Economics and Organization of Logistics
9 (3), 2024, 149–167

DOI: 10.22630/EIOL.2024.9.3.24

Ireneusz Żuchowski[1]✉, **Liudmyla Hanushchak-Efimenko**[2], **Radovan Savov**[3], **Dariusz Racz**[4]

[1] International Academy of Applied Sciences in Lomza
[2] Kyiv National University of Technologies and Design
[3] Slovak Agricultural University in Nitra, Slovakia
[4] University of Warmia and Mazury in Olsztyn

Artificial intelligence in human resource management: opportunities and challenges in the area of logistics

Sztuczna inteligencja w zarządzaniu zasobami ludzkimi: szanse i wyzwania w obszarze logistyki

Abstract. The purpose of this article is to identify applications of artificial intelligence in human resource management in the area of logistics. The analysis is based on the current literature on the subject. The article analyzes the possibilities and areas of application of AI in logistics in HR. Issues of recruitment process automation, performance monitoring, retention management, and HR needs forecasting are discussed. The implementation processes of artificial intelligence have resulted in actions by governments and organizations of countries, such as the European Union, to introduce regulations focusing on ensuring the safe use of AI. It is and will continue to be a key challenge posed by the implementation of AI. In addition, future opportunities for developing this technology in the context of human resource management in logistics are discussed. The literature analysis indicates that artificial intelligence will become increasingly applicable in human resource management, supporting and making these processes more efficient. However, it is essential to note that, with the development of this technology, challenges will not disappear. On the contrary, they will arise from several factors, such as organizational and human factors.

Key words: artificial intelligence, human resources management, logistics

✉**Ireneusz Żuchowski** – International Academy of Applied Sciences in Lomza; e-mail: ireneusz.zuchowski@mans.edu.pl; https://orcid.org0000-0002-3998-1892.

Liudmyla Hanushchak-Efimenko – Kyiv National University of Technologies and Design; e-mail: glm5@ukr.net; https://orcid.org/0000-0002-4458-2984

Radovan Savov – Slovak Agricultural University in Nitra; e-mail: radovan.savov@uniag.sk; https://orcid.org 0000-0002-4882-0978

Dariusz Racz – University of Warmia and Mazury in Olsztyn, email: dariusz.racz@uwm.edu.pl, https://orcid.org/0009-0000-0852-2186

Synopsis. Celem artykułu jest rozpoznanie zastowań sztucznej inteligencji w zarządzaniu zasobami ludzkimi w branży logistycznej. Analizy dokonano na podstawie aktualnej literatury przedmiotu. W artykule dokonano analizy możliwości i obszarów zastosowania AI w HR w logistyce. Omówiono zagadnienia automatyzacji procesu rekrutacji, monitorowania wydajności, zarządzania retencją oraz prognozowania potrzeb kadrowych. Procesy wdrażania sztucznej inteligencji spowodowały działania rządów i organizacji państw. W państwach Unii Europejskiej działania te zmierzają do wprowadzania uregulowań prawnych skupiających się na zapewnieniu bezpieczeństwa używania AI. Jest to i będzie kluczowym wyzwaniem, które stawia implementacja AI. Ponadto omówiono przyszłe możliwości rozwoju tej technologii w kontekście zarządzania zasobami ludzkimi w logistyce. Dokonana analiza literatury wskazuje, że sztuczna inteligencja w przyszłości będzie miała coraz większe zastosowanie w zarządzaniu zasobami ludzkimi, wspierając te procesy i czyniąc je coraz bardziej efektywnymi. Jednak należy zwrócić uwagę, że wraz z rozwojem tej technologii nie znikną a wręcz przeciwnie będą pojawiać się wyzwania które wynikać mogą z wielu czynników takich jak np. organizacyjne czy ludzkie.

Słowa kluczowe: sztuczna inteligencja, zarządzanie zasobami ludzkimi, logistyka

JEL codes: D02, D39, F10

Introduction

The modern development of digital technologies, particularly artificial intelligence (AI), is changing many industries, including logistics. As an advanced analytical tool, AI is beginning to play an essential role in human resources (HR) management, opening up new possibilities for automating processes, forecasting HR needs, and optimizing employee performance. In the context of logistics – an industry characterized by high employee turnover, seasonal changes in HR demand, and demanding working conditions – AI is particularly relevant, supporting companies in this industry to adapt their human resources better to dynamic market needs [Baryannis and Dani 2022, Ahmad and Mohamad 2023].

Using advanced algorithms, AI can analyze historical data and current employee information and, based on this, generate predictions about productivity, engagement, or the propensity to quit. In recruitment processes, AI can automate the analysis of CVs, eliminating biases and speeding up the selection of candidates, which is particularly important in logistics, where there is often a need to quickly hire large numbers of employees for operational positions [Dehghani and Ali 2020, Lewis and Reilly 2020]. As a result, these technologies not only increase the efficiency of HR operations but also allow for more precise matching of candidates with job requirements, which is crucial in the logistics industry, which relies on teamwork and high operational efficiency [Tan and Chan 2023].

An equally important aspect of the application of AI in logistics is the ability to monitor employee performance and predict future performance based on the analysis of indicators such as response time, quality of work, or absenteeism levels. By analyzing large data sets from various sources, organizations can identify employees with high development potential and customize training programs and career paths. This kind of personalization of talent management is particularly relevant in the logistics industry, where performance depends on the precise match between employees' skills and operational requirements [Bhardwaj and Pandey 2021, Fountaine et al. 2023].

As the sophistication of AI increases, so do the challenges of implementing it in HR departments. Ethical issues, such as employee data privacy and potential algorithmic biases, are becoming an essential topic of discussion. Organizations implementing AI need to ensure that these technologies comply with data protection regulations, respect employees' rights, and ensure the transparency of processes [Chaturvedi and Sharma 2022, Ivanova and Dimitrov 2022]. Appropriate approaches are crucial to gaining employee trust and avoiding potential legal or reputational problems.

Materials and methods

We employed the VOSviewer software to enhance the visualization of bibliometric networks, allowing us to map and interpret complex relationships within the field of study. Using the Web of Science database, we analyzed the 1,000 most recent academic papers focusing on applications of artificial intelligence (AI) in management, business, and logistics. The analysis utilized density visualizations depicted as a heat map, providing an insightful overview of the most interesting areas within the network of literature sources. This method is particularly effective in identifying clusters, trends, and potential research gaps.

As illustrated in the visualization (Fig. 1), four primary clusters of research papers were identified, each representing a distinct thematic focus within the literature.

The first cluster primarily addresses the relationship between AI and business, exploring how AI influences business processes and the transformative effects it brings to organizational operations and decision-making. The second cluster centers on the interaction between companies and markets, analyzing how AI can enhance a firm's performance and competitiveness. The third cluster focuses on the challenges associated with the application of AI in the business environment. Lastly, the fourth cluster examines the tools and technologies most frequently utilized in business applications, providing a detailed overview of the methods and systems that support AI-driven innovations.

A notable finding from this analysis is the relatively limited exploration of AI's role in human resource management (HRM) within the logistics sector. This indicates a significant research gap, highlighting an area where further investigation is needed. Addressing this gap, our study aims to provide a more comprehensive understanding of AI's implications in HRM in logistics, contributing valuable insights to the academic community and offering practical recommendations for managers seeking to leverage AI in this domain. This research not only bridges the identified gap but also enriches the broader discourse on the integration of AI in business and management practices.

Implementing AI in logistics human resource management opens a new chapter where these technologies can revolutionize how organizations hire, develop and manage their workforce.

Automating the Recruitment and Selection of Candidates

Automating the recruitment and selection of candidates using AI is one of the critical areas in which AI significantly benefits the logistics HR sector. The industry requires a constant flow of new employees, often hired for positions that require rapid training and

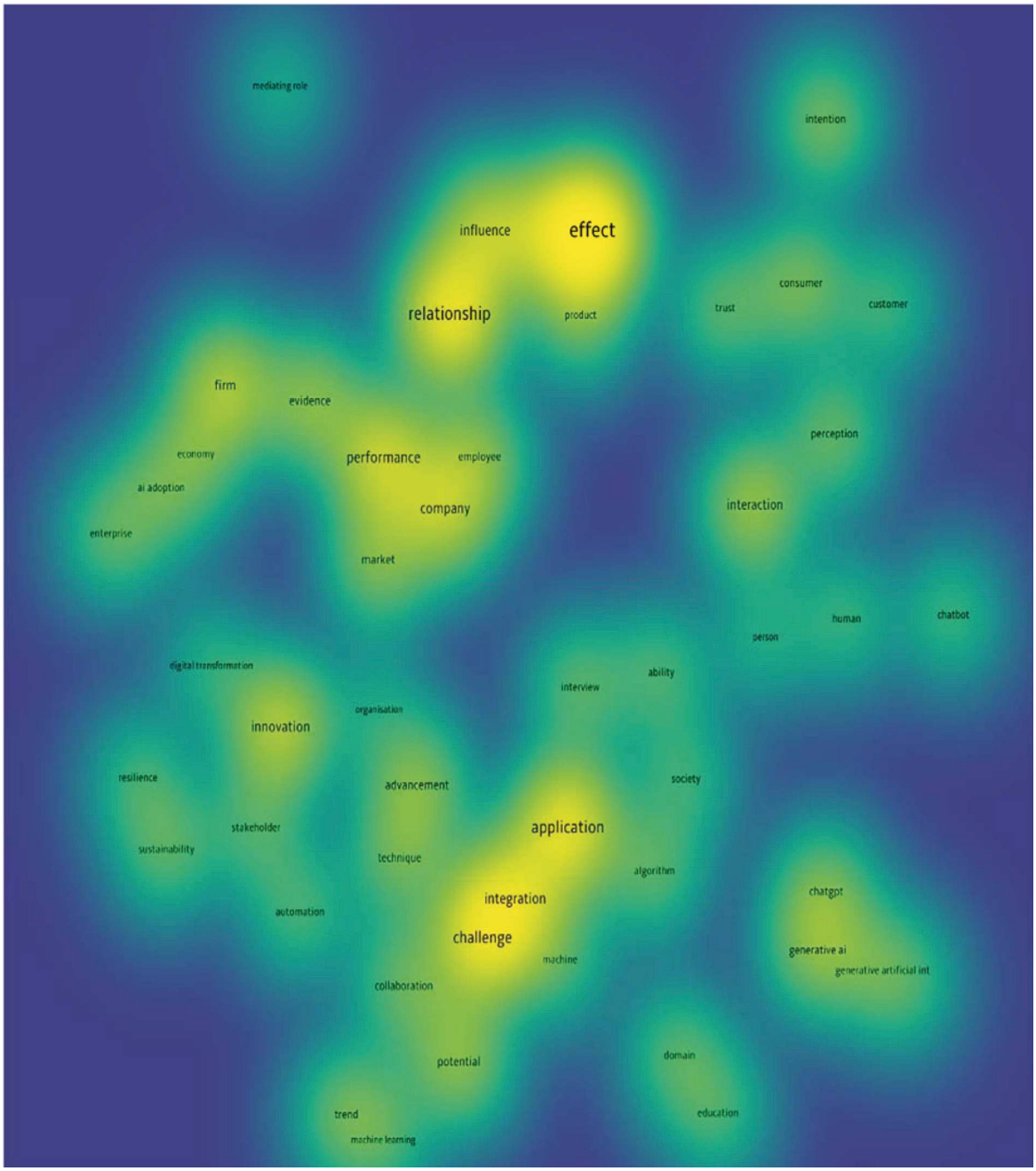

Figure 1: Visualization of bibliometric networks of AI in management and business
Rysunek 1: Wizualizacja sieci bibliometrycznych AI w zarządzaniu i biznesie

Source: own processing using VOSviewer.
Źródło: własne opracowanie przy użyciu VOSviewer.

a high degree of flexibility. Frequent changes in staffing demands and the pressure to hire new employees quickly make traditional recruitment processes insufficient. AI not only streamlines recruitment processes but also reduces errors and the impact of human biases, contributing to more diverse and competent teams [Lewis and Reilly 2020, Ahmad and Mohamad 2023].

One of the main applications of AI in recruitment is the analysis and pre-selection of applications. Traditional application selection takes significant time and involves the risk of errors and subjective assessment. AI algorithms analyze CVs, cover letters, and other application documents, identifying the critical competencies, experience, and skills required for the position. This allows recruiters to focus on reviewing the best-fit candidates, significantly reducing the recruitment time and costs [Dehghani Ali 2020, Tan and Chan 2023].

Cappelli and Tavis [2023] note that AI systems, by analyzing results from previous recruitment processes, can pick up patterns that predict individual performance in logistics positions, helping recruiters accurately match candidates to roles in which they will be effective. Additionally, AI can facilitate the analysis of historical data and compare the profiles of new applicants with the characteristics of high performers, increasing the chances of recruitment success.

Chatbots and candidate pre-screening systems are becoming increasingly popular for automatically conducting initial interviews. Chatbots, equipped with natural language processing (NLP) technology, can conduct initial interviews with candidates, gathering information about their work experience, preferences, and motivation levels. Such a solution benefits logistics [Lewis and Reilly 2020]. Initial interviews conducted by AI also allow the assessment of candidates' soft skills, such as communication skills, responsiveness, and flexibility in response to changing requirements. In turn, based on an analysis of the responses, AI selects candidates who meet the criteria, helping to focus on those with the most significant potential to prove themselves in a demanding work environment [Bhardwaj and Pandey 2021, Fountaine et al. 2023].

AI can also analyze aspects of a candidate's fit with the organizational culture, particularly in logistics, where teamwork and effective communication are essential. By analyzing data from social media, professional profiles, or psychometric test results, AI can assess a candidate's hard skills, working style, and career preferences. This enables a more precise match between the candidate and the organizational culture and increases the likelihood of long-term commitment and job satisfaction [Baryannis and Dani 2022].

As Tan and Chan [2023] point out, AI systems can also identify personality traits conducive to productivity and satisfaction in the logistics work environment and predispositions to work in changing conditions. Through advanced analysis of candidate behaviors and preferences, AI enables the creation of more cohesive teams, resulting in a better working atmosphere and lower turnover.

AI makes it possible to reduce biases that can influence recruiters' choices. Using algorithms makes it possible to objectify the recruitment process by analyzing candidates solely based on their skills, experience, and other criteria. According to Chaturvedi and Sharma [2022], AI eliminates some forms of unconscious biases that can influence the decision-making process, resulting in greater diversity in teams and better organizational performance.

However, there is a potential risk of algorithmic biases. To prevent them, organizations need to regularly monitor and calibrate AI systems to ensure their compliance with ethical standards and a level playing field for all candidates [Ivanova and Dimitrov 2022].

Introducing AI into recruitment makes it possible to automate the administrative tasks of handling applications, monitoring candidate progress, and providing feedback. This approach streamlines the management of large applications, which is essential, especially in large logistics organizations that regularly conduct mass recruitments [Hamdi and Abdallah 2021]. AI can generate personalized feedback messages for candidates and automatically update the status of applications in the system, improving communication and contributing to the candidate experience.

Automation of administrative processes translates into time and resource savings, allowing HR to focus on strategic aspects of recruitment, such as employer branding and creating talent development plans [Gupta and Vashistha 2020]. This approach allows logistics HR departments to operate more flexibly, adapting to changing operational needs and requirements.

Despite the many benefits of recruitment automation, its challenges should also be acknowledged. AI systems can sometimes exclude potentially valuable candidates based on overly strict criteria, leading to the omission of individuals with unusual but valuable work experience [Wright and Snell 2020]. There is a risk that algorithms learning from historical data will replicate errors or reflect biases from previous recruitment processes [Vishwakarma and Singh 2023].

Performance Prediction and Employee Performance Monitoring

Performance prediction and employee performance monitoring are essential application areas for artificial intelligence (AI) in logistics human resource management. In an environment where the operational work is intensive and the demands on time and quality are high, the ability of AI to analyze and predict employee performance is invaluable. AI enables logistics companies to more accurately assess competencies, monitor key performance indicators, and identify employees with high development potential to better align HR activities with operational needs [Baryannis and Dani 2022].

AI algorithms can analyze performance indicators, such as response times, number of tasks completed, error rates, and absenteeism levels. Using this data, AI allows real-time performance levels to be monitored and areas for improvement to be identified. By using AI to monitor performance, logistics companies can not only measure labor performance but also identify trends and patterns in employee behavior, enabling them to make more informed human resource planning decisions [Bhardwaj and Pandey 2021, Fountaine et al. 2023].

Kashyap and Subramanian [2022] highlight that using AI to monitor performance allows companies to personalize career paths and individualize development programs. In logistics, where the pace of work is high and the demands are constantly changing, AI can, for example, identify employees who adapt quickly to new tasks, which helps in optimizing team management. For example, an employee who stands out for high performance during busy times can be identified as someone with the potential to be promoted or take on more responsible positions.

AI can predict employee performance in real-time based on historical and current data, allowing logistics organizations to respond to potential problems even before they affect operational efficiency. Learning algorithms analyze work patterns and, based on this, predict potential drops in productivity, for example, during busy periods such as holidays or seasonal promotions. With this capability, organizations can allocate resources accordingly or implement contingency plans to minimize the risk of downtime [Goldstein and Newman 2022, Wright and Snell 2020].

AI systems can also predict performance in the context of individual employees, assessing their tendencies to maintain high-quality work, punctuality, and adaptability. These analyses are particularly valuable in logistics, where task variability and work intensity affect teams' performance. Ivanov and Dolgui [2021] note that AI can support operations management by predicting which employees need support in completing their tasks and which teams are most optimal for specific projects.

AI provides the opportunity to identify employees with high development potential, which is crucial in succession planning and talent management. AI algorithms analyze employee performance, adaptability, and engagement data and then identify individuals who may be prepared to take on more responsible roles. Such analysis is particularly relevant in logistics, where companies often need leaders capable of managing teams in intense operational environments [Shukla and Patel 2022, Fountaine et al. 2023]. This enables organizations to effectively develop internal talent and promote based on objective data, which promotes increased employee retention and builds loyal teams. Employees who see that their contributions are monitored and evaluated by AI may be more motivated and committed to long-term development within the organization [Ghosh and Ramkumar 2021].

With its ability to detect problems early, AI can pinpoint potential risks associated with low productivity or absenteeism. By analyzing current indicators such as working time, number of sick days, and turnover, AI can predict the risk of burnout and other factors affecting employee performance. As Jatobá, Ferreira, and co-authors [2023] note, AI enables HR departments to take preventive measures, such as implementing support programs or adjusting work schedules, in such a way as to prevent future HR problems. Mishra and Singh (2021) add that monitoring performance metrics makes it possible to predict employee turnover and implement appropriate measures to retain key people. In logistics, where employee turnover can affect operational stability, the ability to anticipate and manage HR risk is an indispensable part of HR strategy.

Based on monitoring performance indicators, AI makes it feasible to personalize training and tailor career paths to individual employees' needs. Learning algorithms can detect which areas individual employees need support in, such as technical skills or teamwork, allowing personalized development programs to be created. Such personalization is beneficial in logistics, where employee demands change dynamically, and flexibility and continuous development are essential to maintain high-quality work [Kashyap and Subramanian 2022]. A personalized approach to training increases employee productivity and fosters long-term commitment and loyalty to the organization, which is a critical element of HR strategy. AI systems help managers better understand employees' strengths and

weaknesses and tailor development programs to their needs, resulting in higher morale and lower turnover [Lewis and Reilly 2020].

Despite its many benefits, the use of AI to monitor and predict employee performance also poses challenges. Real-time monitoring of performance indicators can be perceived as overly intrusive, raising employee privacy concerns [Ivanova and Dimitrov 2022]. Therefore, it is essential to be transparent about how AI is used for performance monitoring and to inform employees about protecting their privacy.

Retention Optimization and Talent Management

Optimizing employee retention and effective talent management are becoming priorities for HR departments in logistics, and artificial intelligence can effectively support these processes. The logistics industry, characterized by an intense work pace, fluctuating staffing needs, and high employee turnover, can particularly benefit from implementing AI. AI-based tools can help HR departments identify retention drivers, predict a propensity to leave, and optimize employee development, contributing to increased engagement, satisfaction, and loyalty to the organization [Ghosh and Ramkumar 2021, Ahmad and Mohamad 2023].

Predicting the Willingness of Employees to Leave

One of the critical applications of AI in retention optimization is analyzing data on employee engagement and their propensity to leave. AI systems monitor various metrics, such as absenteeism, engagement, periodic appraisal results, and satisfaction levels, to predict which employees may be at risk of burnout or job dissatisfaction. Based on such analyses, AI can identify individuals considering leaving, allowing HR to quickly implement actions to retain them [Baryannis and Dani 2022].

This approach benefits logistics, where frequent employee turnover can lead to operational disruption. Logistics organizations can implement personalized support programs and tailored development plans, increasing employee loyalty and reducing the costs of re-hiring and training new people [Mishra and Singh 2021, Shukla and Patel 2022].

Personalization of Development and Training Paths

AI supports personalizing career paths and tailors training to individual employee needs. Based on employee performance, capabilities, and preferences analysis, AI identifies areas where individuals may need support or additional training. It enables logistics organizations to allocate training resources more effectively, focusing on developing core competencies that impact operational efficiency [Fountaine et al. 2023].

Kashyap and Subramanian [2022] highlight that AI enables the creation of personalized development programs that consider both organizational requirements and individual employee goals. Employees with a high potential for teamwork can be referred to a leadership development program, which prepares them for a team leadership role. This approach increases employees' commitment, as they see their employer investing in their development, influencing their loyalty and reducing turnover.

Building an Organizational Culture and Improving Employee Satisfaction

AI supports building an organizational culture that fosters long-term employee engagement and satisfaction. Based on data analysis on work preferences and styles, AI can suggest appropriate management strategies that foster integration and better alignment of employees with organizational values. By analyzing such factors, organizations can shape more aligned and engaged teams, which is crucial for success in the logistics sector, where teamwork is paramount [Gupta and Raj 2023, Lewis and Reilly 2020].

Implementing an AI-based talent management strategy influences the work atmosphere and employee bonding, promoting lower turnover and higher satisfaction levels. Ghosh and Ramkumar [2021] point out that AI can monitor factors affecting employee satisfaction, such as development opportunities, work environment, and work-life balance, allowing support and motivation programs to be adjusted accordingly.

Optimizing Succession Plans and Leadership Development

The AI also supports the optimization of succession plans, which is particularly important in logistics, where there is often a need to quickly replace key employees during emergencies or periods of peak demand for services. By analyzing data on job performance, leadership, and adaptability, AI can identify individuals who may be prepared to take on more responsible positions [Shukla and Patel 2022].

With such analytics, organizations can more effectively plan the development of their leaders, which is vital to ensuring operational continuity. AI supports the development of leaders by providing personalized development programs that help prepare employees for leadership roles and support them in developing essential skills such as decision-making, team management, and effective communication [Jatobá et al. 2023].

Reducing Retention Costs and Increasing Efficiency

High employee turnover is one of the critical challenges in logistics, which generates significant costs in recruiting, training, and retaining new employees. With AI, managing talent better and optimizing retention strategies is possible, allowing logistics companies to save significantly. AI identifies employees with high potential for long-term development, allowing companies to focus on retaining them, thereby reducing turnover costs [Fountaine et al. 2023.

The automation of retention management supported by AI also allows for more efficient allocation of HR budgets for support and motivation programs, which promotes better utilization of resources and increases the organization's operational efficiency. As a result, companies can achieve higher levels of employee satisfaction and improved business performance [Wright and Snell 2020, Ahmad and Mohamad 2023].

Ethical and Practical Challenges in the Management of Employee Retention by AI

Although AI brings numerous benefits to retention and talent management, its implementation also comes with challenges. AI requires access to detailed employee data, which can raise privacy and data protection concerns. Organizations must ensure that all

data analytics activities comply with privacy regulations such as the GDPR [Chaturvedi and Sharma 2022, Ivanova and Dimitrov 2022].

Another challenge is the risk of algorithmic bias. AI can unknowingly reinforce existing biases based on historical data, leading to unfair treatment of certain employees. To prevent this, organizations should regularly monitor and calibrate their algorithms to ensure that AI supports the equal treatment of all employees and does not reinforce biases [Vishwakarma and Singh 2023).

Capacity Planning and Forecasting of Workforce Needs

Human resource planning and forecasting workforce requirements are crucial elements of logistics management, especially in industries with high seasonal fluctuations and variable operational requirements. AI offers cutting-edge solutions that allow organizations to predict and adapt human resources to meet current and future needs. Through advanced data analysis, machine learning, and predictive models, AI enables logistics organizations to manage their workforce more precisely, increasing operational efficiency and reducing costs [Hamdi and Abdallah 2021, Kovács and Kot 2021].

AI in logistics allows for the analysis of historical employment and workforce utilization data, enabling the creation of accurate forecasting models for workforce demand. AI systems can process data from previous seasons, considering changes in demand patterns and predicting when an organization will need more staff. For the logistics industry, which is particularly susceptible to seasonal fluctuations – for example, increased traffic during the holiday season – such predictions are crucial to prevent staff shortages and overstaffing [Wang and Liu 2022].

Baryannis and Dani [2022] note that, with predictive AI models, organizations can better manage the hiring process of seasonal workers by planning to hire based on actual needs. This approach minimizes the risk of staff surpluses or shortages and ensures the optimal use of available resources, resulting in better operational performance and customer satisfaction.

Machine learning (ML), as part of artificial intelligence, enables the creation of dynamic models that predict and adjust forecasts in real-time, considering changing market and operational conditions. ML algorithms analyze data from various sources – from market demand and current orders to productivity rates and production variability – to fine-tune workforce requirements [Varghese and Patel 2020].

With these technologies, companies can plan their human resources more accurately, predicting what skills will be required in a given period and when additional hiring will be needed. AI allows forecasts to be automatically adjusted according to the current market situation, making it possible for an organization to respond flexibly to changes and minimize the costs associated with the suboptimal use of human resources [Gupta and Vashistha 2020].

AI also supports optimizing work schedules, particularly in logistics, where organizations often must cover multiple tasks at different times and locations. AI algorithms can analyze data on employee availability, productivity, and current operational needs and then generate optimal work schedules. This approach allows for better time management, reducing overtime costs and unscheduled absenteeism [Hamdi and Abdallah 2021].

Shukla and Patel [2022] indicate that optimizing work schedules improves working conditions and employee satisfaction. Employee motivation and engagement increase when schedules are tailored to employees' preferences and availability. With AI, organizations can also better manage employee turnover, creating schedules that minimize downtime and maximize productivity.

AI makes it possible to detect recruitment needs early and plan recruitment processes well in advance. By analyzing patterns in workforce demand growth, organizations can prepare for upcoming changes in team composition and ensure that existing employees are adequately trained and developed to take on new roles. This approach is critical in logistics, where dynamic changes in demand can generate sudden staffing needs [Fountaine et al. 2023].

Jatobá et al. [2023] note that AI supports employee development planning by identifying those individuals who may be prepared to take on more responsible positions. In logistics, where rapid adaptation and the ability to manage change are essential, AI enables more effective talent management and succession planning, contributing to more excellent operational stability.

AI in human resource planning allows for a better match between the number of employees and the actual needs of the organization, which helps to reduce costs associated with staff surpluses or shortages. A surplus of staff can lead to unnecessary salary costs, while a shortage can reduce service quality and customer satisfaction [Kovács and Kot 2021]. Using AI, logistics companies can minimize these risks by adjusting staffing according to projected staffing needs.

Automating the HR planning process also allows for better management of HR budgets, which is particularly important in logistics, where operational costs are high. Organizations can allocate resources more efficiently to training, development, or incentive programs rather than incurring costs associated with overstaffing or emergency recruitment [Varghese and Patel 2020].

AI also enables the more efficient management of employees in distributed locations, which is particularly important for large logistics companies that operate across multiple regions. With AI systems, organizations can analyze staffing needs across these regions, aligning resources with local operational requirements and supporting the management of distributed teams. If one division has more significant staffing needs, AI can plan to relocate staff or suggest short-term hires [Lewis and Reilly 2020].

This approach allows them to manage their workload better and respond effectively to changes in demand across locations, which is crucial for logistics, where the work pace and staffing needs can vary from region to region. As a result, organizations can manage their resources more flexibly, minimizing costs and reducing the risk of operational downtime.

Despite its many advantages, implementing AI in workforce planning also brings challenges. One is the need to ensure the quality of the data on which AI forecasts are based. Inaccurate or incomplete data can lead to erroneous forecasts and inappropriate HR planning. Another challenge is monitoring and adapting algorithms to changing market conditions and current organizational requirements [Wright and Snell 2020].

In addition, AI-based resource management also requires HR staff to be adequately trained in using analytical tools and interpreting the results. Organizations must also

adhere to privacy rules and comply with employee data protection regulations, which is a significant challenge in collecting and processing large amounts of personal data [Chaturvedi and Sharma 2022].

Ethical Challenges and Privacy in AI

Artificial intelligence (AI) in human resources management, particularly logistics, brings significant ethical and employee privacy challenges. AI, operating based on sophisticated algorithms, often processes vast amounts of personal data, such as information on employee performance, absenteeism, engagement, and even emotional behavior. While this information can significantly improve human resource management, its collection and analysis can lead to privacy violations and other ethical issues. As AI technology becomes more ubiquitous, organizations face challenges related to transparency, algorithmic biases, and regulatory compliance [Chaturvedi and Sharma 2022, Ivanova and Dimitrov 2022]. The AI deployment processes have prompted governments and organizations of countries, such as the European Union, to introduce regulations to ensure the safety of its use in practice. Key challenges include:

– Employee Privacy: AI requires detailed data on employee performance and behavior, which raises privacy issues.
– Algorithm Transparency: Employees may not understand how the algorithms influence decisions that impact them.
– Algorithmic Bias: Historical data may contain biases that affect decision fairness.

To meet these challenges, organizations must apply rigorous data protection standards and implement privacy policies that clearly define what data is collected, for what purpose, and who has access to it. In the European context, the provisions of the GDPR require that employees have full knowledge of any processing of their data and the ability to correct or delete it if it is no longer needed. Ensuring compliance with these regulations can be challenging for logistics organizations that often collect and process real-time data, such as employee location [Ivanova and Dimitrov 2022].

2. Transparency of Algorithms and Explainability of Decisions Made by AI. AI makes decisions based on complex algorithms that are often difficult to understand, even for systems managers. The lack of transparency in how the algorithms work, the so-called "black box problem," can lead to employees not trusting AI. If decisions made by AI, such as task assignment, performance evaluation, or turnover risk analysis, are not fully explained, employees may feel uncomfortable and feel that they are not in control of their professional development [Jatobá et al. 2023].

To increase transparency, organizations should implement "Explainable AI" (XAI) models that allow users to understand how an algorithm arrived at a particular decision. Explainable AI also supports HR activities, enabling more informed HR decision-making and allaying potential employee concerns about the fairness and objectivity of appraisals. Logistics organizations can use this approach to build team trust and explain how AI works in HR management [Fountaine et al. 2023].

Algorithmic Bias and Workplace Equality. Algorithmic bias is another essential ethical issue related to AI in HR. AI algorithms learn from historical data, which may contain

unconscious biases related to gender, age, race, or nationality, leading to their replication and reinforcement in decisions. For example, if historical data indicates that younger workers or men have historically been preferred for leadership positions, algorithms may automatically prefer such profiles despite the lack of objective justification (Chaturvedi, Sharma, 2022).

To avoid problems with algorithmic bias, organizations should monitor and regularly calibrate their AI models to ensure they do not lead to unfair treatment of employees. Creating more diverse datasets to train algorithms and using methods to test for bias can help reduce this risk. It is also worth conducting regular audits of algorithms to detect potential equity issues in AI decisions, which is particularly important in large logistics organizations where fairness and transparency in employee management are central to organizational culture [Wright and Snell 2020].

4. Employee Consent and Right to Information. The issue of obtaining employee consent for AI to process their data is a critical ethical aspect that must be met for an organization to use monitoring and analytics technologies in compliance with the law. Employees should be allowed to consent to the use of their data and be provided with detailed information on the purpose and scope of the analysis. Organizations must also ensure that employees have the right to access the information that is collected about them and the ability to correct or delete it if it is no longer needed to meet business objectives [Ivanova and Dimitrov 2022, Vishwakarma and Singh 2023].

Employee consent should not be treated as a formality – organizations should ensure that employees understand what data is being collected and how it will be used. In logistics, where data may be collected in real-time (e.g., on location), organizations must be careful to meet the regulatory requirements and ensure transparency in data processing [Kovács and Kot 2021].

Accountability and Anti-Abuse of Technology. The use of AI also brings the challenge of accountability for algorithm decisions. If AI makes a mistake – for example, wrongly categorizing an employee as low-performing or deeming them at risk of burnout – the organization must take responsibility for the consequences of that decision. It is, therefore, crucial that HR operations managers understand the limitations of AI and can effectively review the analytical results generated by algorithms [Gupta and Raj 2023].

These measures may include introducing validation procedures to manually check the results of AI analyses before making decisions that affect employees. It is also essential to counter abuses of the technology, such as excessive monitoring of employees without justification, which can lead to workplace tensions and lower team morale. To avoid such problems, logistics organizations must apply the principles of responsible and ethical AI implementation and regularly train HR staff on accountability for AI results [Lewis and Reilly 2020].

Ethical Frameworks and Standards in AI Governance. Creating ethical frameworks and standards for AI governance is becoming essential for organizations that want to implement AI in a way that is consistent with ethical values. Logistics companies can develop internal policies on AI use, including transparency, privacy, and equality. For example, organizations can create a code of ethics for the HR department that sets out

principles for monitoring employees, protecting their data, and ensuring fairness in decisions [Jatobá et al. 2023].

Implementing these principles helps build trust between employees and management and fosters a positive organizational culture. Organizations can also use international ethical standards and AI guidelines to ensure compliance with best practices and regulations, which is particularly important in global logistics companies.

The Future of AI in Human Resource Management

The development of AI technology is creating new HR opportunities, and its future in logistics looks promising. It is predicted that as this technology develops, AI will provide even more advanced analysis and personalization of talent management processes, allowing development programs to be better tailored to individual employee needs [Hsiao and Chang 2023]. This approach will enable organizations to respond flexibly to market changes and better prepare their human resources for future challenges.

A logistics company can use AI to predict future staffing needs and create talent development programs to better adapt to changing market demands. As the technology evolves, AI will become an indispensable part of HR management strategies, supporting not only the current needs of the organization but also enabling long-term planning (Fiorini and Bardazzi 2021; Son and Kim 2022].

The development of AI in HR management brings the opportunity for fundamental changes that go beyond the automation of current processes. As AI becomes more advanced and integrated into various aspects of HR, the future of HR management in logistics and other industries is gaining new perspectives. Critical areas for future development of AI in HR will be the personalization of the employee experience, dynamic talent management, automated predictive analytics, and the introduction of intelligent decision support systems that can become a support for HR leaders in creating a more flexible, diverse and satisfied team [Hsiao and Chang 2023, Fountaine et al. 2023].

One of the main areas where AI will play a key role is personalizing the employee experience. In the future, AI technologies will allow organizations to understand employees' unique needs and preferences better and tailor their career paths, training, and development programs to meet individual requirements. AI algorithms can analyze data related to employee performance, preferences, and long-term goals, enabling more effective and rewarding talent management [Wright and Snell 2020].

One example of an application is an AI-based development platform that suggests specific courses, training, or development tasks based on analyzing the employee's strengths and areas for improvement. Such a personalized development path contributes to employee motivation and job satisfaction, which is crucial in the logistics industry, where employment is often seasonal and requires flexibility [Jatobá et al. 2023].

AI will enable dynamic talent management in the future, meaning organizations can quickly identify high-potential employees and plan their development to align with current and future organizational needs. As AI becomes more sophisticated, algorithms can forecast staff changes and suggest replacements for critical positions, minimizing operational interruptions when employees leave. These systems will monitor employee performance and competency data, creating transparent and automated succession plans that

allow logistics companies to manage turnover efficiently and better secure key positions [Varadarajan and Srinivasan 2020].

Automated succession planning, supported by AI, also allows organizations to prepare early for changes at the HR level. In logistics, where the effective management of teams is essential, this approach enables precise planning and building human resources more efficiently and flexibly [Gupta and Vashistha 2020].

The future of AI in HR will involve further development of predictive analytics, which enables more accurate forecasting of staff changes and effective workforce planning. AI will use advanced predictive models to predict turnover, burnout, and other issues affecting team stability and performance. AI can identify training needs by analyzing performance, attendance, and engagement data and suggest interventions to help prevent staffing problems [Baryannis and Dani 2022].

The AI systems will also automatically adjust staff resources according to seasonality or changing market conditions. In logistics, where the demand for staff can change dynamically, automated resource planning will allow organizations to quickly adapt to the current requirements and minimize the operational costs associated with excess staff or staff shortages [Hamdi and Abdallah 2021].

In the future, AI will also become a more sophisticated decision-support tool. Intelligent AI systems can provide recommendations for strategic HR decisions by analyzing data from different areas, such as performance results, development needs, and employee engagement. HR can use these systems to create more complex analyses and make decisions based on hard data, allowing for more precise management of teams and a more effective response to HR challenges [Lewis and Reilly 2020].

AI-powered chatbots will become even more integrated into HR operations, offering automated answers to frequently asked questions and more comprehensive employee support. In the future, chatbots may be able to conduct initial interviews, offer information on internal procedures, and monitor employee needs, reducing the burden on the HR department and improving the employee experience [Tan and Chan 2023].

As AI becomes more advanced, it will be necessary to create ethical frameworks and standards for managing AI technologies in HR. Organizations must develop internal policies around data privacy, transparency, and accountability to protect employees' rights and mitigate algorithmic bias risks. An ethical approach to AI management will become vital to building employee trust and maintaining a positive organizational culture [Chaturvedi and Sharma 2022].

In the future, logistics organizations will also need to comply with international regulations on the use of AI, such as the EU's GDPR rules, and implement data protection and accountability standards for AI activities. Implementing ethical practices related to AI will help companies maintain compliance and build employee trust in HR processes based on new technologies [Ivanova and Dimitrov 2022].

In the future, AI will be increasingly integrated with Internet of Things (IoT) technologies and Big Data analytics to enable even more comprehensive human resource management. Combining AI with IoT will enable real-time data collection, such as employee location and status data, supporting effective planning and real-time resource allocation. In logistics, where time and location are critical, such integration will allow for more precise management of teams and optimization of work schedules [Varghese and Patel 2020].

Using Big Data in combination with AI will also enable more accurate forecasts of employee demand and better resource planning. Organizations will be able to use historical and current data to create advanced predictive models that will help them manage their workforce flexibly and in a market-driven way. Integrating AI with IoT and Big Data is a step toward fully digital human resource management [Kovács and Kot 2021].

AI will also support the development of programs that support diversity and inclusivity, which will become increasingly important in the future. In logistics, where teams are often multicultural, AI can help to manage diversity better and support inclusive policies by monitoring the needs of employees from different backgrounds and suggesting actions that foster diverse and inclusive teams. As a result, organizations will not only be able to improve the working atmosphere but also attract more diverse talent, which fosters innovation and better collaboration [Ghosh and Ramkumar 2021].

Summary and conclusions

Artificial intelligence (AI) in logistics HR management has great potential to improve operational efficiency and human resource management. From automating recruitment processes to optimizing employee retention to predicting performance and turnover, AI brings tangible benefits and supports a more strategic approach to HR [Mishra and Singh 2021, Ahmad and Mohamad 2023]. Introducing digital twins and advanced monitoring algorithms will make it possible to better align human resources with organizational requirements, minimizing HR risk and increasing operational efficiency [Gupta and Raj 2023].

However, AI in HR in logistics also brings significant ethical challenges and requires responsible implementation. Privacy issues, risk of bias, and legal compliance must be constantly monitored and improved. The future of AI in HR depends on an organization's ability to implement transparent data protection policies and incorporate ethical considerations into decisions [Ivanova and Dimitrov 2022]. As AI continues to evolve, its role in logistics will become an operational support and an essential element of HR strategy.

Artificial intelligence (AI) is transforming modern logistics HR management, bringing new quality to recruitment processes, performance optimization, retention management, and talent development. Analyzing the applications of AI in HR, it is clear that these benefits go beyond the traditional aspects of workforce management, enabling organizations to be more flexible, better align HR resources to dynamically changing needs, and reduce operational costs. AI supports a more strategic approach to talent management, which is particularly relevant in logistics, where the work intensity, seasonality, and need to respond instantly to market changes pose challenges [Baryannis and Dani 2022, Fountaine et al. 2023].

Research indicates that AI enables a more efficient and personalized approach to human resource management, allowing organizations to fine-tune development paths and career plans to meet individual employee needs. Analytical results confirm that using AI leads to higher efficiency in recruitment processes, performance monitoring, and retention, which increases employee engagement and satisfaction [Wright and Snell 2020, Jatobá et al. 2023].

AI provides tools to more accurately forecast staffing needs and predict turnover risk. Studies have shown that using AI predictive analytics enables organizations to better prepare for peak demand and manage resources dynamically, minimizing costs and increasing operational stability [Gupta and Vashistha 2020, Hamdi and Abdallah 2021].

An analysis of the literature confirms that the future of AI in HR requires the development of ethical data management frameworks and transparent decision-making processes, which are vital to maintaining employee trust and compliance. Studies have highlighted the need to implement "explainable AI" models to understand their algorithms better and support equitable HR management [Chaturvedi and Sharma 2022, Ivanova and Dimitrov 2022].

Based on the analyses carried out, several practical conclusions were formulated.

1. In a practical context, AI benefits logistics organizations by automating recruitment processes, monitoring performance, and dynamically aligning HR resources with operational needs. Automating HR processes allows managers to make faster decisions and better use of resources, helping to reduce costs and increase operational efficiency.
2. From a practical point of view, implementing AI also requires the development of transparent procedures for managing data and ensuring that employees have access to information on how it is used. Logistics companies can benefit from building trust by using AI technologies transparently and accountably, which positively impacts team morale and engagement.
3. The future of AI in HR offers organizations the tools to manage diversity and inclusivity more effectively. By analyzing data on the diverse needs of employees, organizations can build more aligned and diverse teams and develop programs that support diversity and a culture of inclusivity, fostering innovation and strengthening competitive advantage.
4. The practical application of AI enables organizations to better manage HR risk by identifying potential problems early on, such as job burnout and productivity loss. Future applications of AI in HR will aim to integrate with the Internet of Things (IoT) and Big Data technologies, allowing for more accurate predictions and better alignment of HR resources with rapidly changing market requirements.
5. In summary, the future of AI in logistics HR management is promising, with its applications offering organizations a range of tools that improve day-to-day HR operations and allow for more strategic workforce management. AI influences the building of more diverse and satisfied teams, which fosters innovation and a better organizational culture. As AI becomes more advanced, it will be crucial to implement solutions that follow ethical standards that promote transparency and accountability in decision-making, allowing organizations to build long-term trust and improve performance in the logistics sector.

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