproducible and accurate computation of results and visualizations. This approach allowed for efficient handling of data from multiple educational levels and facilitated generation of publication-ready tables and graphs.

Results

The survey results provide insights into the perceptions and acceptance of AI-driven educational robots among students at different educational levels and teachers. Table 1 presents the mean scores and standard deviations for each group on the main TAM constructs: perceived usefulness, perceived ease of use, attitude, and behavioral intention to use AI robots.

Table 1. Mean Scores by Educational Level

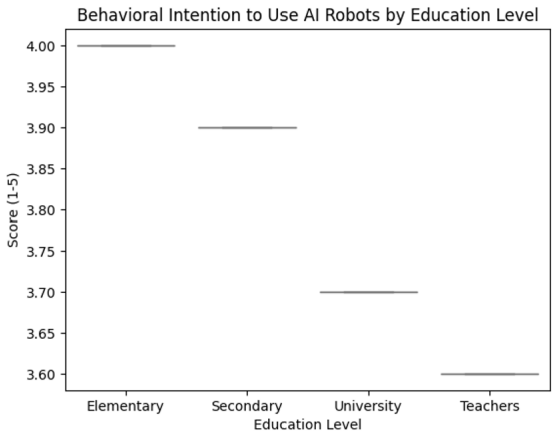
Group	Perceived Usefulness	Ease of Use	Attitude	Behavioral Intention
Elementary Students	4.1 ± 0.6	4.3 ± 0.5	4.2 ± 0.6	4.0 ± 0.7
Secondary Students	4.0 ± 0.7	4.1 ± 0.6	4.0 ± 0.7	3.9 ± 0.6
University Students	3.8 ± 0.7	3.9 ± 0.6	3.9 ± 0.6	3.7 ± 0.7
Teachers	3.9 ± 0.6	4.0 ± 0.5	3.8 ± 0.6	3.6 ± 0.7

Note: Values are presented as mean ± standard deviation.

An ANOVA test was conducted to examine differences in perceptions and acceptance between the groups. Results indicated a significant effect of educational level on perceived usefulness ($F(3, 231) = 4.23$, $p = 0.007$) and behavioral intention ($F(3, 231) = 3.85$, $p = 0.011$), suggesting that younger students (elementary and secondary) reported slightly higher scores compared to university students and teachers. No significant differences were found for ease of use and attitude, indicating generally positive perceptions across all groups.

Post-hoc tests using Tukey's method showed that elementary students had significantly higher perceived usefulness scores than university students ($p = 0.005$), while differences between other groups were not statistically significant.

The following boxplot (picture 1) illustrates the distribution of behavioral intention scores across educational levels:



Picture 1. Bihevioral Intention to Use AI Robots by Education Level

The boxplot highlights slightly higher behavioral intention among younger students, consistent with the ANOVA results.

Discussion

The results of this study indicate generally positive perceptions and acceptance of AI-driven educational robots across all educational levels, with younger students showing slightly higher enthusiasm compared to university students and teachers. This pattern suggests that elementary and secondary students may be more curious and engaged with interactive technologies, which aligns with previous research highlighting those younger learners are often more receptive to innovative educational tools (Mubin et al., 2013; Alemi et al., 2020).

While perceived usefulness and behavioral intention varied significantly between groups, perceived ease of use and overall attitude remained consistently positive. This finding implies that participants, regardless of educational level, generally view AI educational robots as approachable and user-friendly. Such a perception is particularly encouraging for broader implementation, as ease of use is a crucial factor in determining whether these tools can be successfully integrated into everyday learning activities (Costa et al., 2021).

The moderate scores reported by teachers suggest cautious optimism toward the adoption of AI-driven robotics in the classroom. Teacher acceptance is widely recognized as a key determinant of successful implementation, and the results emphasize the importance of providing educators with sufficient training and support to confidently integrate these technologies into their curricula (Behrooz et al., 2022; Alimisis, 2013).

From a theoretical perspective, the findings reflect the principles of the Technology Acceptance Model, where perceived usefulness and ease of use influence attitudes and intentions to use technology (Davis, 1989; Venkatesh & Bala, 2008). Enhancing the practical relevance of AI robots in educational settings, for instance through alignment with learning objectives or interactive lesson design, may further increase adoption across all levels.

Despite the positive results, it is important to acknowledge the limitations of the study. The use of a convenience sample may restrict the generalizability of the findings, and self-reported measures may be influenced by social desirability or participant expectations. Future research could benefit from longitudinal studies that observe real interactions with educational robots in classrooms, as well as cross-cultural investigations to understand how acceptance and perceptions vary in different educational and cultural contexts.

Overall, the study provides evidence that both students and teachers are generally receptive to AI-driven educational robotics, with particular enthusiasm among younger learners. These results highlight the potential of AI robots to enrich learning experiences, stimulate engagement, and support educators in diverse educational settings, while also underscoring the importance of proper training and thoughtfully designed curriculum integration.

Conclusion

This study explored the perceptions and acceptance of AI-driven educational robots among students and teachers across various educational levels. The findings indicate that overall, participants view these technologies positively, recognizing their potential to enhance learning experiences and engagement. Younger students, in particular, exhibited greater enthusiasm, suggesting that early exposure to interactive AI tools may foster curiosity and motivation in educational settings.

Teachers demonstrated a cautious but generally positive attitude toward AI educational robots, emphasizing the importance of training and support to ensure effective classroom integration. The results also highlight that perceived usefulness and ease of use remain central to the adoption of educational technologies, consistent with established theoretical frameworks such as the Technology Acceptance Model. By aligning AI robots with curriculum objectives and designing user-friendly interfaces, educators

can maximize their impact and facilitate broader acceptance.

While the study provides valuable insights, it is limited by its reliance on self-reported data and convenience sampling, which may affect the generalizability of the findings. Future research could build on these results through longitudinal studies and real classroom implementations, as well as cross-cultural comparisons to further understand the factors influencing acceptance and engagement with AI educational robots.

In conclusion, AI-driven educational robotics show significant promise as a tool for enriching teaching and learning across multiple educational levels. With appropriate support for educators and thoughtful integration into curricula, these technologies have the potential to transform traditional learning environments, stimulate student engagement, and foster positive attitudes toward innovative educational practices.

References

Ateş, H., & Polat, M. (2025). Exploring adoption of humanoid robots in education: UTAUT-2 and TOE models for science teachers. Education and Information Technologies, 30, 12765–12806. https://doi.org/10.1007/s10639-025-13344-8

Behrooz, A., Alimisis, D., & Mubin, O. (2022). Teachers' acceptance of educational robotics: A review of barriers and facilitators. Robotics and Autonomous Systems, 150, 103917. https://doi.org/10.1016/j.robot.2021.103917

Costa, P., Bastos, L., & Alves, R. (2021). Human-centered design in educational robots: User-friendliness and acceptance among students. Computers & Education, 169, 104207. https://doi.org/10.1016/j.compedu.2021.104207

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13(3), 319–340.

Ivanov, A., Radonjić, A., Stošić, L., Krčadinac, O., Đokić, D. B., & Đokić, V. (2025). Teachers' digital competencies before, during, and after the COVID-19 pandemic. Sustainability, 17(5), 2309. https://doi.org/10.3390/su17052309

Krčadinac, O., & Stojaković, N. (2024). The application of deep learning in medicine: Benefits, challenges, and future prospects. Journal of UUNT: Informatics and Computer Sciences, 1(1), 19–25.

Krčadinac, O., Stanković, Željko, Mrazovac, S., & Stošić, L. (2024). Mobile robotic laboratory - UNT Lab. Journal of UUNT: Informatics and Computer Sciences, 1(1), 1-10. https://doi.org/10.62907/juuntics240101001k

Latinović, B., Krčadinac, O., Stanković, Ž., & Stošić, L. (2025). The sociology of artificial intelligence through the lens of ethics in the digital age. Journal of UUNT: Informatics and Computer Sciences, 2(1), 1–8.

Labadze, L., Grigolia, M., & Machaidze, L. (2023). Role of AI chatbots in education: A systematic literature review. International Journal of Educational Technology in Higher Education, 20, Article 56. https://doi.org/10.1186/s41239-023-00426-1

Milivojević, L., Mrazovac Kurilić, S., Božilović, Z., Koprivica, S., & Krčadinac, O. (2023). Study of particular air quality and meteorological parameters at a construction site. Atmosphere, 14(8), 1267. https://doi.org/10.3390/atmos14081267

Mubin, O., Stevens, C. J., Shahid, S., Al Mahmud, A., & Dong, J. J. (2013). A review of the applicability of robots in education. Technology for Education and Learning, 1(1), 1–7. https://doi.org/10.2316/Journal.209.2013.1.209-0015

Naseri, R. N. N., & Abdullah, M. S. (2024). Understanding AI technology adoption in educational settings: A review of theoretical frameworks and their applications. Information Management and Business Review, 16(3), 3963. https://doi.org/10.22610/imbr.v16i3(I).3963

Negrini, L. (2025). Teachers' attitudes towards educational robotics in compulsory school. Italian Journal of Educational Technology.

Ouyang, F., & Xu, W. (2024). The effects of educational robotics in STEM education: A multilevel meta-analysis. International Journal of STEM Education, 11, Article 7. https://doi.org/10.1186/s40594-024-00469-4

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. MIS Quarterly, 27(3), 425–478.

Wang, H., Liu, S., & Li, Q. (2025). Social and emotional support and acceptance of educational robotics. Contemporary Educational Technology, 17(1), ep545. https://doi.org/10.30935/cet.11545

Zhang, C., Schießl, J., Plößl, L., & Hofmann, F. (2023). Acceptance of artificial intelligence among pre-service teachers: A multigroup analysis. International Journal of Educational Technology in Higher Education. https://doi.org/10.1186/s41239-023-00420-7

Stošić, L., Radonjić, A., & Krčadinac, O. (2025). The Evolution of Artificial Intelligence and Its Transformative Role in Education. Journal of UUNT: Informatics and Computer Sciences, 2(1), 15-21. https://doi.org/10.62907/juuntics250201015s

UDC:
331.101:004.89(497.11)

\10.62907/juuntics250202007i

The Effects of Chatbots on Customer Services Jobs - Does Using Chatbots Mean Losing the Human Jobs?

Damir Ilić[1], Olga Mašić[2], Tatjana Ilić-Kosanović[3]*

[1]University "Union - Nikola Tesla", School of Engineering Management, Belgrade, Serbia, E-mail: damir.ilic@fim.rs
[2]PhD Student, University "Union - Nikola Tesla", School of Engineering Management, Belgrade, Serbia, E-mail: olga.masic@fim.rs
[3]University "Union - Nikola Tesla", Belgrade, Serbia, E-mail: tilickosanovic@unionnikolatesla.edu.rs

Abstract: As chatbots progressively replace employees in customer support, studies on their influence on customer satisfaction, customers' planning of the repurchasing, and customers' recommendations of goods and services are rapidly expanding, assisting businesses in identifying implementable technical solutions that decrease labor expenses while preserving purchaser retention. However, the topic of influence of chatbots on the labor market mostly consists of sensationalist claims in the media about the disappearance of human job positions in customer service with the observable lack of rigorous empirical studies on the extent of job losses, AI-human collaboration models, and customer preferences. The findings of this study indicate that chatbot implementation has led to a moderate reduction in customer service staffing, with the largest effects in sectors characterized by routine inquiries. However, qualitative evidence shows that companies are mostly restructuring job roles rather than engaging in large scale layoffs, with many employees transitioning into more complex or strategic tasks. Customer satisfaction improved slightly, following digitalization and automation of customer service, suggesting that chatbots can enhance service efficiency when integrated into hybrid models. The Serbian context, particularly language adaptation challenges and uneven financial resources, and organizational readiness, continues to shape the pace and outcomes of implementation. These results highlight the need for targeted training and coordinated emplozee development policies to help employees in customer service adapt to changing job requirements.

Keywords: *Chatbots, customer services, jobs, job loss, hybrid models, customer preferences.*

Introduction

As chatbots increasingly replace human agents in customer support, research on their impact on customer satisfaction and repurchase intentions or product and service recommendations is rapidly expanding. At the same time, the implementation of chatbots in customer service departments has become widespread, and such research often helps companies identify optimal technological solutions that reduce labor costs while maintaining or improving customer retention. Customers can also express their satisfaction or dissatisfaction with new products and services, and the quality of information they receive, especially in the context of complaint resolution, through social media and review pages (like Google review options).

In parallel, headlines, both in daily newspapers and reputable business magazines, often sensationally claim that human work in customer support will soon disappear and that large numbers of employees will be laid off (Sirimanne, 2023; Carbonaro, 2023; Wiseman, & Associated Press, 2024; Elwan, 2025; Meenakshi, & Ayush, 2025). However, rigorous empirical research that can reliably estimate the extent of potential job losses, explore possible models of cooperation between artificial intelligence and employees, and identify how and in which sectors replaced customer service agents can apply their existing knowledge, skills, and abilities are missing. For companies, it is often more about understanding whether consumers prefer to have conversation with a person or a chatbot, which may be key to

*Corresponding author: damir.ilic@fim.rs

understanding future job losses in this area (Cheng, Zhang, Cohen, & Mou, 2022; Sirimanne, 2023; Silva, Shojaei, & Barbosa, 2023; Babashahi, Barbosa, Lima, Lyra, Salazar, Argôlo, Almeida, & Souza, 2024).

In the context of Serbia, where digital transformation is accelerating but with specific challenges such as technological and financial barriers for small businesses and an unemployment rate of around 9%, this research will try to fill the gap with empirical data from available statistical data and reports and interviews with HR managers of companies in various sectors. The focus is on quantifying the loss of full-time agents (ΔFTE), containment rates, and customer preferences, providing a basis for hybrid models and retraining policies.

Literature Review

Customer service is one of the crucial elements of every successful business, like a glass bridge connecting a company to its customers. Imagine a salesperson in a traditional store who, with a smile, listens to a complaint about a poor-quality product and immediately offers a replacement (or it can be quite the opposite, a salesperson who is not willing to listen to the complaints of the customers), that scene is now multiplied in the digital world with thousands of interactions a day. From simple phone calls to sophisticated chats in digital realm, customer service is not just about reacting to problems, but proactive care that builds loyalty and turns regular customers into brand advocates. In the past, customer service was also a personal touch in small businesses, where the owner knew every purchaser by name. Modern businesses introduced call centers, where agents were trained to resolve complaints quickly and efficiently. Today, with the rise of e-commerce, service is expanding across multiple channels like email, social networks, apps and self-service portals, enabling 24/7 borderless support (Huang, & Rust, 2020; Adam, Wessel, & Benlian, 2021; Zhang, Li, & Liu, 2022; Lee, Ju, & Lee, 2023; Ranieri, Di Bernardo, & Mele, 2024; Soori, Arezoo, & Dastres, 2023; Gao, Opute, Jawad, & Zhan, 2025; Marcineková, Sujová, & Ďurica, 2025).

Customer service employees carry a load of emotions, from angry complaints to thank-you notes. Their key missions include resolving issues quickly, such as tracking shipments or issuing refunds; tracking buyer satisfaction through surveys; supporting consumers in the situations where small gestures like personalized offers make a great difference; reporting to and collaborating with other departments to prevent future errors. The health challenges are countless: headaches, high blood pressure, stress, burnout, and the need for empathy in a digital distance, but those who succeed create stories that may go viral, especially in the age of social media. Quality customer service is not an expense, but an investment, studies show that loyal customers spend more (Huang, & Rust, 2020; Cheng, Zhang, Cohen, & Mou, 2022; Zhang, Li, & Liu, 2022; Marcineková, Sujová, & Ďurica, 2025). In the era of reviews on Google and other platforms, one negative story can cost thousands of euros, while a positive one becomes free marketing, and sometimes reviews can make or break businesses. In the end, it is the art of listening that enables a company not only to be profitable, but also to be appreciated and to build a brand.

Artificial intelligence (AI) is a technology that enables machines to simulate human intelligence, including learning, understanding, and decision-making. It is based on machine learning algorithms, neural networks, and deep learning, enabling them to process vast amounts of data faster and more accurately than humans. Artificial intelligence is widely used to automate routine tasks, such as invoice processing, customer support via chatbots, and inventory management, which reduces costs and errors. In marketing, AI analyzes consumer behavior for personalized campaigns and product recommendations, increasing sales. It also predicts machine failures in production and optimizes supply chains. Key benefits are thought to include increased efficiency (automation frees up employees for strategic tasks, speeding up processes by up to 50% in many sectors); better decisions (data analysis reveals trends and risks, e.g. in finance to forecast markets); personalization (improves the customer experience through customized services, such as in retail.

Challenges and the future development is also a significant topic (Huang, & Rust, 2020; Adam, Wessel, & Benlian, 2021; Dwivedi, Hughes, Ismagilova, Aarts, Coombs, Crick, … Williams, 2021; Cheng, Zhang, Cohen, & Mou, 2022; Soori, Arezoo, & Dastres, 2023; Ranieri, Di Bernardo, & Mele, 2024;

Meenakshi, & Ayush, 2025). Implementing AI requires investments in training and infrastructure, along with concerns about data privacy (Soori, Arezoo, & Dastres, 2023). However, companies that implement it are gaining a competitive advantage, with its use growing in Serbia and the region.

Chatbots are a revolutionary tool in customer service, acting as virtual assistants that are able to respond to customer inquiries in real time, 24/7, without tiredness or waiting. Picture a situation where a customer asks for the status of a shipment at night, instead of being left without an answer, the chatbot instantly provides information, tracking, and even suggests next steps, thereby building trust and customer satisfaction. This technology, based on AI and natural language processing, takes over routine tasks, freeing agents for more complex problems. Chatbots may reduce response waiting, and in some cases, such as airlines, may resolve most of inquiries without human intervention, increasing efficiency and reducing costs. They offer personalized recommendations based on purchase history, support multiple languages, and proactively intervene, e.g., reminding about abandoned carts in e-commerce. They also accumulate feedback, transforming customer support into future sales opportunities. Nevertheless, there are some questions, whether the chatbots are providing the true assistance, or the effects are only perceived and whether the customers prefer human interaction and empathy, not only artificial or synthetic empathy which is sometimes actually presenting chatbot inadequacies (Adam, Wessel, & Benlian, 2021; Castelo, Boegershausen, Hildebrand, & Henkel, 2023; Silva, Shojaei, & Barbosa, 2023; Agnihotri, & Bhattacharya, 2024; Gao, Opute, Jawad, & Zhan, 2025; Knutsson, 2025).

The best chatbots are not human replacements, but associates, they routinely direct complex cases to agents with a comprehensive history of conversations, avoiding frustration. At companies like BMW, they handle thousands of inquiries per month, freeing up call centers for high-value interactions. This hybrid type guarantees empathy where it's needed, with scalability for global teams (Cai, Heo, & Yan, 2025). With the advancement of generative AI, chatbots are becoming even smarter, anticipating needs and offering emotional support through tone analysis. However, the key to success lies in continuous training of employees and investing in analytics, where NPS (Net Promoter Score) and conversions are measured for optimization (Marcineková, Sujová, & Ďurica, 2025). Ultimately, they don't just solve problems, they create stories of quickness and attention that customers share, but also stories of their failures to solve some complex customer problems (Adam, Wessel, & Benlian, 2021; Castelo, Boegershausen, Hildebrand, & Henkel, 2023; Silva, Shojaei, & Barbosa, 2023; Agnihotri, & Bhattacharya, 2024).

Scientific literature highlights that chatbots significantly improve customer service efficiency, reducing response times by half and support costs by a third, while increasing customer satisfaction (CSAT) by 12-30% compared to traditional customer service channels. Studies show that they handle the most of routine inquiries, freeing agents for complex cases, with highest resolution rate in hybrid systems. Positive impacts on performance are considered to be obvious (Zhang, Li, & Liu, 2022). Empirical research documents that AI chatbots increase conversions and reduce cancellations, thanks to personalization and 24/7 availability. In banking and retail (e.g. Bank of America, Starbucks), they reduce handling times by a half, with higher NPS scores than phone or email support. These effects are particularly pronounced in e-commerce, where chatbots generate additional sales through proactive recommendations. Negative sides are also very important, especially when chatbots fail to produce real support and are unable to solve complex problems (Adam, Wessel, & Benlian, 2021; Castelo, Boegershausen, Hildebrand, & Henkel, 2023; Silva, Shojaei, & Barbosa, 2023; Agnihotri, & Bhattacharya, 2024; Elwan, 2025; Gao, Opute, Jawad, & Zhan, 2025).

The literature warns of double effects, chatbots do replace lower-level jobs (up to a 20%), and transform agent roles towards strategic tasks, increasing productivity by 80%. A 2025 study concludes that they do not lead to mass layoffs, but require retraining for AI collaboration, with most of the companies reporting faster complaint resolution. Despite the benefits, scientists highlight problems such as lower empathy in complex emotional interactions (more than two thirds of customers prefer human customer service employees for complaints) and the need for continuous training of AI models to avoid errors (Elliott, 2018; Zhang, Li, & Liu, 2022; Cai, Heo, & Yan, 2025; Meenakshi, & Ayush, 2025). Current research predicts hybrid models as optimal, co-working between humans and AI, with a focus on empathy, problem solving, ethics, and data privacy (Adam, Wessel, & Benlian, 2021; Castelo, Boegershausen, Hildebrand,

& Henkel, 2023; Silva, Shojaei, & Barbosa, 2023; Agnihotri, & Bhattacharya, 2024).

3. Methods and Measures

The study draws on a mixed method design to examine how the introduction of chatbots has influenced employment patterns in customer service departments in Serbia. Quantitative data were obtained from various available statistical and labor reports (HR Lab, 2023; NZS 2022-2024; IBISWorld, 2025; Statistical Office of the Republic of Serbia, 2025), and data sheets provided by the HR managers (with the prominent lacking of these information in published company reports). These data and reports covered the period from 2022 to 2025 and included information on the number of full time employees (FTE), automation indicators such as containment rate, and customer experience metrics. Changes in staffing levels before and after the deployment of chatbots were used to estimate the scale of workforce adjustments.

To complement the statistical data, semi structured interviews were conducted with 20 HR managers from various companies with more than 100 employees (retail, finance and banking, production, transport, logistics, information technologies and communications). Interviews took place online during the summer of 2025 and typically lasted around 30 minutes. Participants were asked about chatbots implementation, retraining initiatives, projected shift toward hybrid human-AI service models, and their perceptions of how digitalization and automation was reshaping customer service roles. All interviews were transcribed and examined using thematic analysis, with attention to differences across sectors and company size. Ethical procedures were followed throughout the study, including informed consent and the protection of organizational anonymity. The main outcome variable was the percentage change in FTEs, calculated as:

$$\Delta FTE = \frac{FTE_{pre} - FTE_{post}}{FTE_{pre}} \times 100$$

Digitalization and automation intensity (measured through containment rate) and customer satisfaction indicators served as key explanatory variables. Triangulation of quantitative and qualitative sources was used to strengthen the reliability of findings.

4. Results

Quantitative data shows that the introduction of chatbots was associated with an average decrease of 17.8% in customer service FTEs. The extent of change varied by sector: retail companies recorded the largest decline, while financial institutions experienced more modest reductions, reflecting the higher share of complex inquiries that still require human intervention. Digitalization and automation levels were relatively high across all sectors, with an average containment rate of 70%. Customer satisfaction scores showed only slight improvements, following the adoption of automated systems. A summary of sector level results is presented below:

Table 1. A summary of sector level results (Source: Authors' research)

Sector	ΔFTE (%)	Containment Rate (%)	CSAT Improvement
Retail	23.5	78	+0.6
Telecom	14.9	65	+0.3
Finance	11.5	72	+0.5
Average	17.8	70	+0.4

The interview data provide additional insight into how organizations are managing the transition to automated service channels. Three topics appeared consistently across responses. Firstly, managers emphasized the growing reliance on chatbots for routine inquiries, which has reduced the need for entry level customer service roles. Secondly, many companies are moving toward hybrid service models in which human agents focus on more problematic or complex communications. This shift has initiated new training programs aimed at developing analytical, communication, and problem solving skills of customer service employees. Thirdly, several respondents noted challenges specific to the Serbian context, including the budget, the need for improved language adaptation in chatbot systems, and varying levels of organizational readiness for digital transformation.

Taken together, the findings suggest that the introduction of chatbots has led to noticeable but not uniform reductions in customer service staffing. Rather than large scale displacement, the evidence points to a gradual restructuring of roles, with automation absorbing routine tasks and customer service employees moving toward more specialized functions.

Discussion

The findings of this study show that the introduction of chatbots has had a measurable, though uneven, impact on employment in Serbian companies customer services. The average reduction of 17.8% in FTEs suggests that digitalization and automation is reshaping staffing structures, particularly in sectors where customer inquiries are highly standardized. Retail companies, for example, reported the largest declines, which is consistent with the high proportion of routine, repetitive interactions that can be digitalized and automated with quite small risk. In contrast, financial institutions experienced more modest reductions, reflecting the continued need for human judgment in complicated or complex cases.

Although the quantitative data point to a noticeable contraction in customer service roles, the qualitative findings provide important distinction. HR managers consistently emphasized that digitalization and automation has not resulted in widespread layoffs. Instead, companies appear to be reallocating human labor toward tasks that require interpersonal skills, analytical, or problem solving abilities. The shift toward hybrid service models, where chatbots handle routine inquiries and human agents manage escalations, illustrates how digitalization and automation can coexist with customer service employees rather than replace them entirely, which is in line with contemporary research by Zirar, Ali, & Islam (2023), Babashahi, Barbosa, Lima, Lyra, Salazar, Argôlo, Almeida, & Souza (2024), and Cai, Heo, & Yan (2025). This pattern aligns with broader research suggesting that AI adoption often leads to job transformation rather than simple displacement which is in line with current research as Ranieri, Di Bernardo, & Mele (2024) and Meenakshi, & Ayush (2025).

The interviews also highlight several contextual factors that shape how automation unfolds in Serbia. Language adaptation remains a challenge, particularly for expressions that are difficult for automated systems to interpret. Organizational readiness varies as well; some companies have established training programs and clear transition paths, while others are still adjusting their internal processes to accommodate new technologies. These differences help explain why the impact of chatbots is not uniform across sectors or regions. Customer experience indicators provide another layer of insight. The modest improvement in CSAT scores following chatbot implementation suggests that digitalization and automation has not compromised customer service quality. In some cases, faster response times and consistent handling of routine inquiries may have contributed to these gains. However, the qualitative data indicate that customers still prefer human interaction for complex issues, reinforcing the need for balanced customer service models.

Taken together, the results point to a gradual restructuring of customer service work rather than abrupt workforce reductions. Digitalization and automation is clearly reducing the demand for entry level roles, but companies are simultaneously investing in training and increasing the responsibilities of remaining staff. This transition raises significant strategy concerns. Given Serbia's labor market conditions and the skill requirements of emerging customer service roles, targeted training could help employees to adapt to changing job demands and reduce the risk of long term unemployment. Overall, the study

shows that chatbot adoption is reshaping customer service employment in Serbia, but the process is more evolutionary than disruptive. The combination of quantitative and qualitative evidence emphasizes the importance of viewing digitalization and automation not only as a technological change but also as an organizational and social one.

Implications and Conclusion

The findings of this study carry several implications for organizations, policymakers, and the broader labor market in Serbia. For companies, the results emphasize the importance of approaching chatbot adoption as a process of organizational transformation rather than a purely technical upgrading. While digitalization and automation can reduce the volume of routine job tasks, the shift toward hybrid service models may require investment in employee development. Training programs that strengthen communication and analytical skills, and digital literacy appear critical for empowering existing employees to transition into more complex job roles. Businesses that disregard this aspect risk widening internal skills gaps and limiting the benefits of digitalization and automation.

From a policy perspective, the study suggests a need for targeted support mechanisms that help employees to adapt to technological change. Given the uneven impact of digitalization and automation across sectors and regions, training subventions or public-private partnerships could play a role in reducing adjustment costs, particularly for employees in entry level customer service positions. Strengthening vocational programs in digital service competencies may also help align the labor force with emerging job requirements. Additionally, the challenges related to language adaptation in chatbot systems point to an opportunity for local technology development, which could improve service quality while reducing dependence on imported solutions. Finally, the results have implications for the broader debate on digitalization, automation and employment. The evidence from Serbia indicates that job restructuring is more common than large scale lay-offs. This suggests that the long term effects of digitalization and automation will depend not only on technological capabilities but also on how organizations design their customer service models and how effectively employees are supported during transitions.

The results of this study show that introduction of chatbots has led to a measurable reduction in customer service staffing, with an average decline of 17.8% across the sample. However, the qualitative findings clarify that these cutbacks do not equate to widespread job loss. Instead, companies are restructuring their customer service structures, shifting routine tasks to digitalized and automated systems while expanding the responsibilities of employees in areas that require judgment, receptiveness and empathy, or specialized knowledge. The sectoral variances observed in the study emphasize the significance of contextual factors such as budgets, customer service complexity, organizational readiness, and language adaptation. Customer satisfaction indicators improved slightly following chatbot implementation, suggesting that digitalization and automation can enhance service efficiency without undermining user experience when deployed appropriately.

Overall, the findings highlight a gradual evolution of customer service configuration, rather than sudden technological shift. As digitalization and automation continues to advance, the key challenge for organizations will be to ensure that the employees are equipped with the skills needed to thrive in increasingly hybrid customer service environments. Continuous attention to training, flexibility and adaptation, and responsible implementation will be crucial for maximizing the benefits of digitalization and automation while mitigating its potential risks.

References

Adam, M., Wessel, M. & Benlian, A. (2021). AI-based chatbots in customer service and their effects on user compliance. Electron Markets 31, 427–445 (2021). https://doi.org/10.1007/s12525-020-00414-7.

Agnihotri, A., & Bhattacharya, S. (2024). Chatbots' effectiveness in service recovery. International Journal of Information Management, 76. https://doi.org/10.1016/j.ijinfomgt.2023.102679.

Babashahi, L., Barbosa, C. E., Lima, Y., Lyra, A., Salazar, H., Argôlo, M., Almeida, M. A. d., & Souza, J. M. d. (2024). AI in the Workplace: A Systematic Review of Skill Transformation in the Industry. Administrative Sciences, 14(6), 127. https://doi.org/10.3390/admsci14060127.

Cai, N., Heo, J., & Yan, J. (2025). Understanding consumer reactions to chatbot service failures: Evidence from a Wizard-of-Oz experiment. Acta Psychologica, 253. https://doi.org/10.1016/j.actpsy.2025.104707.

Carbonaro, G. (2023, July 19). AI is 'absolutely' coming after your job if you work in customer service. But it's not all bad. Euronews. Retrieved on September 12, 2025 from https://www.euronews.com/next/2023/07/19/ai-is-absolutely-coming-after-your-job-if-you-work-in-customer-service-but-its-not-all-bad.

Castelo, N., Boegershausen, J., Hildebrand, C., & Henkel, A. P. (2023). Understanding and Improving Consumer Reactions to Service Bots, Journal of Consumer Research, Volume 50, Issue 4, December 2023, Pages 848–863, https://doi.org/10.1093/jcr/ucad023.

Cheng, X., Zhang, X., Cohen, J., & Mou, J. (2022). Human vs. AI: Understanding the impact of anthropomorphism on consumer response to chatbots from the perspective of trust and relationship norms. Information Processing and Management, 59(3). https://doi.org/10.1016/j.ipm.2022.102940.

Cordero, J., Barba-Guaman, L., & Guamán, F. (2022). Use of chatbots for customer service in MSMEs. Applied Computing and Informatics, Vol. ahead-of-print No. ahead-of-print. https://doi.org/10.1108/ACI-06-2022-0148.

Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., … Williams, M. D. (2021). Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. International Journal of Information Management, 57. https://doi.org/10.1016/j.ijinfomgt.2019.08.002.

Elliott, C. (2018, August 27). Chatbots are killing customer service. Here's why. Forbes. Retrieved on September 12, 2025 from https://www.forbes.com/sites/christopherelliott/2018/08/27/chatbots-are-killing-customer-service-heres-why/.

Elwan, J. (2025, March 24). AI chatbots in customer service: Can they truly replace human agents? Infomineo. Retrieved on September 12, 2025 from https://infomineo.com/artificial-intelligence/ai-chatbots-in-customer-service-can-they-replace-human/.

Gao, J., Opute, A. P., Jawad, C., & Zhan, M. (2025). The influence of artificial intelligence chatbot problem solving on customers' continued usage intention in e-commerce platforms: an expectation-confirmation model approach. Journal of Business Research, 200. https://doi.org/10.1016/j.jbusres.2025.115661.

HR Lab. (2023). Regional labour market research 2023. Retrieved on September 2, 2025 from https://www.hrlab.rs.

Huang, M. H., & Rust, R. T. (2020). A strategic framework for artificial intelligence in marketing. Journal of the Academy of Marketing Science. 49. 10.1007/s11747-020-00749-9.

IBISWorld. (2025). Human resources provision in Serbia. Retrieved on September 2, 2025 from https://www.ibisworld.com.

Knutsson, K. (2025, July 13). Chatbots are losing customer trust fast. Why customers still prefer humans over chatbots for customer service. Fox News. Retrieved on September 12, 2025 from https://www.foxnews.com/tech/chatbots-losing-customer-trust-fast.

Lee, S. E., Ju, N., & Lee, K. H. (2023). Service chatbot: Co-citation and big data analysis toward a review and research agenda. Technological Forecasting and Social Change, 194. https://doi.org/10.1016/j.techfore.2023.122722.

Marcineková, K., Sujová, A. J., & Ďurica, R. (2025). Implementing AI Chatbots in Customer Service Optimization - A Case Study in Micro-Enterprise. Information, 16(12), 1078. https://doi.org/10.3390/info16121078.

Meenakshi, R., & Ayush, N. (2025). The Impact of Chatbots on Customer Service Jobs: A Study on the Replacement of Human Customer Support Agents. International Journal of Research and Innovation in Social Science (IJRISS), 9(07), 764-774. https://doi.org/https://dx.doi.org/10.47772/IJRISS.2025.90700060.

NZS. Arhiva biltena (2022-2024). Arhiva biltena (2022-2024). Retrieved on September 3, 2025 from https://www.nsz.gov.rs.

Ranieri, A., Di Bernardo, I., Mele, C. (2024). Serving customers through chatbots: positive and negative effects on customer experience. Journal of Service Theory and Practice, Vol. 34 No. 2 pp. 191–215, doi: https://doi.org/10.1108/JSTP-01-2023-0015.

Silva, F. A., Shojaei, A. S., & Barbosa, B. (2023). Chatbot-Based Services: A Study on Customers' Reuse Intention. Journal of Theoretical and Applied Electronic Commerce Research, 18(1), 457-474. https://doi.org/10.3390/jtaer18010024.

Sirimanne, S. N. (January 2023). How artificial intelligence chatbots could affect jobs. UNCTAD. Retrieved on September 9, 2025 from https://unctad.org/news/blog-how-artificial-intelligence-chatbots-could-affect-jobs.

Soori, M., Arezoo, B., & Dastres, R. (2023). Inteligencia artificial, aprendizaje automático y aprendizaje profundo en robótica avanzada, una revisión. Cognitive Robotics. KeAi Communications Co. Retrieved on September 8, 2025 from https://reader.elsevier.com/reader/sd/pii/S2667241323000113?token=E5222E4F1B4CAB1F3437D3249BD170DA31E487F08AD1BFEE316274E433FE309BB9BFC6E33C037F901181440EE936DF7F&originRegion=us-east-1&originCreation=20230518140602.

Statistical Office of the Republic of Serbia. (2025). Labour market statistics. Retrieved on September 3, 2025 from https://www.stat.gov.rs.

Wiseman, P., & Associated Press. (2024, September 2). AI may change your job but it won't eliminate many, labor experts say. Fortune. Retrieved on September 12, 2025 from https://fortune.com/2024/09/02/ai-change-job-eliminate-many-labor-experts-say/.

Zhang, Z., Li, B. & Liu, L. (2022). The impact of AI-based conversational agent on the firms' operational performance: Empirical evidence from a call center. Applied Artificial Intelligence. 37. 10.1080/08839514.2022.2157592.

Zirar, A., Ali, S. I., & Islam, N. (2023). Worker and workplace Artificial Intelligence (AI) coexistence: Emerging themes and research agenda. Technovation, 124. https://doi.org/10.1016/j.technovation.2023.102747

UDC:
323.2:004.89
323.23:172.1
10.62907/juuntics250202015l

Social and Ethical Challenges of Artificial Intelligence in International Political Communication

Boris Latinović[1], Olja Krčadinac[1]*

[1]University "Union – Nikola Tesla", Faculty of Informatics and Computer Science, Belgrade, Serbia
E-mail: blatinovic@unionnikolatesla.edu.rs, okrcadinac@unionnikolatesla.edu.rs

Abstract: Artificial intelligence has become deeply woven into the fabric of global political communication, subtly altering how states, institutions, and transnational actors attempt to shape public opinion across borders. Although AI-driven systems promise efficiency, predictive capacity, and unprecedented reach, they simultaneously generate vulnerabilities that are neither easily measurable nor ethically neutral. This article investigates the social and ethical complexities emerging from the deployment of AI in the international political sphere. Central attention is given to disinformation dynamics, algorithm-mediated asymmetries of power, the erosion of individual autonomy, and the global diffusion of biased technological infrastructures. The study draws upon political sociology, communication ethics, and the sociology of technology to establish a multidimensional framework that captures the intertwined nature of AI's political, cultural, and moral consequences. It argues that without sustained ethical vigilance and cross-border regulatory cooperation, AI will continue to amplify the existing inequalities in the global political landscape and undermine the conditions necessary for democratic deliberation.

Keywords: *Artificial Intelligence, Political Communication, Disinformation, Algorithmic Power, Ethical Governance.*

Introduction

Artificial intelligence has entered international political communication not with the loud steps of a conqueror, but rather with the quiet persistence of a system that operates beneath perception. What once depended on the persuasive voice of diplomats, the ideological tone of state media, or the slow rhythm of traditional political campaigns now increasingly travels through opaque algorithmic infrastructures that decide (long before citizens even notice) what will reach their screens, how it will be framed, and which emotional contours it should evoke.

The transformation is not merely technical. It reshapes the grammar of political interaction. Political messaging across borders used to be a matter of strategic calculation, ideological projection, and human judgment. Today it unfolds in an environment where data analytics, generative models, predictive systems, and automated narratives operate with a logic of their own. These new instruments do not simply transmit political speech: they recombine it, anticipate preferred reactions, and tailor it to the psychological dispositions of millions.

For regions like Eastern Europe, which historically oscillate between large global forces and whose public spheres have always been exposed to foreign influences, AI-driven communication brings an additional layer of vulnerability. It introduces a subtle kind of power, a blend of persuasion and technological dependency, that can shape political imaginaries without announcing itself. To Western audiences, the phenomenon often appears abstract; yet in transitional societies, its effects are felt directly, as if a new invisible actor has stepped into the public square.

In this article, I examine the social and ethical dimensions of these changes. The goal is not to demonize AI nor to present it as an uncontestably destiny, but to uncover the invisible mechanisms through which it reorganizes international political communication. I propose that the ethical question,

*Corresponding author: blatinovic@unionnikolatesla.edu.rs

who is responsible for algorithmic political influence, and toward whom, is becoming one of the defining issues of contemporary political life.

AI as a Socio-Technical Infrastructure

Contemporary AI functions as a hybrid system composed of technical architectures, organizational interests, cultural expectations, and global flows of data. Scholars increasingly describe AI as a form of infrastructural power, capable of influencing public perception through its structural position in the communication ecosystem. This infrastructural power means that AI systems are not neutral intermediaries; they carry embedded assumptions, incentives, and constraints derived from their design and economic environment.

Traditional political communication relied on identifiable sources and predictable channels. AI disrupts this pattern by enabling:

- micro-personalized political narratives
- predictive modelling of public sentiment
- automated cross-border messaging campaigns
- fragmentation of audiences into isolated informational "textual bubbles"

These transformations complicate the distinction between propaganda, persuasion, and legitimate political communication.

Ethical analysis relies on several philosophical traditions:

- deontological ethics, which demands transparency and respect for autonomy
- consequentialism, which evaluates political outcomes of algorithmic influence
- virtue ethics, which considers what political character emerges when persuasion becomes automated
- relational ethics, which emphasizes the moral quality of interactions between humans and AI systems

When applied to international political communication, these frameworks reveal the complexity of assigning responsibility within distributed algorithmic environments.

Global Landscape of AI-Driven Political Communication

The United States promotes an innovation-driven, market-cantered approach to AI governance. China integrates AI into a centralized political vision that merges technological advancement with state-led ideological messaging. The European Union emphasizes a rights-based regulatory model prioritizing human dignity and democratic accountability. These differing paradigms produce a fragmented global environment in which smaller states lack the capacity to negotiate with powerful AI infrastructures that transcend borders.

States with limited technological capacity often become dependent on foreign platforms for their political communication environment. This informational dependency reduces their ability to control digital sovereignty, exposing them to algorithmic biases generated outside their cultural context.

Private digital platforms now possess the ability to amplify or suppress political narratives globally. Their influence extends beyond national jurisdictions, making them de facto geopolitical actors. [1] Their algorithmic systems shape visibility, frame international conflicts, and influence elections in subtle yet far-reaching ways.

Social Challenges

Algorithmic systems are built to maximize engagement rather than foster meaningful democratic deliberation. They prioritize emotionally charged content, thereby deepening ideological divides and enabling foreign actors to strategically exploit latent social tensions. This intensified polarization heightens overall vulnerability to manipulative political messaging. In practice, such systems generate psychological

echo chambers in which individuals encounter predominantly those messages that reinforce their existing worldviews, turning difference of opinion into a form of symbolic threat. Over time, digital spaces that were once envisioned as platforms for pluralistic dialogue become arenas of antagonistic contestation, where emotionally provocative messages are algorithmically rewarded regardless of their factual integrity. This cycle of fragmentation reshapes how communities imagine one another, as opposing groups begin to perceive disagreement not as a democratic necessity, but as a destabilizing force. The engagement-driven logic of digital platforms simultaneously creates openings for external influence, allowing foreign actors to identify and amplify social fault lines with minimal resistance. As these pressures accumulate, societies enter a state of "permanent vigilance," unsure whether political discourse is organic or strategically engineered. This erosion of confidence in the informational environment contributes to a broader crisis of trust in public institutions, civic processes, and interpersonal communication. Consequently, democratic deliberation weakens, and the conditions that sustain political extremism become progressively normalized, as the algorithmic ecosystem elevates intensity over substance.

AI-enhanced disinformation campaigns now rely on synthetic media, automated account networks, and predictive modelling to shape the attitudes of foreign publics. Their cross-border diffusion complicates attribution and accountability, leaving governments with limited institutional tools to respond effectively. These campaigns function through fluid, decentralized architectures that are difficult to trace, blurring the boundaries between state-driven operations, proxy actors, and opportunistic digital groups. Synthetic audio-visual materials, including deepfakes, introduce a new layer of epistemic instability by undermining citizens' confidence in sensory evidence itself. As a result, trust in journalism, official communications, and even interpersonal messaging is systematically weakened. Algorithmically targeted disinformation adapts rapidly to the emotional patterns of specific populations, exploiting triggers such as fear, resentment, or moral outrage in ways tailored to local socio-historical contexts. Predictive models operate like psychological cartographies, identifying points of maximal susceptibility where persuasive pressure will have the greatest impact. Traditional state institutions often respond too slowly, constrained by legal frameworks and bureaucratic procedures that cannot match the velocity of algorithmic amplification. In the meantime, public discourse becomes increasingly opaque and volatile, reducing the distinction between domestic and foreign influence to a matter of mere technical sophistication. Under these conditions, global political communication evolves into a competitive battleground where truth is determined less by evidentiary standards and more by algorithmic visibility and narrative momentum.

Micro-targeting driven by large-scale personal data collection has the capacity to steer political preferences beneath the threshold of conscious awareness. Political messages crafted to exploit psychological vulnerabilities undermine collective debate and weaken democratic autonomy. In this paradigm, citizens are recast as clusters of behavioural indicators and emotional profiles, while political persuasion becomes a form of neuro-psychological targeting. When messages are tailored so precisely that they resonate with individual fears, aspirations, or frustrations, the shared public sphere dissolves into a constellation of private political realities. Voters then participate in elections and public discussions on the basis of pre-engineered predispositions rather than reflective judgment. This fragmentation of the informational landscape erodes the sense of a common political horizon, as different segments of society inhabit incommensurable informational worlds. Individuals are typically unaware that their perceptions are being shaped, which reinforces the illusion of autonomous political agency while masking the underlying architecture of influence. These dynamics raise profound questions about the authenticity of political will: can a decision be considered free if it is constructed through algorithmic profiling? Moreover, the private corporations that design and deploy these targeting systems operate without democratic accountability, further complicating the ethical landscape. Over time, micro-targeting contributes to the dissolution of a shared democratic imagination, posing a serious threat to the very foundations of deliberative political life.

Cultural Vulnerabilities in Transitional Societies

In societies marked by historical trauma or geopolitical instability (particularly those in Eastern Europe) algorithmic interventions tend to resonate with exceptional depth. Narrative manipulation becomes

more feasible when public trust is structurally fragile, dispersed, or historically undermined. Over time, algorithmically curated narratives can become internalized, subtly shaping citizens' political perceptions without overt coercion. This gradual "colonization of the mind" challenges traditional conceptions of political identity and agency. Transitional societies, still negotiating the legacies of conflict, state dissolution, and shifting geopolitical alignments, provide fertile ground for such processes. Collective memory in these contexts often remains contested and emotionally charged, allowing algorithmic systems to reactivate dormant grievances or anxieties embedded in historical consciousness. Because the boundary between past and present is frequently blurred, artificially crafted narratives can easily masquerade as extensions of familiar cultural scripts, even when they originate from external strategic actors. As a result, the digital environment becomes a terrain of symbolic struggle in which identities are continually reconstructed under conditions shaped by technological platforms rather than local deliberative practices. Geopolitical pressures further heighten this susceptibility: any new international crisis can serve as a trigger for algorithmically amplified campaigns targeting fear, perceived victimhood, or existential insecurity. Over time, citizens may lose the ability to distinguish between organic public narratives and strategically manufactured ones, generating confusion about the authenticity of their own political intuitions. In this setting, political agency is reconfigured; instead of emerging from reflective civic engagement, it is increasingly shaped by the flow of algorithmically curated informational stimuli. Ultimately, these dynamics raise critical questions about whether transitional societies can stabilize their democratic institutions if their epistemic foundations remain constantly exposed to algorithmic manipulation.

Ethical Challenges

AI often functions as a "black box", making it difficult to understand how political messages are selected, modified, or amplified. This opacity disperses responsibility among platform owners, developers, and political actors. Biases embedded in training data or design choices can distort international representations of certain regions or groups. When these biases influence political communication, global inequalities are further reinforced.

AI-driven political persuasion threatens individual autonomy by exploiting psychological patterns to influence opinions. As the boundary between authentic judgment and algorithmic suggestion weakens, democratic agency becomes fragile. Foreign actors can influence public opinion in other states without crossing physical borders, challenging traditional notions of sovereignty. This raises concerns about interference in elections, referendums, and diplomatic discourse.

Because AI systems optimize for efficiency, they may push political discourse toward standardized forms devoid of cultural nuance. This homogenization limits the diversity of political expression globally.

Case Studies

The Cambridge Analytica scandal revealed how personal data could be exploited to influence political outcomes through micro-targeted messaging. It served as the first global warning about the dangers of algorithmic political persuasion. The episode also exposed how opaque data brokerage systems feed into political profiling without the awareness or consent of citizens. It demonstrated that AI-driven persuasion can become indistinguishable from manipulation when deployed without proper ethical oversight. Moreover, the scandal highlighted the vulnerability of democratic processes when computational power intersects with psychological modelling. Its legacy continues to shape regulatory conversations worldwide, serving as a benchmark for understanding the risks of unrestrained digital political influence.

Russia - Ukraine Information Warfare

The Russia - Ukraine conflict demonstrated how AI-assisted propaganda, narrative generation, and automated sentiment manipulation became tools of geopolitical struggle. Algorithmic amplification played a crucial role in shaping global perceptions of legitimacy and aggression. Beyond traditional state-

controlled media, computational propaganda networks used deepfake videos, synthetic audio, and bot-driven discourse to distort the informational environment. These digital artifacts often circulated faster than fact-checking mechanisms could respond, producing alternative versions of events that competed with verified reality. AI-enhanced linguistic models further enabled rapid translation and localization of propaganda, making messages more resonant across diverse linguistic communities. In this environment, information became both a weapon and a shield, with each side striving to define truth as a strategic resource. The conflict ultimately revealed how AI collapses the distance between technical systems and geopolitical intentions, allowing states to contest narratives in real time on a global scale.

U.S. - China Digital Diplomacy

AI is now integral to the strategic communication efforts of the United States and China. Their approaches reflect broader ideological and geopolitical models embedded in technological infrastructures. The United States tends to emphasize decentralized innovation ecosystems, where private sector platforms indirectly shape global political narratives. China, conversely, integrates AI within a state-centric framework, using centralized digital governance to coordinate external messaging with internal stability goals. The competition between these two models increasingly plays out on social media platforms, multilateral institutions, and transnational digital corridors. Their rivalry has also generated distinct norms regarding transparency, algorithmic accountability, and data sovereignty. As both nations project geopolitical influence through AI-augmented messaging, smaller states often find themselves navigating overlapping spheres of digital power. Thus, AI becomes more than a communicative tool - it serves as a symbolic battleground through which contrasting political values attempt to assert global relevance.

Balkan Informational Dynamics

The Balkans, as a historically contested region, illustrate how algorithmic political communication interacts with unresolved national narratives. Foreign-generated political content easily finds resonance, shaping international alignments and public sentiment. Because collective memory remains fragmented along ethnic and political lines, AI-driven messaging can quickly amplify existing tensions. Automated recommendation systems often push emotionally charged content to the forefront, intensifying divisions rather than fostering deliberation. External actors exploit these vulnerabilities by crafting narratives that appeal to local grievances, identity politics, or geopolitical loyalties. Domestic political groups sometimes mirror these tactics, using AI-mediated communication to mobilize supporters or discredit opponents. As a result, the digital sphere becomes a continuation of regional political history - one where algorithms, rather than traditional institutions, arbitrate which stories gain authority and which are submerged.

Toward a Framework for Ethical Governance in the Age of AI and Emerging Transhumanism

A viable regulatory framework must include commitments to transparency, source identification, limits on micro-targeting, and mechanisms ensuring user autonomy. Such a framework must also anticipate the rapid evolution of AI-generated political communication, which increasingly blurs the line between authentic political discourse and algorithmically curated persuasion. Effective governance will therefore require clear standards defining what constitutes legitimate political messaging, especially in environments where automated content production can outpace human monitoring capacities. In addition, institutional safeguards must be designed to ensure that citizens maintain meaningful control over their informational environments, rather than becoming passive receptors of opaque algorithmic decisions. This implies the need for multi-layered oversight mechanisms capable of auditing both the data pipelines that fuel micro-targeting and the inferential models that operationalize them. Transparency obligations must extend not only to states and political parties but also to private technology companies whose algorithmic infrastructures shape the global flow of political meaning. Regulatory bodies will need the authority to impose restrictions on persuasive technologies that manipulate emotional vulnerabilities or

exploit cognitive biases, particularly when such practices occur covertly. A durable governance framework must also integrate ethical evaluation procedures, ensuring that new technologies are assessed in terms of their broader socio-political consequences rather than solely through economic or technical metrics. Ultimately, the goal is to create institutional conditions under which democratic agency remains grounded in informed deliberation rather than algorithmic suggestion, preserving the integrity of the civic sphere in an era of accelerating informational complexity.

AI in political communication transcends borders, requiring coordinated international governance supported by institutions such as UNESCO, the UN, and OSCE. Global cooperation is indispensable because AI-generated political influence travels instantaneously across jurisdictions, bypassing traditional diplomatic channels and rendering national regulatory systems insufficient on their own. International institutions must therefore articulate shared normative principles. For example, prohibitions on AI-enabled electoral interference, standards for digital evidence verification, and protocols for responding to coordinated disinformation campaigns. These bodies should also facilitate cross-border data sharing, enabling states to identify and counter transnational networks that deploy AI-driven persuasion tools. Furthermore, coordinated governance must address global inequalities in technological capacity: smaller or less developed states are disproportionately vulnerable to algorithmic manipulation and require institutional support to ensure digital sovereignty. International law will need to evolve toward a hybrid model that combines human rights protections with emerging norms related to algorithmic transparency, synthetic media disclosure, and cross-border accountability. Without such coordination, the informational environment risks devolving into a geopolitical battlefield dominated by technologically advanced actors capable of shaping political realities beyond their own borders. Cooperative frameworks anchored in global institutions can mitigate these asymmetries, ensuring that technological development does not erode democratic autonomy but instead strengthens collective resilience. Ultimately, responsible international governance will require not merely treaties but the cultivation of shared ethical commitments capable of sustaining political pluralism in a digitally integrated world.

Transhumanism spectacularly opened a new dimension of humanity and firmly took its place in many branches of science today. Within political communication, transhumanist thinking reframes the relationship between human cognition and technological augmentation, raising difficult questions about the future of political agency. As AI systems increasingly mediate perception, memory, and decision-making, the boundary between human reasoning and machine assistance becomes progressively porous. This creates a conceptual shift: citizens are no longer merely influenced by technology but are gradually integrated into techno-cultural ecosystems that extend their cognitive capacities while simultaneously shaping them. Transhumanism thus compels governance frameworks to address a deeper ethical concern, the possibility that political persuasion will eventually target enhanced cognitive architectures rather than natural psychological dispositions. In such a scenario, the stakes of political autonomy are transformed, as external actors might influence not just beliefs but the augmented cognitive processes through which beliefs are formed. Moreover, transhumanist developments challenge traditional democratic assumptions about equality, since access to cognitive or informational enhancement technologies may become unevenly distributed. Governance will need to ensure that these augmentations do not produce new hierarchies of political influence or deepen existing social divides. Transhumanism also invites reconsideration of the concept of the public sphere itself: if political communication occurs within a hybrid human-machine epistemic system, then safeguarding deliberation requires protections that encompass both biological and augmented forms of reasoning. Ultimately, integrating transhumanist perspectives into political communication governance ensures that regulatory frameworks remain forward-looking, attentive not only to current AI capabilities but also to the emerging forms of technologically extended human agency.

In a world saturated with automated narratives, ethical governance must restore the centrality of human reasoning and responsibility. This requires cultivating digital literacy programs that empower citizens to interrogate algorithmic outputs, recognize synthetic content, and critically assess persuasive techniques. Ethical governance must also promote a culture of accountability, ensuring that both public and private actors are held responsible for deploying AI in ways that distort democratic processes. As

algorithmic mediation becomes ubiquitous, fostering human-centered decision-making will depend on supporting institutional environments that encourage transparency, dialogical engagement, and pluralistic debate. Restoring human responsibility also means resisting tendencies to treat algorithmic systems as neutral or inevitable; instead, these technologies must be seen as socio-technical constructs shaped by human choices, values, and priorities. In addition, ethical governance should encourage reflexive practices within technological design communities, ensuring that engineers and data scientists understand the political implications of their work. A human-centered approach must likewise reaffirm the dignity of political participation, recognizing that meaningful civic engagement cannot be outsourced to automated systems. As political communication becomes increasingly hybridized through AI and transhumanist augmentation, governance must protect the spaces in which citizens can deliberate free from coercive digital pressures. Ultimately, ethical governance in this evolving landscape demands a renewed commitment to cultivating political judgment, reinforcing democratic resilience, and safeguarding the moral autonomy of individuals navigating a technologically augmented world.

Conclusion

Artificial intelligence has transformed international political communication in profound ways, blurring the boundaries between persuasion, manipulation, and geopolitical influence. The ethical stakes are immense: AI can enhance cross-cultural dialogue, yet it can also fracture public spheres, distort democratic processes, and weaken sovereignty. The political world emerging from these shifts demands greater vigilance, deeper ethical reflection, and institutional courage capable of confronting the hidden infrastructures that shape global opinion.

Yet beyond the technical and regulatory debates lies a deeper human concern. Societies must decide whether they will become passive landscapes shaped by algorithmic currents or active agents who assert their moral and political agency. The challenge is not only to understand AI but to cultivate the inner resilience needed to withstand the seductive ease of automated certainty.

If the 20th century belonged to mass ideologies and visible propaganda, the 21st belongs to silent influence - woven into interfaces, predictive models, and the curated architecture of the digital world. For international politics to retain legitimacy, citizens must reclaim the capacity for doubt, reflection, and responsible judgment. Without this, no regulatory framework will be sufficient.

The future of political communication will be determined not solely by algorithms, but by the moral posture with which humanity confronts them. It is here, at the intersection of technological power and human consciousness, that the struggle for democratic authenticity will be decided.

References

Atar, N. (2025). Artificial Intelligence and the Transformation in Political Communication and Campaigns: Ethical Debates, Analyses, and Cases. In Understanding Generative AI in a Cultural Context: Artificial Myths and Human Realities (pp. 461-490). IGI Global Scientific Publishing.

Benjamins R., Salazar I. (2020). Towards a framework for understanding societal and ethical implications of Artificial Intelligence.

Checketts, L., Boyles, R. J., Chan, B. S. B., Gan, Z. R., Hongladarom, S., Kimura, T., ... & Gonzalez-Ferrer Garcia, A. (2025). Ethical and Social Concerns of Artificial Intelligence in Asia. NanoEthics, 19(2), 12.

Chen, Y. (2025). Artificial Intelligence and Digital Imaging: Future Trends in Editing and Ethical Concerns. Journal of Sociology and Education, 1(2).

Christodoulou E., Iordanou K. (2021). Democracy Under Attack: Challenges of Addressing Ethical Issues of AI and Big Data for More Democratic Digital Media and Societies.

Corrêa N.K., Galvão C., Santos J.W., et al. (2022). Worldwide AI Ethics: a review of 200 guidelines and recommendations for AI governance.

Dlamini, Z. (2025). GLOBAL AI ETHICS: A REVIEW OF THE SOCIAL IMPACTS AND ETHICAL IMPLICATIONS OF ARTIFICIAL INTELLIGENCE.

Floridi, L. (2023). The ethics of artificial intelligence: Principles, challenges, and opportunities.

Graglia, M. A. V., Huelsen, P., & Lazzareschi, N. (2021). The growing moral challenge in the face of technologies: internet, social networks, IoT, blockchain and artificial intelligence. Journal on Innovation and Sustainability RISUS, 12(2), 17-29.

Gutiérrez Caneda B., Lindén C G., Vázquez Herrero J. (2024). Ethics and journalistic challenges in the age of artificial

intelligence: talking with professionals and experts.
Hagelstein, J., Volk, S. C., Zerfass, A., Silveira Athaydes, A., Macnamara, J., Meng, J., & Hung-Baesecke, C. J. F. (2024). Ethical challenges of digital communication: a comparative study of public relations practitioners in 52 countries. International Journal of Communication, 18, 1072-1093.
Hagerty A., Rubinov I. (2019). Global AI Ethics: A Review of the Social Impacts and Ethical Implications of Artificial Intelligence.
Ivanović M., Raković R. (2024). Challenges for the Application of Artificial Intelligence and Ethical Issues.
Jafarova L.A. (2024). Political Institutions in Times of AI, and Ethical Aspects of the Digitalization in Politics.
Jovanović S., Dražeta L., Petrović A., Bačanin Džakula N., Živković M. (2025). Ethical Concerns and Mass Agentic AI Adoption.
Jungherr, A. (2023). Artificial intelligence and democracy: A conceptual framework. Social media+ society, 9(3), 20563051231186353.
Kóňa, M. A. (2025). ETHICAL CHALLENGES IN THE USE OF ARTIFICIAL INTELLIGENCE FOR MARKETING COMMUNICATION IN THE PUBLIC SECTOR21. PUBLICY 2024 I., 108.
Latinović, B. B., Ostojić, B. M., & Bugarčić, M. D. (2023). Analysis Of Attitudes Towards Social-Economic And Marketing Factors On The Growth Of Organic Production. Економика пољопривреде, 70(3), 725-735.
Latinović, B., & Ostojić, B. (2023). Socio-political context and strategy of modern marketing. Politička revija, 75(1), 281-298.
Latinović, B., Ostojić, B., Krčadinac, O., & Stanković, Ž. (2023). Socio-Marketing Aspects of the Application of Artificial Intelligence in Environmental Protection and Preservation. In Proceedings of The Third International Conference on Sustainable Environment and Technologies [„Creating sustainable commUNiTy “] (pp. 185-200).
Sahebi S., Formosa P. (2025). The AI mediated communication dilemma: epistemic trust, social media, and the challenge of generative artificial intelligence.
Schopmans H., Cupać J. (2021). Engines of Patriarchy: Ethical Artificial Intelligence in Times of Illiberal Backlash Politics.
Škorić J., Galetin M. (2024). Artificial Intelligence and Social Work: Ethical Dilemmas and Challenges in the Protection of Human Rights.
Spalević Ž., Marković F., Marković S. (2023). Artificial Intelligence: The New Inevitability of Contemporary Society.
Taddeo M., Floridi L. (2018). How AI can be a force for good. Science.
Volodenkov, S. V., Fedorchenko, S. N., & Pechenkin, N. M. (2024). Risks, threats, and challenges of introducing artificial intelligence and neural network algorithms into the contemporary system of socio-political communications: The results of expert study. RUDN Journal of Political Science, 26(2), 406-424.