

THE IMPACT OF ARTIFICIAL INTELLIGENCE ON HUMAN RESOURCE MANAGEMENT: CHALLENGES, OPPORTUNITIES, AND FUTURE DIRECTIONS

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Abstract: Artificial intelligence (AI) is fundamentally transforming human resource management (HRM) by automating processes, improving efficiency, and reshaping organizational dynamics. This study examines the multifaceted impacts of AI on HRM, focusing on its potential to enhance employee productivity and streamline operations. While AI introduces significant opportunities, including better candidate-job matching and predictive workforce analytics, it also presents challenges such as ethical concerns, potential biases, and the displacement of certain job roles. The analysis is grounded in current scientific research and practical applications, highlighting the dual role of AI as both an enabler of innovation and a source of ethical and operational dilemmas. By addressing these complexities, the study aims to provide a comprehensive perspective on how AI can be effectively integrated into HRM practices to achieve sustainable organizational growth.

Keywords: artificial intelligence, human resource management, employee efficiency, automation, ethical challenges.

1. INTRODUCTION

The dynamic development of artificial intelligence (AI) is radically transforming contemporary human resource management (HRM), opening new perspectives while also posing significant challenges for organizations. AI technologies support recruitment processes, streamline operational activities, and enable more accurate predictions of employee behaviors, such as turnover. For instance, Aleksandra Kuzior and her co-authors emphasize that machine learning algorithms can significantly enhance candidate-job matching as well as improve transparency in decision-making processes related to competence management.

The application of AI is also a crucial element in the transformation within Industry 4.0. (Wachnik, 2022) analyzes the use of artificial intelligence in managing Industry 4.0 projects in the Polish industry, highlighting that these technologies support more efficient management of complex processes but require appropriate infrastructure and competencies. Similarly, (Ingaldi and Ulewicz, 2020) note that the implementation of



Industry 4.0 solutions, including AI, in SMEs often encounters challenges related to financial constraints and the lack of adequate organizational preparation

In the context of education, AI plays a significant role in shaping entrepreneurial skills. (Tkachenko et al., 2019) point out the benefits of integrating AI tools into training methods for entrepreneurship, emphasizing their ability to personalize learning processes and develop innovative competencies

The aim of this article is to explore the impact of artificial intelligence on human resource management in the context of increasing employee efficiency and optimizing organizational processes. The analysis will address both the potential of AI technologies and their limitations, drawing on current scientific research and practical experiences.

2. HISTORY OF ARTIFICIAL INTELLIGENCE

One of the pioneers in the field of artificial intelligence research was the British scientist Alan Turing. In 1950, he proposed a test, named after him the Turing Test, which assumed conducting a conversation with the participation of a human and other recipients (not necessarily humans). If during the conversation the human was unable to reliably indicate that one of the parties to the conversation was a machine, then the result indicated that the artificial intelligence had passed the test (Łupkowski, 2010).

In 1955, John McCarthy defined artificial intelligence as the construction of a machine whose operation would be similar to that of an intelligent human being (Bach, 2020).

Turing Test conducted by scientists at the University of California using a human, the robot ELIZA (the first robot to pass the test in 1966), Chat GPT v. 3.5, and ChatGPT v. 4.0 gave the following results:

- 22 percent of subjects mistook ELIZA for a real human,
- 50 percent of subjects mistook ChatGPT v. 3.5 for a real human,
- 54 percent of subjects mistook ChatGPT v. 4.0 for a real human,
- 67 percent of subjects recognized a conversation with a human (Krzysztofik, 2024).

The increasing results achieved by ChatGPT suggest that subsequent versions of the program will imitate humans much better, which may prove to be a significant threat to various areas of society's functioning. The initial use of artificial intelligence focused primarily on constructing programs that solve mathematical equations and logical problems. Work also began on programs capable of playing chess (AI IAB, 2014). The last example shows how carefully work was carried out to improve a program capable of playing chess - work on it began in the 1950s, while the historic match between the Deep Blue computer and the current grandmaster Garry Kasparov did not take place until 1996 (Kasparov's victory) and 1997 (the symbolic date of the defeat of man against the computer).

Currently, we can talk about artificial intelligence presented in two aspects:

- Strong artificial intelligence - this approach assumes that appropriately programmed artificial intelligence systems would become equivalent to human intelligence, which would make it possible to create self-learning mechanisms.
- Weak artificial intelligence - the view that the artificial intelligence program allows for the formulation and testing of hypotheses about the brain. In this approach, it is possible to create mathematical models of analyzed problems and then import them into a program that would provide answers to the questions asked (Różanowski, 2007).

Currently, based on the results of the Turing test for ChatGPT, it can be concluded that strong artificial intelligence is present in society, which will continue to develop to a level of intelligence equal to or exceeding human intelligence. Therefore, it is necessary to introduce mechanisms to control work on the development of artificial intelligence and to introduce mechanisms to control it at a global level. Artificial intelligence systems, especially since the introduction and availability of ChatGPT to a wide audience, are developing much faster. In social life, both in Poland and around the world, more and more areas are slowly being conquered and taken over by AI systems - for example, Off Radio Kraków "hired" new journalists programmed by artificial intelligence (the experiment was completed in October 2024), the Google Maps navigation system decided to move away from voiceovers and completely switch to artificial intelligence systems, while in November 2024, the church in Lucerne, Switzerland decided to install a chatbot (Deus in Machina) with the image of Jesus Christ, capable of conducting conversations in over 100 languages, and some of the large car companies have already decided to introduce fully autonomous cars. Therefore, based on these examples, it can definitely be assumed that most professions performed by people are currently at risk of being taken over by artificial intelligence. This is also confirmed by Moravec's paradox formulated in the 1980s. Its discoverer assumed that it would be relatively easy to implement AI to perform tasks such as playing chess, mathematical operations or engineering, while AI requires much more resources for activities such as facial recognition, walking or moving in space (skills typical of children) (Rotenberg, 2013). For this reason, it can be said that the most at risk of being taken over by AI are mathematicians, secretaries, lawyers, financiers or statisticians, while gardeners or cooks would be safe, for example.

All these factors indicate that even greater changes will come in the near future in the functioning of individual industries in the world, and this also applies to human resource management. Artificial intelligence is already becoming an essential element in everyday objects and processes. However, it should be borne in mind that this is an area that raises considerable concerns and controversy due to the negative possibilities of its application.

3. APPLICATION OF ARTIFICIAL INTELLIGENCE IN HUMAN RESOURCE MANAGEMENT

One of the most significant areas where AI has made strides is in recruitment. AI-powered recruitment tools leverage machine learning algorithms to streamline the hiring process by automating candidate screening and enhancing the matching of candidates to job requirements. For instance, Thakral et al. highlighted the development of a comprehensive analytics framework that aids HR recruiters in making informed hiring decisions, thereby improving placement outcomes (Thakral et al., 2023). Similarly, Venkatasubramanian emphasized how machine learning technologies have revolutionized talent acquisition by enabling more precise candidate evaluations and reducing biases inherent in traditional hiring practices (Venkatasubramanian, 2023). This is further supported by the work of Garg et al., who reviewed various machine learning applications in HRM, noting that while the adoption is still in its early stages, the potential for efficiency gains is substantial (Garg et al., 2021). Moreover, AI's role in enhancing employee retention has garnered attention. Paigude et al. discussed how machine learning and deep learning methodologies can analyze vast amounts of employee data to identify patterns that predict turnover, thereby allowing organizations to implement proactive retention strategies (Paigude et al., 2023). This predictive capability is crucial,

as it enables HR departments to address potential issues before they escalate, ultimately fostering a more stable workforce. The research by Patil also aligns with this perspective, as it provides a methodological framework for predicting employee churn, which can empower organizations to take preemptive measures for retention (Patil, 2023). AI's influence extends beyond recruitment and retention; it also plays a pivotal role in performance management. The application of AI in assessing employee performance through data analytics allows organizations to gain insights into employee productivity and engagement levels. For example, the study by Alsaadi et al. identified critical factors contributing to employee attrition, emphasizing the importance of HR analytics in understanding workforce dynamics (Alsaadi et al., 2022). Furthermore, the integration of AI in performance evaluations can lead to more objective assessments, reducing biases that may arise from human judgment (Vaddepalli, 2023). This shift towards data-driven decision-making enhances the overall effectiveness of HRM practices. The ethical implications of AI in HRM are also a significant concern. As organizations increasingly rely on AI-driven tools for decision-making, the potential for bias in algorithms raises questions about fairness and transparency. Mujtaba and Mahapatra highlighted the risks of human biases being perpetuated through AI systems, emphasizing the need for ethical considerations in AI-based recruitment (Mujtaba and Mahapatra, 2019). This concern is echoed by Hunkenschroer and Kriebitz, who analyzed the human rights implications of AI hiring practices, advocating for the enforcement of ethical standards in AI applications within HRM (Hunkenschroer and Kriebitz, 2022). Addressing these ethical challenges is crucial for ensuring that AI technologies are implemented responsibly and equitably. In addition to recruitment and retention, AI has the potential to enhance employee engagement and satisfaction. The study by Choi and Choi explored how machine learning techniques can predict job involvement, which is linked to various positive work outcomes, including increased job satisfaction and reduced turnover intent (Choi and Choi, 2020). By leveraging AI to understand employee sentiments and engagement levels, organizations can tailor their HR strategies to foster a more motivated and committed workforce. The future of HRM is undoubtedly intertwined with advancements in AI technology. As organizations continue to embrace digital transformation, the role of AI in HRM will likely expand, leading to more sophisticated tools and methodologies. The research by Vaddepalli suggests that AI-driven innovations will not only optimize HR processes but also enhance decision-making capabilities, ultimately contributing to improved organizational performance (Vaddepalli, 2023). This perspective is further supported by the findings of Nocker and Sena, who discussed the rise of talent analytics and its implications for enhancing HR functions (Nocker and Sena, 2019).

One of the most important strategic elements of every company is conducting a proper recruitment process. Activities that consist of acquiring new employees for the team, whose skills will be adapted to the needs of the company, become an element that determines the company's success. In an era of rapid changes in the labor market, tools that make up artificial intelligence can significantly improve the recruitment process.

Data provided by KPMG International (named after the founders) for 2023 shows that 15 percent of organizations used AI-based technologies, and another 13 percent planned to implement them in the work of the company in Poland. (kpmg.com.pl, 2023). The figures quoted indicate that AI-based solutions are not currently popular, Polish entrepreneurs are only just getting used to this technology. The McKinsey report presents completely different results for companies from around the world, which states that in 2019-2023,

approximately 50-60 percent of companies used AI, while in 2024 it was already 72 percent (homodigital.pl, 2024). At this point, however, it is worth bearing in mind that the presented data covered 1,300 companies from around the world, hence the actual results of using AI in companies may turn out to be significantly different.

In terms of streamlining recruitment processes, the most important application of artificial intelligence is automation. It can occur in several variants:

- Application screening – algorithm-based solutions allow for automatic analysis of submitted applications in order to find the candidate best suited for the offered vacancy. This solution significantly speeds up the application verification process.
- Introduction of recruitment chatbots – introduction of bots enabling interviews with candidates allows for quick interviews with many candidates. By introducing such a solution, time is saved for departments responsible for conducting job interviews due to the fact that bots can operate in a 24/7 system.
- Application of predictive analysis elements in the recruitment process – by analyzing candidate documentation, artificial intelligence can evaluate candidates who have the greatest potential to work in the offered position.

The presented solutions focus on broadly understood automation, and interpersonal contact has been limited to the absolute minimum. This is not a completely good solution, although it significantly speeds up the entire recruitment process. However, contact with another person is a significant part of the procedure and despite the possibility of equipping artificial intelligence with the information necessary to find the ideal candidate, it is not able to replace an individual conversation and assessment of the candidate's skills. The fact that artificial intelligence in recruitment is currently not the most popular tool is evidenced by the results of the Power of AI study for 2023 (Fig.1):

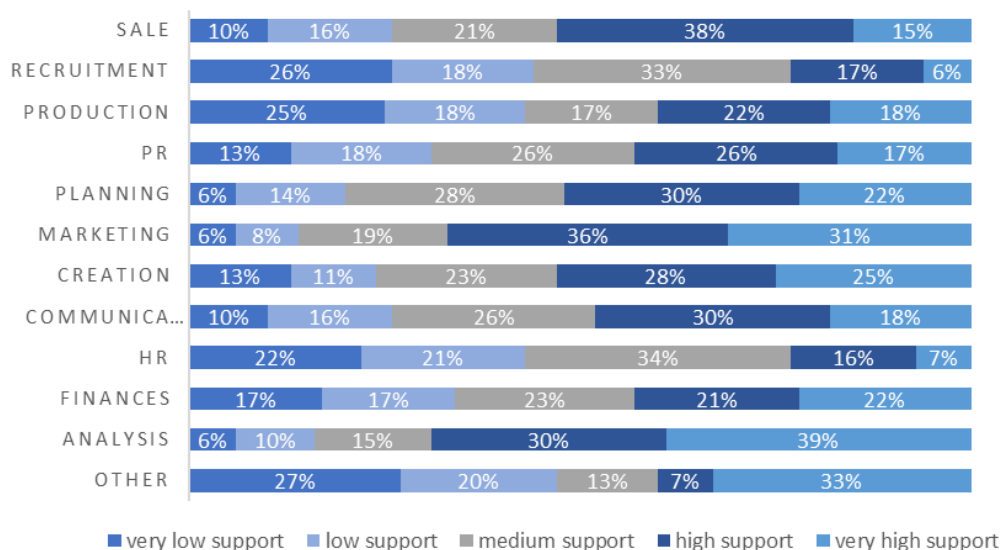


Fig. 1. Areas that can benefit the most from AI-based solutions

Source: Author's own elaboration based on: Raport Power of AI. Nowe Możliwości rozwoju i skalowania biznesu, <https://buzzcenter.pl/wp-content/uploads/2023/11/Raport-Power-of-AI.pdf>, [access: 22.11.2024]

As can be seen, the highest results according to respondents were obtained by areas related to analysis, marketing and sales, while HR and employee recruitment received quite low indications. This clearly indicates that in areas related to human resources, companies are focusing on existing solutions.

It is worth noting that focusing on elements related to data analysis or marketing may indicate limited knowledge of employers/employees about the use of artificial intelligence in other areas. AI in widespread use is a solution that has been present for a relatively short time - the provision of a tool such as ChatGPT has become a kind of pass for the widespread use of this possibility. Hence the popularity of training in the use of tools based on artificial intelligence. The use of AI elements in marketing, so clearly associated with creativity, which until now was proof of human ingenuity, is a kind of paradox.

The use of artificial intelligence can take place in various areas of the company's activity. The possibilities of using this solution are unlimited, and increasingly new aspects of the functioning of tools based on AI will generate new options. It should be noted, however, that in the area of enterprise management, management should not focus on replacing or eliminating the human factor.

Other areas in which artificial intelligence can be used are directly related to the business activity conducted. This is illustrated in Table 1.

Table 1
Areas of use of artificial intelligence

Area	AI application
Planning	Supply Chain Planning Planning the supply of products and services based on demand forecasts
Organization	Coordination of personnel needs Organization of official tasks Coordination of activities between individual departments of the company
Management	Delegating tasks
Customer Management	Improving service Identifying needs Personalizing offers
Financial Management	Payables and receivables management Reducing the freezing of financial resources in inventories

Source: Kłoczko A. Wykorzystanie sztucznej inteligencji w zarządzaniu organizacją jako potencjał obniżenia kosztów, Zeszyty Naukowe Politechniki Częstochowskiej nr 55 (2024), s. 70

All the activities presented in the table can significantly increase the productivity and efficiency of the company and increase its efficiency. The introduction of artificial intelligence elements in individual areas can also significantly reduce current costs and speed up work. For the areas of human resources management, the organizing and management departments are important, which clearly refer to issues related to personnel. The use of artificial intelligence in this area would allow for the efficient flow of information and the proper delegation of tasks to the appropriate structures. It is worth noting here that the previously described role of AI in recruitment in this case was reduced to the coordination of the demand for personnel, which indicates that also in this case the recruitment processes would take place in a more traditional than automated way.

4. WORK EFFICIENCY AND AI

Efficiency is one of the most important factors that determine the success of a company. Artificial intelligence has become an opportunity to find new solutions that allow for increasing efficiency, speeding up activities, saving time/money and improving the quality of goods or services.

Efficiency in companies can be increased in the simplest way by introducing automation in the performance of certain activities. Tasks that can be replaced by AI and that are repetitive and time-consuming can be successfully performed using appropriate tools. This allows for saving resources and directing the employee's energy to more demanding activities. A good example can be ATMs, which in the older generation offered options limited to depositing/withdrawing money, significantly saving time for cashiers employed in banks. In the new generation based on artificial intelligence, ATMs have greater efficiency, increased security measures and user memory, which allows for the recognition of returning customers and introduces voice functions.

A PwC report published in 2024 clearly indicates an increase in efficiency in sectors in which artificial intelligence is used.

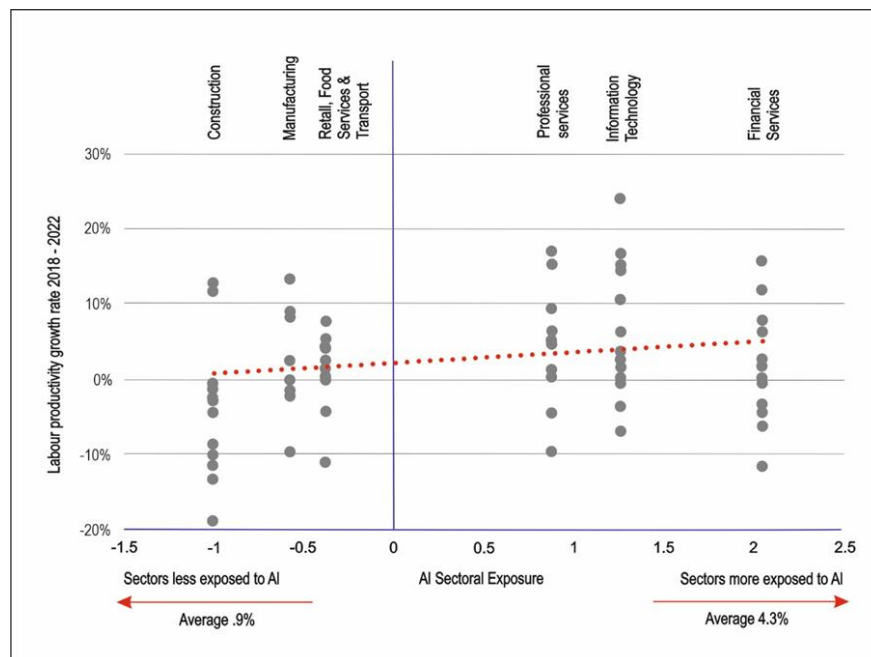


Fig. 2. Labor productivity growth dynamics by sectors exposed to AI

Source: Author's own elaboration based on: <https://www.pwc.com/gx/en/issues/artificial-intelligence/job-barometer/report.pdf>, [access: 23.11.2024]

According to the data presented (Fig.2), productivity growth in three sectors more exposed to AI – financial services, IT and professional services – can be observed almost five times faster than in sectors with less exposure, such as transport, manufacturing and construction. It is likely that in the coming years these numbers will also increase further in sectors with less exposure to AI. This can be observed most clearly in the area of transport services and the increasing number of fully autonomous vehicles. Despite the fact that in many countries their use is prohibited or unregulated by law, it can be expected that this situation will change. This is proven by the new solution proposed by Volkswagen – Emergency Assist. In the event of the driver's inactivity or failure to respond to warnings,

the system starts a controlled stop of the vehicle and warns other drivers by switching on the hazard warning lights.

The introduction of such solutions may prove to be a milestone on the way to introducing driver automation, which can significantly affect the company's efficiency. Autonomous vehicles capable of transporting goods or people would allow for increased work efficiency and time savings due to the lack of rest breaks for the driver. On the other hand, however, it may turn out to be a threat to working drivers by the possibility of job cuts.

Robert Solow noted in reference to the computer era that their influence is visible everywhere, but not in productivity statistics (Acemoglu et al., 2014). Researchers propose various solutions to this problem, but this situation cannot be applied to artificial intelligence. Its influence on productivity is already visible, as presented in Table 4. The PwC report even indicates that AI can be expressed as a J-curve, where new technologies can cause a rapid increase in productivity over a long period of time (PwC, 2024).

Research conducted by the IBM institute showed, in turn, that most of the leaders surveyed would prefer artificial intelligence to complement the workplace, and not replace the employees employed there (Fig. 3).

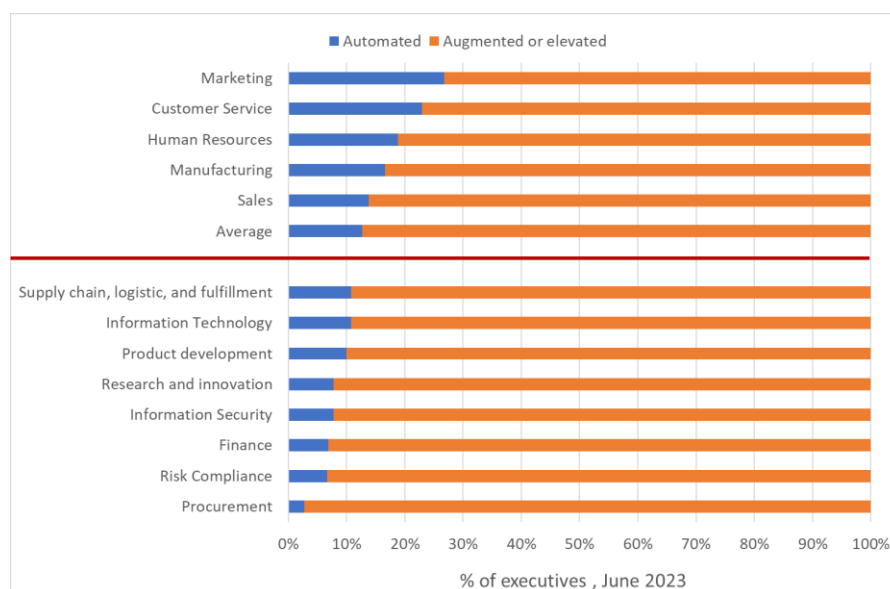


Fig. 3. The trend of replacing employees with artificial intelligence

Source: Author's own elaboration based on:

https://www.ibm.com/ibmpublic/documents/our-insights/AI-impact-series/ImpactSeries_12_brochure.pdf, [access: 23.11.2024]

The tendency to supplement employees with artificial intelligence tools depends on the job position – for procurement departments this level was 95 percent, while in the case of marketing this level dropped to 73 percent. This result is consistent with the previously cited Power of AI report, which stated that Polish companies use artificial intelligence in the area of generating content (buzzcenter.pl, 2023), which is actively used in marketing processes.

We can therefore say that artificial intelligence should significantly increase efficiency in companies dealing with broadly understood advertising, where marketing activities are a kind of calling card for potential customers.

For the purposes of the article, the ChatGPT tool was asked to generate a forecast for increasing employee efficiency through the use of artificial intelligence and the answers were as follows.

Table 2

AI Performance Improvement Predictions Generated by ChatGPT

Area	Current status	Prognosis
Automation of routine activities	Artificial intelligence is able to automate simple and repetitive tasks and conduct basic conversations with customers (chatbot)	AI will be able to perform more advanced elements, such as financial report analysis, inventory management. Improving the chatbot will allow for more detailed conversations with the customer, which will save employees time.
Personalization and better time management	Voice assistant functions and recommendation algorithms (e.g. Netflix recommendations) are helpful for better work organization	AI development will help create a dynamic work schedule that will optimize working time and will be helpful in combating burnout
Improved data analysis	The use of AI allows for quick analysis of large data sets	In the future, AI will be better at predicting trends, identifying patterns, and even suggesting specific actions.
Increasing professional efficiency	Artificial intelligence supports the work of teams, among others, by synchronizing work in distributed teams	In the future, artificial intelligence will be able to assign tasks to team members based on their individual characteristics (skills or availability)
New models of hybrid work	Support virtual offices or video conferences Artificial intelligence is helpful in organizing remote work	The introduction of AR (augmented reality) and VR (virtual reality) systems integrated with artificial intelligence into hybrid work will create immersive and productive conditions for hybrid work
Development of decision support systems	AI provides recommendations based on analysis	In the future, this system will be widely used in almost every field (e.g. medicine) providing real-time support
Minimizing errors and improving quality	Minimizing errors and improving quality	In the future, AI will be able to reduce the risk of errors and will also work on continuous improvement of the process

Source: Author's own elaboration

ChatGPT also noted that this process faces certain challenges:

- Training employees in the use of tools offered by artificial intelligence
- Strengthening security related to data security
- Potential reduction of jobs as a result of increasing the level of automation.

As can be seen, artificial intelligence does not see too many threats related to its increasing use, presenting only the positive aspects of such a situation and only indicating the possibility of reducing jobs, which can be interpreted as replacing the human factor with a machine. However, the presented forecasts are very real and achievable in the next dozen or so years. However, it should be borne in mind that the presented changes should be based on the human factor, which will supervise the processes carried out by artificial intelligence and, if necessary, will be able to interrupt the potentially harmful process, as is the case when conducting surgeries using a robot, which are supervised by a team of doctors present on site.

5. DISCUSSION AND CONCLUSIONS

The integration of artificial intelligence (AI) into human resource management (HRM) has emerged as both an opportunity and a challenge. AI significantly enhances operational efficiency, supports decision-making, and fosters innovative processes. However, these advancements also raise concerns related to ethical issues, workforce displacement, and the necessity for human oversight.

AI's contributions to HRM, particularly in recruitment and employee retention, are transformative. Automated systems streamline candidate screening and enable predictive analytics for better workforce planning. (Kuzior et al., 2024) emphasize the importance of aligning AI with sustainable development goals, arguing that AI-driven systems can enhance organizational efficiency while contributing to smart, sustainable environments. (Similarly and Sira, 2024) highlights AI's potential to improve occupational health and safety by using predictive tools to identify and mitigate risks, thereby fostering safer and more efficient workplaces.

Generative AI technologies have revolutionized productivity across industries by automating repetitive tasks and augmenting human decision-making capabilities. (Sira, 2023) discusses how these tools are reshaping industries by enabling higher efficiency and innovation while stressing the importance of balancing automation with human-centric strategies to maintain workplace harmony.

Despite its advantages, the integration of AI poses challenges, particularly in addressing ethical concerns and ensuring transparency in algorithm-driven decisions. As (Sira, 2024) notes, organizations must prioritize responsible AI governance to prevent unintended consequences, such as biases in recruitment processes or decision-making (Kuzior, 2024) further argues that AI systems must be designed to complement human decision-making rather than replace it, emphasizing the importance of maintaining human oversight in processes that affect employee well-being and organizational culture.

In conclusion, the adoption of AI in HRM represents a significant step toward enhancing organizational efficiency and sustainability. However, successful integration requires addressing ethical challenges, ensuring transparency, and fostering collaboration between humans and AI systems. Future research should explore frameworks for ethical AI implementation and innovative approaches that leverage AI for sustainable development. By navigating these complexities, organizations can harness the full potential of AI to drive technological and human progress simultaneously.

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