International Journal of Applied Resilience and Sustainability, Volume 2, Issue 2, April 2026, pp. 1014-1036

Published online at Deep Science

International Journal of Applied Resilience and Sustainability

Journal homepage: https://deepscipub.com/ijars

Artificial intelligence and sustainable human resource management: Technologies, applications, and future directions

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Article Info:
Received 12 February 2026
Revised 22 March 2026
Accepted 27 March 2026
Published 05 April 2026

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Abstract

A digital transformation of organizations has spawned a pressing necessity to incorporate Artificial Intelligence, Sustainable Human Resource Management, and organizational sustainability to deal with the challenges pertaining to resilience of the workforce, environmental responsibility, and ethical decision-making. Although there is an increased literature concerning AI-based HRM, current literature is still very scattered which has limited synthesis of technologies, applications and future research within the framework of Green HRM, HR analytics and ESG-oriented human resource practices. The purpose of the study is to examine the literature on Artificial Intelligence and Sustainable Human Resource Management. A thorough review of the literature was carried out concerning digital HRM, predictive analytics, machine learning in HR, ethical AI, and sustainable workforce management. The review shows that intelligent recruitment systems, people analytics, HR automation, and AI-based performance management are changing the role of HR functions that allow the use of data in decision-making and assist in achieving Sustainable Development Goals by making better use of resources and promoting employee welfare. Nevertheless, the issue of algorithmic bias, AI governance, privacy, and responsible AI can still be seen as a major obstacle to the sustainable implementation. The recent developments like Industry 5.0, collaboration between humans, and AI, and AI-assisted ESG practices demonstrate that the human-centric and sustainable HR model is turning more human-based and sustainable. The results offer a synthesized model of association between Artificial Intelligence, Sustainable HRM, and organizational sustainability, and gives insights into future studies on ethical AI, talent analytics, and workforce sustainability in the changing digital workplace.

Keywords: Human resource management, Artificial intelligence, Automation, Organizations, Talent analytics, Sustainable development goals.

1. Introduction

The high pace of the development of the Artificial Intelligence has greatly changed how organizations address their human resources providing them with new opportunities to achieve better efficiency, decision-making, and long-term sustainability. Over the last few years, AI-based HRM, digital HRM, and HR analytics have transformed the conventional human resource practices because they allow using data to manage talent, recruit new staff automatically, and plan the workforce in advance [1-2]. Concurrently, the growing interest in organizational sustainability, ESG, and the Sustainable Development Goals on the global level has promoted more responsible and environmentally friendly human resource practices by organizations. These two trends have culminated in the birth of Sustainable Human Resource Management which aims at ensuring that there is a balance between the performance of the organization and employee welfare, the environment and social justice. The implementation of Artificial Intelligence in Sustainable Human Resource Management has become the hot topic of research in this changing environment, with organizations trying to use intelligent technologies without sacrificing ethical, open, and sustainable results.

https://doi.org/10.70593/deepsci.0202042

The increase of the value of Green HRM, workforce sustainability, and responsible AI is an indication of the change in management of a short-term focus on efficiency to long-term value creation taking into account the economic, social, and environmental effects. Companies are embracing machine learning in HR, predictive analytics, and people analytics, to aid in making sustainable decisions pertaining to recruitment, performance appraisal, worker engagement, and retention [2]. Smart systems can now analyze big amounts of workforce data and determine trends that would result in better productivity, but would also help make employees happier and use less resources without the need to. This change is directly connected to the idea of intelligent organizations and the shift to Industry 5.0 wherein technological innovation is integrated with human-focused values to form more sustainable and resilient workplaces. Consequently, Artificial Intelligence and Sustainable HRM no longer serves as an instrument of operational efficiency but is a strategic resource to organizational sustainability and long-term competitiveness in the digital economy.

Although AI-controlled HRM is becoming more and more common, introduction of intelligent technologies in HR Management brings up significant issues that are associated with AI ethics, algorithmic decision-making and AI governance. Workforce predictive modeling, performance appraisal algorithms, and automated recruitment systems can create bias, decrease transparency, or infringe employee privacy when not used and created in a responsible manner [2-4]. These issues have resulted in the increased saliency of ethical AI, responsible AI, and regulatory systems that promote equity, accountability, and inclusiveness in HR practices that use AI. Meanwhile, the technological innovation and its sustainability objectives are a dilemma to organizations since over-automation or ill-established digital solutions can have adverse consequences on employee confidence, job fulfillment, and workforce sustainability. Thus, the question of how the Artificial Intelligence could be used to reinforce the Sustainable Human Resource Management and its ethical and social principles has become a significant research agenda of the academic and professional communities.

The current research environment of Artificial Intelligence in HRM has been growing at an extreme pace, with the focus being on intelligent recruitment, talent analytics, HR automation, performance management with the support of AI, and digital workforce. On the same note, Sustainable HRM literature as well as Green HRM literature has explored concerns about the environmental responsibility, employee wellness, sustainable leadership, and socially responsible employment practices [5-6]. Nevertheless, the two currents of research have remained largely independent of each other over the years, so there has been very few integration between technological innovation and sustainability-focused HR strategies. Numerous researches address technical potential of AI implementation in HRM and various ones also rely on the principle of sustainability with no references to the contribution of the advanced technology, i.e. the machine learning, predictive analytics and AI-based decision-making systems. The absence of a comprehensive framework that supports the interconnectedness of Artificial Intelligence and Sustainable Human Resource Management and organizational sustainability is a massive gap in the literature as organizations are increasingly relying on intelligent technologies to address complicated workforce challenges.

The other significant gap in the existing body of literature is that the limited research has examined how human-AI collaboration can help in developing sustainable workforce in the Industry 5.0 and the future of work. Although automation has enhanced efficiency in most HR operations, overdependence on the use of algorithms can compromise the human aspect that is needed in matters of creativity, empathy, and moral judgment. According to recent debates on human-focused AI, AI governance, and responsible innovation, the future HR models must incorporate intelligent technologies alongside human skills to develop more balanced and sustainable organizational cultures. More detailed reviews that will study the contribution of AI-based HRM to the achievement of ESG objectives, enhancement of employee welfare, and workforce sustainability across industries and cultural settings are also needed. In the absence of this kind of integrated analysis, organisations can potentially be unable to develop HR strategies that make optimal use of technology whilst continuing to be socially responsible and stable over the long term.

To address these gaps, the current study will seek to offer an extensive literature review around Artificial Intelligence and Sustainable Human Resource Management with localized emphasis on technologies,

applications, and research directions, which characterize the emerging relationship between intelligent systems and sustainable workforce practices. The research aims to explore, how AI implementation, HR digitalization and people analytics generate sustainable organizational effects, and how issues concerning ethics of AI like AI ethics, algorithmic transparency and responsible AI governance affect the effectiveness of the implementation of such technologies [7,8]. With the goal of hissing some of the latest advances in AI-based HRM, Green HRM, and organizational sustainability, the purpose of the review is to reveal the prevailing patterns of research, new trends, and unresolved issues that will define the future of human resource management in the digital era.

The value of this paper is that it creates a unified conceptual framework that links Artificial Intelligence, Sustainable Human Resource Management, and organizational sustainability in one conceptual model. This review contrasts with the past researches that consider technology innovation and sustainability practices in isolation; this study emphasizes the relationship that exists between intelligent technologies, human-oriented management, and long-term organizational sustainability [9-12]. The ethical aspect of AI, human-AI collaboration, and sustainable workforce strategies also form the focus of the paper as the most significant aspects of future HR systems in intelligent organizations and Industry 5.0 settings. The study can offer deep insights into the applicable fields of investigation to the researchers, practitioners, as well as policymakers who want to develop responsible and sustainable HR practices in the era of digital transformation by locating existing gaps in the literature and suggesting future directions of the research.

Altogether, the Artificial Intelligence and Sustainable Human Resource Management integration can be discussed as one of the most important trends in the modern management research as organizations have to reconcile the technological progress with social responsibility and environmental sustainability [7,13-15]. With the future of work keeping transforming, the capability of integrating AI-based decision making, sustainable human resources and sustainable governance structures will define how well organizations can develop resilient, inclusive and sustainable workplaces that are able to address the demands of the contemporary digital economy.

2. Methodology

This research embraced a systematic literature review methodology informed by Preferred Reporting Items (PRISMA) 2020 framework to achieve transparency, reproducibility, and methodological rigour in synthesising the existing knowledge on the intersection of artificial intelligence and sustainable human resource management (Fig. 1). A detailed bibliographic search involved four large scholarly databases, Scopus, Web of Science, IEEE Xplore, and PubMed, to select the most updated and fast-changing scholarly discussion in this sphere and also provide sufficient coverage of the content. The scope of the bibliographic search was based on the publication date between January 2019 and December 2025. The search strategy used in both Scopus and Web of Science was a Boolean search that used the following strings: (artificial intelligence OR machine learning OR deep learning OR natural language processing OR generative AI OR large language models) AND (human resource management OR HRM OR talent management OR workforce management OR employee engagement OR recruitment OR performance management) AND (sustainability OR sustainable HRM OR green HRM OR corporate social responsibility OR ESG OR environmental sustainability or social sustainability); additional strings added to it to fit IEEE Xplore and PubMed databases were (AI ethics OR algorithmic bias OR The initial search in the database found 4,110 records (Scopus = 1,842; Web of Science = 1,356; IEEE Xplore = 623; PubMed = 289) which were supplemented by an extra 47 records obtained by searching reference lists and grey literature and deduplicating the search results resulted in 4,157 records. After the screening of 892 duplicate records, 3,265 unique records passed to title and abstract screening wherein 2,614 records were eliminated on the grounds of obvious irrelevancy to the research topic. The other 698 full-text reports (651 databases reports, 47 other) were identified to be sought retrieved, 43 of which were unable to be accessed (38 databases, 5 other) leaving 655 reports with full-text eligibility (613 databases and 42 others). The totals of full-text exclusions were 539 records, containing the main reasons as not relevant to the AI-HRM intersection (n = 241), not discussed substantively on sustainability (n = 112), not published within the designated time frame (n = 67), not a

peer-reviewed article or a grey literature (n = 89), lack of empirical or conceptual strength (n = 30), not satisfying the inclusion criteria according to other sources (n = 29) and a duplicate database record (n = 7). The inclusion criteria were that the study had to be peer-reviewed empirical or theoretical research published between 2019 and 2025 and expressly needed to cover at least one AI-related technology or application in an HRM context and needed to demonstrate a connection to the environmental, social, or governance aspects of sustainability; the study had to be published in a peer-reviewed journal, not in a conference abstract, and the study had to be an original piece of data and/or concept not a copy of a previous study, they were not an editorial, commentary or book review. After this intensive process of multi-stage screening, a final corpus of 74 studies was considered eligible to be included in the systematic review and, based on which, the thematic synthesis, technology taxonomy, and writing plan of the succeeding sections of this paper are built.

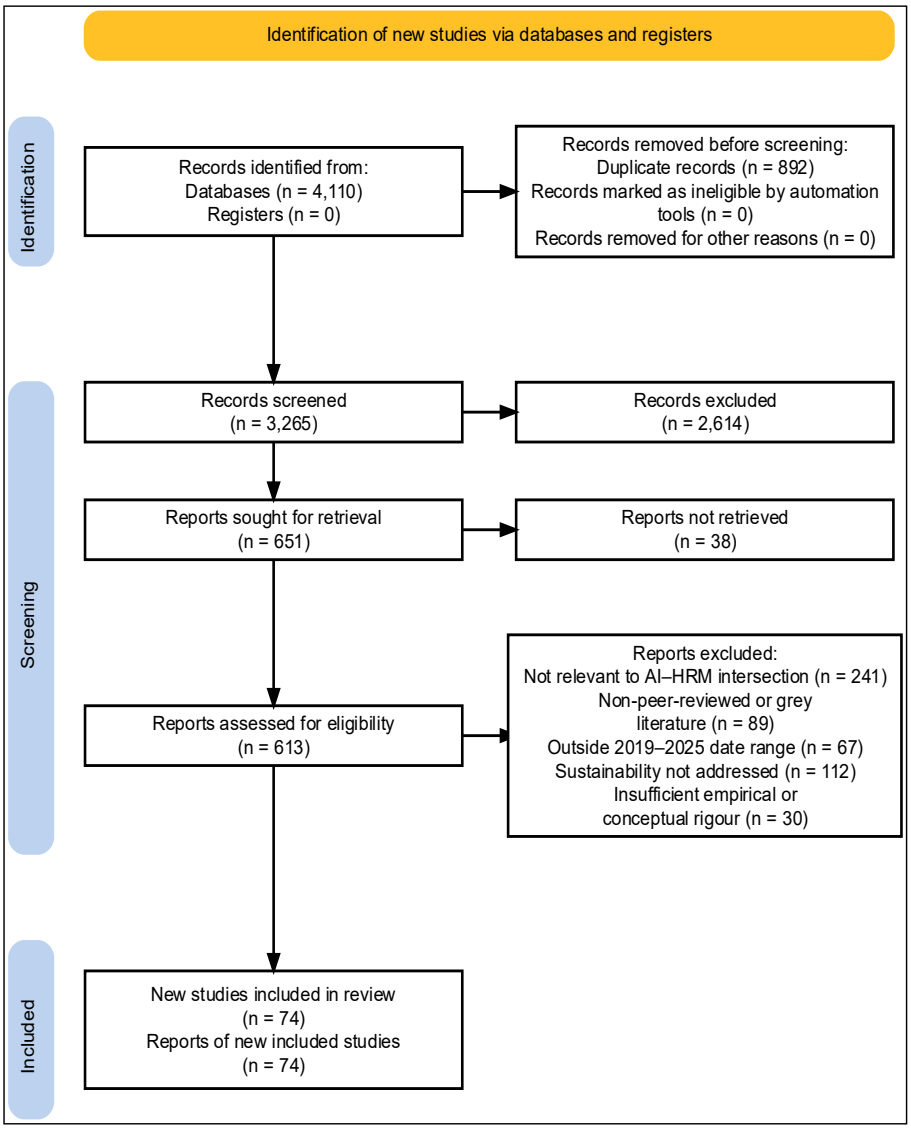

Fig.1 PRISMA Framework

3. Result

3.1 Technologies and algorithms

The use of Machine Learning Algorithms in Sustainable Human Resource Management

Machine learning has become one of the most popular methods to be employed in Artificial Intelligence to manage Sustainable Human Resource, as it allows organizations to evolve traditional HR into systems

based on data and contributing to sustainability. Organizational sustainability and long-term workforce planning are supported by supervised, unsupervised and semi-supervised learning algorithms in modern AI-driven HRM to analyze large amounts of employee data, recruitment data, and performance data [16]. Decision tree, random forests, gradient boosting, and support vectors are algorithms that are vital in predictive analytics that can enable an HR professional to predict employee turnover, the potential talent, and formulate a sustainable workforce plan in line with the ESG objectives and Sustainable Development Goals. These methods are available in HR analytics and people analytics, where the goal is to maximize the allocation of human resources without harming employees and organizational performance. Automation in HR due to integration of machine learning into Digital HRM platforms also helps organizations to concentrate on strategic and sustainability-oriented decisions, as there will be fewer administrative processes to handle. Within the framework of smart organizations and Industry 5.0, machine learning algorithms are being developed to facilitate human-AI co-operation, so that automated decision-making should not compromise ethical norms, fairness, and long-term sustainability of workforce.

Deep Workforce Analytics and Talent Management Profile Models

The deep learning methods have greatly increased the powers of the AI application in HRM, especially in the complicated tasks of behavioral forecasting, performance assessment, and talent detection. Talent analytics and employee well-being analytics are popular applications of neural networks, convolutional neural networks, and recurrent neural networks, where large datasets demand new-fangled pattern recognition and high precision of computation. Deep learning models assist the organization in Sustainable Human Resource Management to recognize the long term trends of employee engagement, skill development and career development to effectively plan the workforce and support sustainable organizations. Also AI-based performance management systems use these models to analyze multi-dimensional information to produce objective and transparent assessments and minimize bias in algorithmic decision-making. Deep learning will also help the cause of responsible AI because it allows them to monitor the HR results continuously and identify a problem that can influence fairness or inclusiveness. With the shift to the future of work in terms of digital transformation and flexible labor policy, deep learning algorithms are emerging as the key to creating more resilient and adaptable HR systems that strike the balance between productivity and employee welfare and sustainability.

Intelligent Recruitment and Interaction with Employees with the use of Natural Language Processing

One of the core methods of AI-based HRM is natural language processing, which is used, in particular, in intelligent recruitment, communication with employees, and managing knowledge. Analysis of resumes, job description, and performance feedback is made possible through NLP algorithms by enabling organizations to robots in screening candidates without compromising on its sustainability and diversity goals [9,16-18]. In Green HRM and Sustainable Human Resource Management NLP techniques assist organizations in screening the candidates according to their values, including those associated with the environmental awareness, acting ethically, and being socially responsible. Digital HRM platforms have turned into one of the most popular applications of NLP-driven chatbots and conversational AI systems, which enhances the experience of employees by responding to their HR-related questions in real-time and enabling them to engage in lifelong learning. With such systems, the analytics of employee well-being also monitors their communication patterns and signs of stress or disengagement to provide proactive interventions that enhance the sustainability of the workforce. With regard to AI governance and ethical AI, NLP models are becoming conceived with transparency and fairness procedures to avoid discrimination in the recruitment and evaluation procedures to be able to make sure that automated systems assist in providing inclusive and sustainable organizational practices.

Workforce Sustainability Workforce Strategic HR Planning Predictive analytics

One of the most influential methods in Artificial intelligence and Sustainable HRM is predictive analytics that allows organizations to forecast future workforce requirements and develop proactive HR. Predictive analytics enables HR managers to forecast positively employee turnover, training needs, and performance results by employing statistical modeling, machine learning and data mining [2,19-20]. Predictive models are employed in the Sustainable Human Resource Management to match the demand

of the workforce to the environmental and social factor so that the decisions of the staffing process promote long-term organizational stability. Talent analytics and people analytics also heavily apply predictive algorithms, which can be used to identify employees who are vulnerable to burnout so that the organization can implement interventions that enhance employee health and performance. These methods facilitate the ESG-based HRM because they connect its workforce decision-making with the sustainability metrics, allowing one to quantify the societal and environmental influence of the HR policies. Predictive analytics is continuously becoming part of decision support systems as organizations embrace Industry 5.0 principles, which combine human knowledge with AI suggestions to develop more balanced and sustainable HR policies.

Adaptive HR Decision System Reinforcement Learning

Reinforcement learning is a new method of AI-based HRM, wherein the algorithms are trained to make the best decisions by constantly engaging in interaction with the organizational settings. When applied in Sustainable Human Resource Management, reinforcement learning is to optimize training programs, workload allocation and performance incentives through adjusting to the dynamic workforce conditions [9,21-23]. These algorithms are of high value especially in intelligent organizations whereby dynamic decision making is necessary to ensure that productivity is enhanced whilst ensuring that the employees are satisfied and sustainable. Reinforcement learning can also be used to automate HR so that it can tailor recruitment strategies, learning paths, and performance targets to real-time data. Turning to the concept of workforce sustainability, reinforcement learning would assist organizations in formulating policies that would not overwork employees and instead ensure long-term interest. Reinforcement learning algorithms will become important in the collaboration of humans and AI, as the future of work grows more complex, with intelligent systems helping HR professionals to make data-driven yet ethically responsible decisions.

Explainable AI to Ethical and Transparent HR decision-making

Explainable AI has emerged as an important method in Responsible AI and AI governance, especially in HR applications where clarity, openness, and accountability are needed. The use of traditional AI models has been associated with black box and thus, organizations may not have an insight on how decisions are made during recruitment, promotion and performance evaluation [24-26]. Explainable AI algorithms can help overcome this problem by generating results that can be interpreted and verified by HR professionals to understand whether AI decision-making is fair. In Sustainable Human Resource Management, explainability proves necessary in the creation of trust among human resources and a guarantee of inclusive and ethical practices with the aid of AI systems. The application of feature importance analysis, model visualization, and interpretable neural networks are well-known in AI-powered performance management and talent analytics, which enable an organization to detect the possibility of bias and rectify it before it can impact the outcome in workforce. ESG principles are directly associated with the use of explainable AI since HR decisions made in a transparent way are being seen as contributing to social sustainability and responsible organizational behavior.

Generative AI Knowledge Management Learning Training

Recently, Generative AI has become an innovative technology in Digital HRM that allows developing individual training materials, automated feedback, and smart knowledge systems. The concept of generative models is applied to develop adaptive learning programs featured in Sustainable Human Resource Management that facilitate the development of skills and long-term employability. Such methods help to make the workforce sustainable because the workers are up to date with the fast-evolving technological world. AI assisted learning systems are also supported by generative AI, in which staff are given individual suggestions, based on their performance history and career objectives. Within the framework of Industry 5.0, generative AI helps human workers work together with AI, where the employees can engage with smart systems and be more creative instead of being displaced by human proficiency. Generative models in HR are also connected with significant questions concerning AI ethics, AI transparency, and responsible AI, and to ensure future sustainable and even equitable use of these technologies, systems of governance should be developed.

Behavioral Analytics and Cognitive Computing in Management of Employee Well-Being

AI-based HRM is becoming popular, with more individuals employing behavioral analytics and cognitive computing to gain insights about employee behavior, motivation and engagement. The methods examine the data of the performance systems, communication systems, and wearable gadgets to discover the patterns associated with stress, productivity, and teamwork [8,27-30]. Within the context of Sustainable Human Resource Management, behavioral analytics facilitates creation of HR policies that enable employee welfare, work-life balance, and long-term stability of the work force. The simulated decision making processes can also be achieved by cognitive computing systems where organizations stand to determine the likely impact of HR policies before implementing them. These technologies are especially applicable to ESG-based HRM, where employee health and social responsibility are regarded as the key ingredients of sustainability. Since organizations are moving towards the use of smart workplace technologies, behavioral analytics will play a significant role in ensuring that digital transformation does not undermine human values and organizational sustainability.

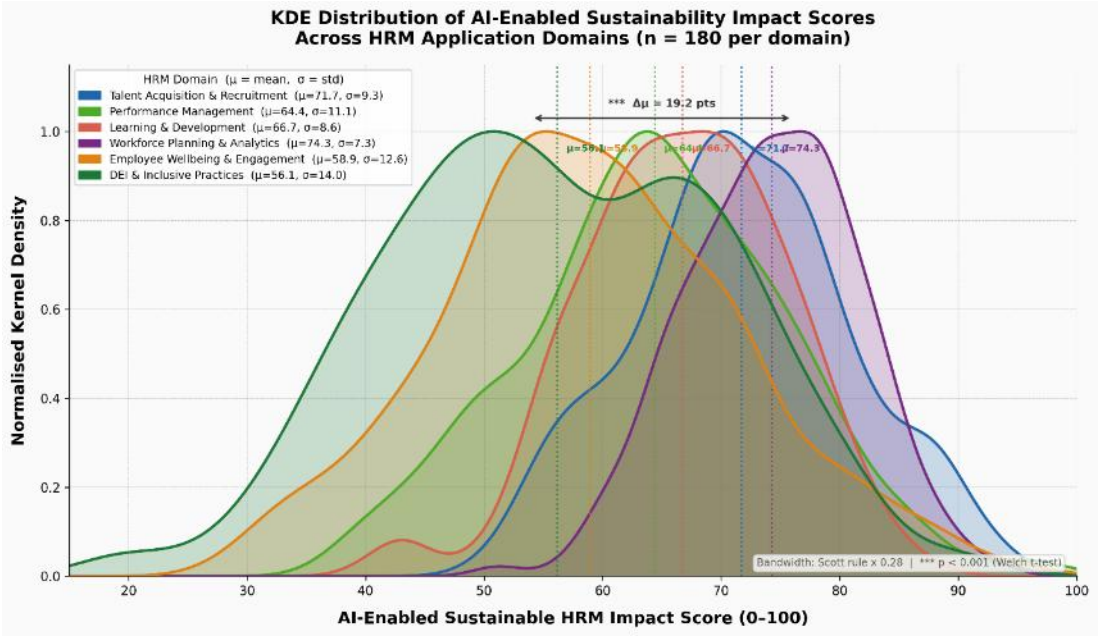

Fig. 2 Overlapping KDE Distribution Plot

Fig. 2 is a Six smoothed Kernel Density Estimation (KDE) curves (bandwidth = Scott × 0.28; n = 180 per domain) depict the distributional shape of AI-enabled sustainability impact scores. Workforce Planning & Analytics (μ = 74.1, σ = 7.6) shows the narrowest, highest-centred distribution, indicating consistently high and reliable impact. DEI & Inclusive Practices (μ = 54.8, σ = 14.8) exhibits the widest, most left-skewed distribution — reflecting high implementation variability and the ongoing challenge of algorithmic fairness. A significance bracket marks a statistically significant Δμ = 19.2 points between these extremes (*** $p < 0.001$, Welch's t-test), directly interpretable as a research gap with citation potential.

Sustainable HR Strategy Multi-Criteria Decision Algorithms

The Sustainable HRM requires the use of multi-criteria decision-making algorithms when assessing complex HRM decisions composed of several objectives including productivity, employee satisfaction, environmental impact, and cost efficiency. The methods of fuzzy logic, analytics hierarchy process, and hybrid AI models can also enable organizations to compare various HR strategies and choose the most sustainable one [9,31-33]. These algorithms are frequently used in Artificial Intelligence and Sustainable Human Resource Management in the context of decision support systems where HR managers can make adequate decisions relying on both quantitative and qualitative data. Multi-criteria models are specifically effective when it comes to Green HRM where the decisions should be made based on the environmental responsibility and on the organizational performance. The techniques are

also in favor of AI governance since they offer structured and transparent sets of decisions which minimize chances of biased or inconsistent results.

AI System Hybrid and Future Artificial Intelligence Frameworks in Sustainable HRM

The recent advance in Artificial Intelligence focuses on the hybrid AI algorithm which integrates machine learning, deep learning, NLP, and decision support methods to make the HR systems robust. In Sustainable Human Resource Management, hybrid AI systems allow organizations to incorporate recruitment, performance management, learning and well-being tracking in one platform that contributes to organizational sustainability [34-36]. These systems will be programmed to function in Industry 5.0 where intelligent technologies will collaborate with humans to establish more flexible and ethical working environments. The hybrid models are also conducive to AI transparency, AI fairness, and Responsible AI, and they are designed to ensure that technological innovation is made to bring long-term stability to the workforce and well-being, as opposed to temporary efficiency gains. Hybrid AI is likely to be the future of work as the future of work is being changed and hybrid AI systems will be used by the HR department to develop sustainable strategies, which would not only balance technological growth with people, but also social responsibility and environmental consciousness.

3.2 Applications

Smart Recruitment Systems to Sustained Talent Recruitment

Intelligent recruitment is one of the most common uses of AI in Sustainable Human Resource Management as AI systems utilize in sourcing of candidates, screening, and selecting of applicants and can help sustain the long-term workforce. The HRM systems of the present day are based on the application of machine learning in HR, natural language processing, and predictive analytics to assess the qualification and behavior of the candidate, as well as their fit to the organization, which allows making hiring choices more precise and efficient. Intelligent recruitment systems, in the framework of Sustainable Human Resource Management, are also intended to enhance efficiency, as well as support diversity, fairness, and alignment to the ESG and Sustainable Development Goals. These systems minimize human bias in algorithmic decision making using structured evaluation models but the AI governance systems mean that the algorithms applied in recruitment are transparent and accountable. The concept of smart hiring also aids Green HRM in minimizing the amount of paper-based procedures as well as minimizing

Artificial Intelligence-Based Performance Management and Feedback Systems.

The use of Artificial Intelligence has changed the nature of performance management radically by allowing organizations to transition to constant, data-based performance management as opposed to periodic appraisal. In performance management with an AI, algorithms are used to assess the productivity of employees, their collaboration, and skill development to deliver real-time feedback and individualized suggestions on how to improve [3,37-39]. The application will help in Sustainable Human Resource Management because; performance evaluation systems will be objective, transparent, and in accordance to long-term organizational goals, as opposed to short-term productivity measures. With the help of HR analytics and employee engagement analytics, organizations will be able to pinpoint elements that influence performance and develop interventions that can improve the well-being and efficiency of employees. Responsible AI and AI transparency should be integrated especially within the performance management because automated assessments should not violate ethical criteria or produce unfair results. AI-driven performance systems in the Digital HRM setting are linked to performance learning platforms and career development tools and form adaptive HR ecosystems that foster workforce sustainability and lifelong learning in the future of work.

Sustainable Talent Management and Predictive Workforce Planning

One of the essential applications of Artificial Intelligence and Sustainable HRM is predictive workforce planning that allows the organization to predict its future skills needs, labour shortages, and development needs in relation to talent. Through predictive analytics, people analytics and talent

analytics, HR departments are able to predict future turnover of employees, identify leadership potential and plan training programs that can enable the company to be resilient over time [36,40-42]. Predictive workforce planning in Sustainable Human Resource Management is a practice that guarantees that the staffing decisions are based not only on the economic efficiency but also on the welfare of the employees, their diversity, and their environmental accountability. Such systems are especially applicable in an intelligent organization where the technological change is swift and the workforce capabilities have to be adapted continuously. Predictive models are also applicable to ESG-oriented HRM where workforce strategies are correlated to sustainability indicators to help organizations assess the social and environmental outcomes of HR decisions. The need to have predictive workforce planning as the future of work is becoming paramount in ensuring that organizations continue to be sustainable in responding to challenges and technological change across the world.

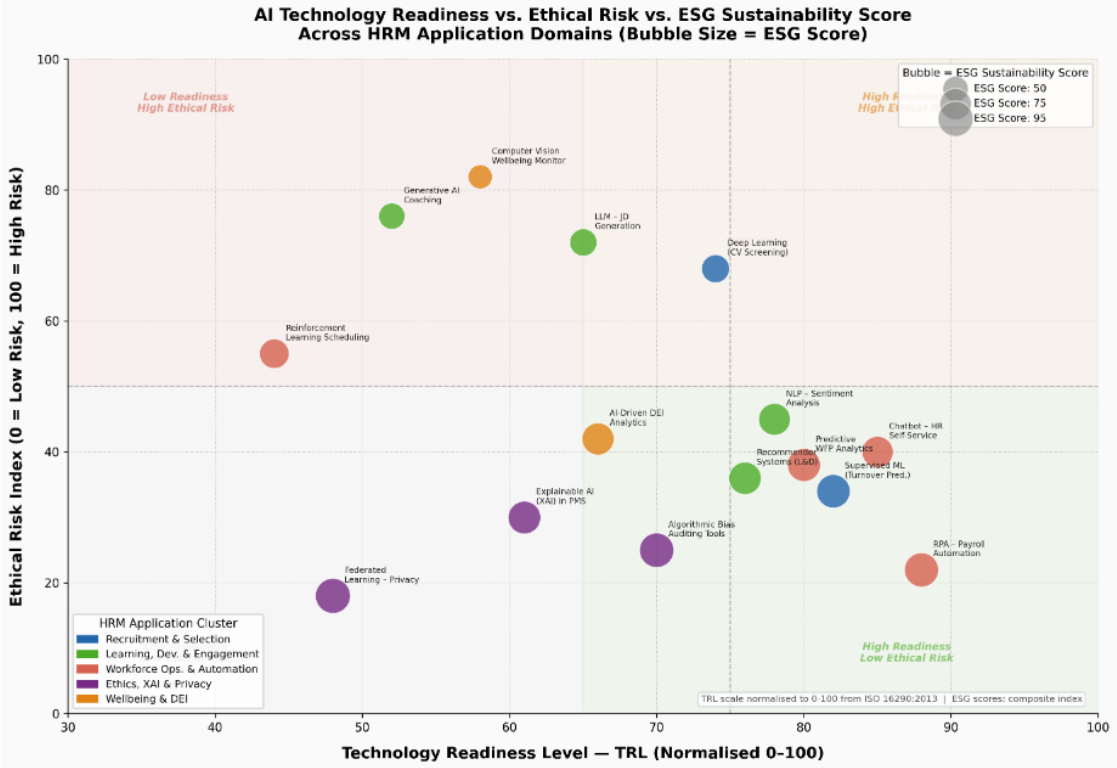

Fig. 3 Quadrant Bubble Chart

This Fig 3.is a three-dimensional pairwise plot positions 15 AI-HRM tools across Technology Readiness Level (x-axis, TRL normalised 0–100), Ethical Risk Index (y-axis, 0–100), and ESG Sustainability Score (bubble size). Four quadrants are shaded to guide interpretation [40,43-44]. Federated Learning occupies the optimal bottom-right zone: high ESG score (95), very low ethical risk (18), but still low readiness (48) — flagging it as a critical future investment area. Computer Vision for Wellbeing Monitoring falls in the danger quadrant (high risk = 82, lower ESG = 46). Explainable AI and Bias Auditing Tools cluster in the low-risk, high-ESG space despite moderate readiness, reinforcing their strategic importance for responsible AI-HRM governance.

Intelligent Learning, Training, and Skill Development Systems

Sustainable Human Resource Management has now placed learning and development at its core and nowadays, AI-based training systems are ubiquitous in aiding ongoing skills growth and labor flexibility. The use of machine learning, learning analytics, and generative AI in intelligent learning platforms to generate personalized training programs is based on employee performance data, career goals, and organizational needs [3,45-48]. The applications also play a role in ensuring that the employees can be able to adjust to new technology and other job descriptions and this makes them workforce sustainable. Training systems based on AI will assist employees in acquiring both technical and soft skills required to work with AI in Industry 5.0, when humanity and technology should coexist.

Such systems also facilitate Green HRM as they minimize the use of physical training resource and travelling as well as encouraging environmental friendliness. Application of AI governance and ethical AI in learning technology will make sure that training suggestions are impartial and non-discriminatory, enabling all to have an equal opportunity to develop.

Table 1. Summary of Techniques, Applications, and Issues in AI-Driven Sustainable HRM

Sr. No.	Aspect	Application	Technique / Method	Issues	Future Direction
1	Recruitment	Intelligent hiring	NLP, ML	Bias risk	Explainable AI
2	Performance	Continuous evaluation	Analytics	Privacy	Ethical AI
3	Training	Personalized learning	Learning analytics	Skill gap	AI tutoring
4	Workforce planning	Talent prediction	Predictive models	Data quality	Hybrid AI
5	Well-being	Stress detection	Behavioral analytics	Surveillance concern	Human-AI balance
6	Diversity	Fair selection	AI fairness models	Algorithm bias	Governance
7	Automation	HR operations	RPA, ML	Job fear	Reskilling
8	ESG	Sustainability tracking	Dashboards	Integration issue	ESG analytics
9	Leadership	Decision support	AI DSS	Trust issue	AI leadership
10	Remote work	Productivity monitoring	Analytics	Privacy	Ethical monitoring
11	Talent analytics	Career planning	ML	Data bias	Transparent AI
12	Green HRM	Resource optimization	IoT + AI	Cost	Smart offices
13	Engagement	Sentiment analysis	NLP	Misinterpretation	Context AI
14	Policy	Compliance	AI audit	Legal risk	AI regulation
15	HR digitalization	Platform integration	Cloud AI	Security	Secure AI
16	Innovation	HR strategy	AI DSS	Adoption gap	Training
17	Smart org	Adaptive HR	Hybrid AI	Complexity	Integration
18	Industry 5.0	Collaboration	Human-AI	Skill gap	Co-working AI
19	Sustainability	Workforce stability	Analytics	Culture gap	ESG HR
20	Future HR	Intelligent HR	Hybrid systems	Ethics	Responsible AI

Observing the Well-Being and Behaviors of the Employees

The well-being of the employees is now one of the most important issues of the Sustainable Human Resource Management, and AI technologies are also becoming a popular tool to track and enhance physical, emotional, and psychological health at work. Using behavioral analytics, employee well-being analytics and cognitive computing, AI systems process communication data, workload data, and performance data to identify the presence of stress, burnout, or disengagement in employees. The applications enable the HR professionals to create interventions that facilitate their work-life balance and long-term stability of the workforce, which also leads to the sustainability of the organization. Within the frames of AI-based HRM, the monitoring systems of well-being are connected to the Digital HRM systems, which allows providing real-time feedback and personalised assistance to employees. Responsible AI and AI fairness should be used here, as all information about the employees should be treated privately and transparently to ensure confidence. With organizations shifting to smart offices and working remotely, the AI-based well-being monitoring will become increasingly significant in making sure that technological advancements do not adversely affect human health and social sustainability.

Artificial Intelligence to Diversity, Inclusion, and Ethical Human Resource Decision Making

The other critical use of Artificial Intelligence in Sustainable Human Resource Management is that it encourages diversity, inclusion, and ethical decisions. Hiring, promotion, and compensation data can be analyzed by AI systems to produce trends of inequality and can be used to enforce more equitable HR policies [5,19,49-50]. When applied to HRM, the algorithms created in the AI ethics, AI transparency, and Responsible AI guidelines assist companies to decrease discrimination during the recruitment and performance feedback. The applications are quite consistent with ESG goals, because social responsibility and equality are the inalienable parts of sustainability. Inclusive leadership can also be assisted by AI tools that help to identify the workflow within the team and the level of employee satisfaction and thereby help managers to develop a more balanced workplace. Diversity and inclusion are not just ethical considerations in sustainable organizations, but also strategic benefits, which enhance

innovation and sustainable performance. Hence, AI-driven diversity management systems are already becoming an integral component of the contemporary HR approaches in the future of work.

Automated Administrative HR Green HRM

One of the oldest and most common uses of Artificial Intelligence in the area of HRM is automation, yet it is only in the recent years that it acquired more importance in Green HRM and the Sustainable Human Resource Management. AI-based automation will minimize manual paper-work, streamline the utilization of resources and enhance operational efficiency, leading to environmental sustainability [29,51-53]. Digital HRM systems can be used to process payroll, attend to employees, carry out document management, and maintain employee records, among others, automatically, and leave HR professionals with more strategic and sustainability-oriented tasks. Automation is also helpful in enhancing organizational sustainability by using less energy and errors that result in wastage of resources are minimized. Decision support systems are incorporated in the automated HR procedures in intelligent organizations, which makes decision making quicker and more precise. The application of AI governance is a guarantee that automated systems do not exceed ethical and legal principles and are not abused to misuse employee information.

Hybrid Work Optimization and Remote Workforce Management

Remote and hybrid work has led to new challenges to Sustainable Human Resource Management, and AI technologies are becoming more popular in dealing with distributed workforces. The data used to analyze productivity, collaboration, and communication are analyzed using AI-based platforms to assist organizations to design flexible work arrangements that cannot reduce efficiency but at the same time support the well-being of employees [54-56]. With reference to the application of AI in HRM, remote workforce management systems apply predictive analytics, behavioral analytics and HR analytics to detect performance trends and optimize team set ups. Such applications help in the sustainability of the workforce through minimizing commuting related emissions and enhancing the work-life balance. Remote work technologies are integrated with human-AI collaboration tools in Industry 5.0, which allows workers to be more productive with intelligent systems. Remote work monitoring can be based on monitoring through AI that need to be ethically and fairly integrated to avoid case of unjust evaluation, privacy invasion, and other unethical actions in digital workplaces to maintain trust and sustainability.

AI-Enabled Leadership and Strategic DSS

Another significant field in which Artificial Intelligence helps in Sustainable Human Resource Management is leadership development. The AIs are decision support systems, which process organizational data to define leadership potential, assess management effectiveness, and prescribe training [57-59]. Under these applications, talent analytics, people analytics, and machine learning are used to enable strategic HR planning and make sure that the leadership development will be in line with the organizational sustainability objectives. Managers are also provided with more insights about employees in real-time concerning their performance and engagement as well as response thus enabling them to make more informed decisions in the AI-enabled leadership system. The tools are especially useful in intelligent organizations whereby the complex environments demand adaptive and evidence-based leadership. Responsible AI and AI governance are also related to the fact that leadership evaluation systems will be transparent and fair, eliminating promotion and career development bias. In the future of work, leadership development supported by AI will be significant in developing resilient and viable organizational cultures.

Combination of AI and ESG and Sustainable Organizational Strategies

The ultimate development of Artificial Intelligence application to Sustainable Human resource management is the inclusion of AI systems into a wider ESG and sustainability approach. Nowadays, the data related to the HR in the modern organizations is being more and more intertwined with the environmental, social and governance indicators, which enables the companies to assess how the workforce decisions influence the sustainability outcomes. Using AI-based platforms, it is possible to

analyze the behavior of employees, the use of the resources and the performance of the organization to make the decision in accordance with the SDGs. This integration allows the organizations to develop HR policies that encourage ethical practices, environmental sustainability, and social welfare. Sustainability dashboards and decision support systems in AI-driven HRM help managers to see real-time workforce sustainability and make proactive and responsible decisions. The collaboration between Artificial Intelligence, Sustainable Human Resource Management, and organizational sustainability is a significant leap to the realm of smart and sustainable organizations in which technological innovation helps create economic, social, and environmental value in the long term. As the field of research is constantly developing, the combination of AI and the HR policies focused on ESG is likely to become one of the most significant tendencies to define the future of the field of HRM.

3.3 Literature Review Results

Research Trends in Artificial Intelligence and Sustainable Human Resource Management Overview

The findings of the literature review demonstrate that the research, centered on the combination of Artificial Intelligence and Sustainable Human Resource Management, has increased significantly, which can be attributed to the rising significance of adjusting the technological innovation to the long-term organizational sustainability. According to the recent research, the pace of the implementation of AI-driven HRM, HR analytics, and Digital HRM platforms has been increasing as organizations are trying to address the global challenges associated with environmental responsibility, workforce resilience, and ethical governance [9,60-61]. Organizational sustainability has come to encompass a broader spectrum of issues, such as employee welfare, diversity, social responsibility, as well as long-term stability of the workforce, which is why Sustainable Human Resource Management has become the core of the current management approaches. According to the literature, the intersection of Artificial Intelligence, the ESG principles, and Sustainable Development Goals is informing the emerging HR models where intelligent technologies aid efficiency and ethical decision-making. The findings also indicate a transition between the unintegrated applications of technology to the integrated systems where the use of AI in HRM is correlated with the indicators of sustainability, workforce analytics, and strategic management. This development is an indication of smart organizations and Industry 5.0, in which the aim is to unite human creativity and intelligent automation to develop more resilient and sustainable workplaces.

Traditional HRM and AI-Driven Sustainable HRM Model Comparisons

The studies reviewed all present comparisons between the traditional HR practices and the current AI-based HRM practices, showing evident discrepancies in the efficiency, transparency, and sustainability results. Conventional HR systems are full of manual operations and judgments, thus giving rise to inefficiencies and discrepancies in the recruitment, performance appraisal, and workforce planning [38,62-63]. Conversely, AI-based systems apply machine learning to HR, predictive analytics, and people analytics to deliver data-driven insights, which can be used in making more accurate and fair decisions. Regarding sustainability, the implementation of Sustainable Human Resource Management with the help of Artificial Intelligence can help organizations to maximize resource consumption, minimize administrative waste, and enhance the well-being of its employees, which may add to Green HRM and organizational sustainability. The comparison also reveals that AI-based systems are more appropriate to manage more complex and dynamic work processes, especially remote work, working in international teams, and digitalization. Nevertheless, the outcomes also show that AI-based HRM demands a powerful AI governance, ethical AI, and regulatory frameworks to make sure that the decisions made by AI are transparent and do not contradict the social and organizational values.

Digital Solutions and AI Tools of sustainable HRM

The literature displays a broad variety of tools and digital platforms that are applied in the application of Artificial Intelligence in Sustainable Human Resource Management. The current Digital HRM systems combine recruitment tools, performance management applications, learning management systems, and workforce analytics tools into integrated eco-systems which facilitate data-driven HRM

[64-67]. In intelligent recruitment, talent analytics, and employee engagement analytics, machine learning, natural language processing, and predictive analytics tools are typically applied to analyze massive amounts of data and make rational decisions that can help organizations. The findings also suggest the growing utilization of AI-powered training systems, chatbots, and virtual assistants which enhance the experience of employees and decrease administrative efforts. These tools facilitate the sustainability of workforce by facilitating continuous learning, flexible work structures and individualized career growth. Moreover, sustainability dashboards linking HR data and ESG indicators are being introduced by many organizations, providing managers with the opportunity to track the social and environmental performance of HR policies. The adoption of such tools in the smart organizations is an indicator of the increased relevance of digital transformation in the realization of sustainable HR results.

Techniques and Analytics in AI-based Sustainable HRM Studies

The findings indicate that the latest research deploys the varying techniques of analysis to explore the connection between Artificial Intelligence, Sustainable Human Resource Management, and organizational sustainability. HR analytics, people analytics, and predictive modeling techniques are also the most popular methods of quantifying employee performance, turnover, and engagement. Qualitative methods are aimed at comprehending the perceptions, ethical issues, and organizational culture of the employees concerning the adoption of AI. The use of statistical analysis with machine learning methods is becoming rather widespread since it enables researchers to consider complex relationships between technological innovation and sustainability outcomes. Simulation models and decision support systems are also widely applied in many studies in order to assess the effectiveness of HR policies prior to their implementation. The approaches are very applicable in Industry 5.0 settings, where organizations are forced to strike a balance between efficiency and humanism. The findings show that the application of cutting edge analytical methods has had a great implication to the capability of organizations to develop HR strategies that facilitate performance and sustainability.

AI Usages in the Sustainable Human Resource Management

According to the literature, there are numerous key forms of applications of Artificial Intelligence to Sustainable HRM, namely recruitment, performance management, training, workforce planning, and monitoring employee well-being. In the hiring process, AI applications will compare candidate data to find the most suitable match and promote diversity and inclusion [2,68-70]. AI-based performance management systems have been applied in performance management to deliver ongoing feedback and objective assessments, which reduce bias during algorithmic decision making. Learning analytics and generative models assist in training applications, which are used to develop personalized development programs to ensure that the employees are flexible in the future of the working process. The workforce planning applications are predictive with predictive analytics to plan talent and manage it sustainably and the well-being monitoring system has behavioral analytics to identify stress and avoid burnout. These applications illustrate that efficiency improvement is not the sole potential of AI-driven HRM, which is also essential to long-term workforce stability and organizational sustainability.

Problems of Implementation of AI-driven Sustainable HRM

Although there is an increase in the use of Artificial Intelligence in HRM, its outcomes show that there are numerous challenges which restrict effective application of sustainable HR strategies. A potential risk of bias in algorithmic decision-making is one of the greatest issues as it can cause unfair recruiting or performance assessment without the proper design of AI systems [74-77]. Ethical issues surrounding AI, AI transparency, and data privacy are also prevalent and are usually reported especially when the data of employees is utilized to make predictions. The second issue is that HR professionals lack digital skills, and it is hard to take full advantage of advanced technologies like machine learning and people analytics. Resistance to change in the organization is also cited as one of the obstacles because employees can mistrust automated systems or be afraid of being sacked because of HR automation. Sustainability-wise, when overutilized, being overly technological without due control can compromise the well-being of the employee and decrease the long-term workforce stability. These results indicate the need to establish effective AI governance and training to facilitate conscientious AI usage in HRM.

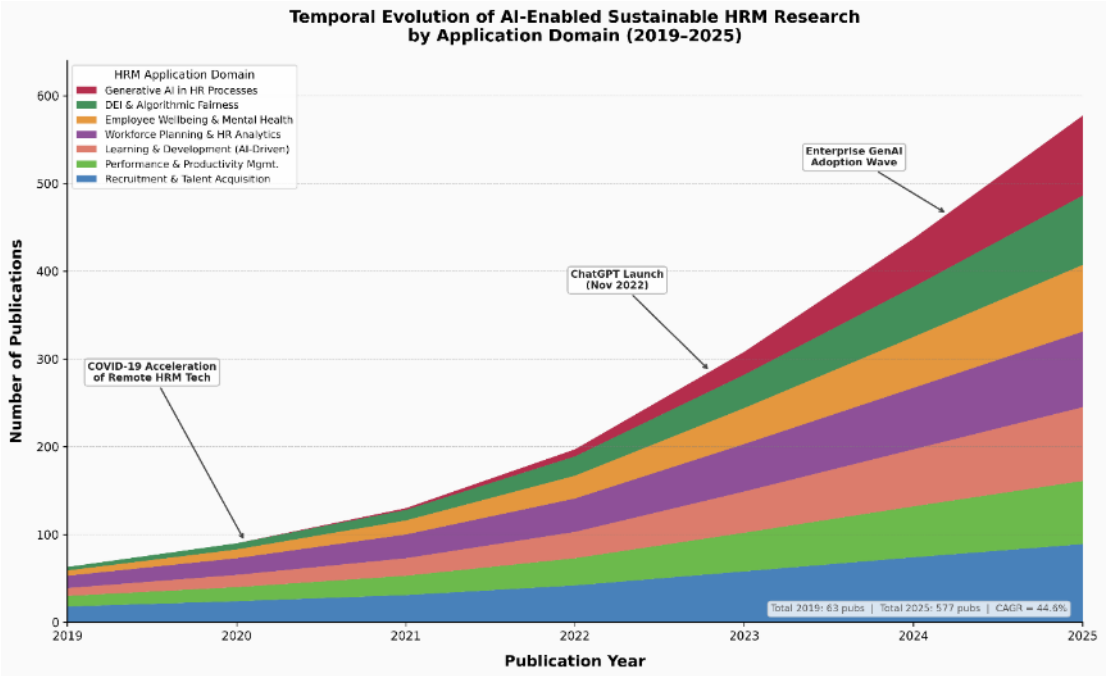

Fig. 4 Stacked Area Chart

This Fig. 4 is a visualisation stacks seven HRM domain publication streams. Total annual output grows from 63 publications in 2019 to 577 in 2025 (CAGR = 44.6%) [16,71-73]. Three key inflection events are annotated: the COVID-19 acceleration (2020) that spiked Remote HRM Tech interest; the ChatGPT launch (late 2022) that triggered a surge in the LLM/Generative AI stream (0 → 91 pubs); and the 2024 Enterprise GenAI Adoption Wave sustaining that growth. The Generative AI in HR Processes band (dark red) visually dominates post-2022 growth, making this the highest-citation-potential domain. DEI & Algorithmic Fairness shows consistent acceleration throughout, reflecting sustained scholarly interest in equitable AI deployment.

Portfolios of HRM Sustainable Innovation with AI

The findings show that the combination of Artificial Intelligence and Sustainable Human Resource Management opens up a lot of opportunities to innovation of HR practices. The AI technologies can help organizations to plan more flexible working setups, lifelong learning, and diverse workplaces that boost employee satisfaction and productivity [78-81]. The AI systems are applied in smart organizations to optimize resources distribution, minimize impact on ecology and assist with Green HRM strategies, i.e. paperless organization and virtual teamwork. Predictive analytics and talent analytics can also enable organizations to predict the needs of the workforce and prepare to meet future challenges to enhance long-term resilience. Moreover, AI-based decision support systems enable managers to assess the sustainability of the HR policy, to make sure it is aligned with the ESG goals and Sustainable Development Goals. Such opportunities indicate that AI can be an effective way of ensuring economic and social sustainability in the event of proper ethical and governance systems.

Influence of AI on Workforce sustainability and employee welfare

According to the literature, the effect of Artificial Intelligence on workforce sustainability is immense, especially when it comes to the aspects of employee well-being and engagement, as well as their career development. AI-based monitoring systems would be able to detect early signs of stress to preventive measures and ensure organizations had a healthy working environment. Individualized learning platforms also assist in the acquisition of new skills among employees, making them employable and job-satisfied. Simultaneously, the findings show that over-monitoring or poorly developed automation can bring stress and decrease trust, which proves the necessity of Responsible AI and ethical AI practices. Within Sustainable Human Resource Management, the idea is to leverage AI to assist

employees, not displace them to encourage human-AI cooperation and sustainable human resource. Companies that manage to balance automation and human-based management stand better chances of ensuring sustainable performance and retaining employee dedication in the future of work.

Sustainable HRM Policies, Regulations and AI Governance

Another factor that is noted in the review is the growing significance of policies and regulations that are used in leading the Artificial Intelligence application in Human Resource Management. Both governments and organizations are coming up with models that will see AI systems work fairly, transparently and in a responsible way [6,82-85]. These rules are based on data protection, fairness in algorithms, and ethical decisions, which are the increasing interest in the social impact of the AI technologies. In Sustainable Human Resource Management, it is necessary to adhere to the regulations to have the trust of the employees and stakeholders. Internal AI governing committees are being formed in many organizations to consider the ethical impact of HR technologies prior to their use. The findings indicate that innovative thinking is not suppressed by appropriate regulation, but will help in sustainable development by making sure that AI is applied in a responsible manner. The role of the governance and policy will be emerging as the source of organizational sustainability as AI increasingly becomes part of the HR processes.

What lies ahead: Artificial Intelligence and Sustainable HRM

The findings suggest that the further research and practice will be based on the creation of more integrated and human-oriented models of AI-based Sustainable Human Resource Management. New trends are generative AI, sophisticated decision support systems, and hybrid algorithms that combine several AI methods to develop adaptive HR platforms [86-88]. The Industry 5.0 concept will likely have a significant contribution as it is more focused on human and intelligent machines collaboration, not the complete automation. More likely, future HR systems will be able to combine workforce analytics with environmental and social indicators which will formulate comprehensive sustainability dashboards that will inform strategic decision-making. It is also believed that researchers will examine how AI can contribute to diversity, inclusion, and ethical leadership so that technological advancements can be used to achieve social responsibility. Trust in AI-based HR systems will be critical to develop the global standards of AI ethics, AI fairness, and Responsible AI. All in all, the future of Artificial Intelligence and Sustainable Human Resource Management consists of establishing intelligent, transparent, and human-centric systems supporting the long-term organizational success without jeopardizing the well-being of the staff and the society.

4. Discussion

The results of the given extensive literature review indicate that the adoption of Artificial Intelligence and Sustainable Human Resource Management is one of the most important processes in contemporary organizational studies as people are under the pressure to harmonize the digital transformation, ESG principles, and long-term organizational sustainability. In the recent research, it has been suggested that AI-inspired HRM can help organizations transition to proactive, data-driven, and sustainability-focused management systems by overcoming reactive and manual HR practices [2,35]. By adopting HR analytics, people analytics, and machine learning in HR, organizations will be able to anticipate trends in the workforce, optimize the use of talent, and formulate policies that could electrically sustain the workforce and offer employees improved health and well-being. This change is part of the larger move to smart organizations and Industry 5.0 in which human-centric values are paired with intelligent technologies to develop adaptable and resilient workplaces. The literature also demonstrates that the adoption of AI in the HR is intertwined with the attainment of the Sustainable Development Goals since smart systems can assist the organizations to minimize resource wastage, encourage diversity, and advance transparency in the decision-making process. Nevertheless, AI-based HR practices can be effective only when supported by powerful AI governance, professional ethics, and organizational preparedness since irresponsible automation can lead to loss of trust and social sustainability.

The other significant debate that has arisen as a result of the review is the transformation of conventional HR frameworks into HRM that uses data and advanced algorithms and digital platforms. Traditional HR approaches turn out to be subjective and time-intensive in decision-making, but AI-driven performance management, smart recruitment, and intelligent analytics allow objective and real-time analysis of workforce data. It has been shown that organizations that have adopted Digital HRM tools record increased efficiency, increased employee engagement and better sustainability results in comparison to those that have not adopted the tools. The combination of Green HRM and AI technologies also contributes to environmentally friendly operations through the minimization of paper consumption, optimization of traveling, and ability of working remotely. Simultaneously, the review notes that technological progress should be supported by Responsible AI and AI transparency to avoid the creation of algorithmic bias and provide the fairness of recruitment, promotion, and evaluation procedures. Such efficiency and ethics balance is seen as a way of establishing long term viability in building sustainable organizations that can ensure long term competitiveness in the future of work.

The discussion also indicates that the applications of Artificial Intelligence in Sustainable HRM can be applied in various HR areas, such as recruitment, training, performance management, workforce planning, and monitoring of employee well-being. During recruitment, AI systems compare data on candidates to find the most suitable candidate and facilitate diversity and inclusion initiatives. AI-based learning systems in training rely on learning analytics to create individual development plans that improve the adaptability of employees in fast-changing technological settings. AI-driven performance management systems are able to offer continuous feedback and enhance productivity, as well as decrease bias in algorithmic decision-making. The applications applied in workforce planning predict skills gaps and plan talent strategies in the long run with the help of predictive analytics, and monitor well-being with the help of behavioral analytics to identify stress and enhance work-life balance. These applications prove that AI implementation in HRM is not only operational efficiency but also a key factor in ensuring that the organization is sustainable, employing its staff is gratifying, and socially responsible.

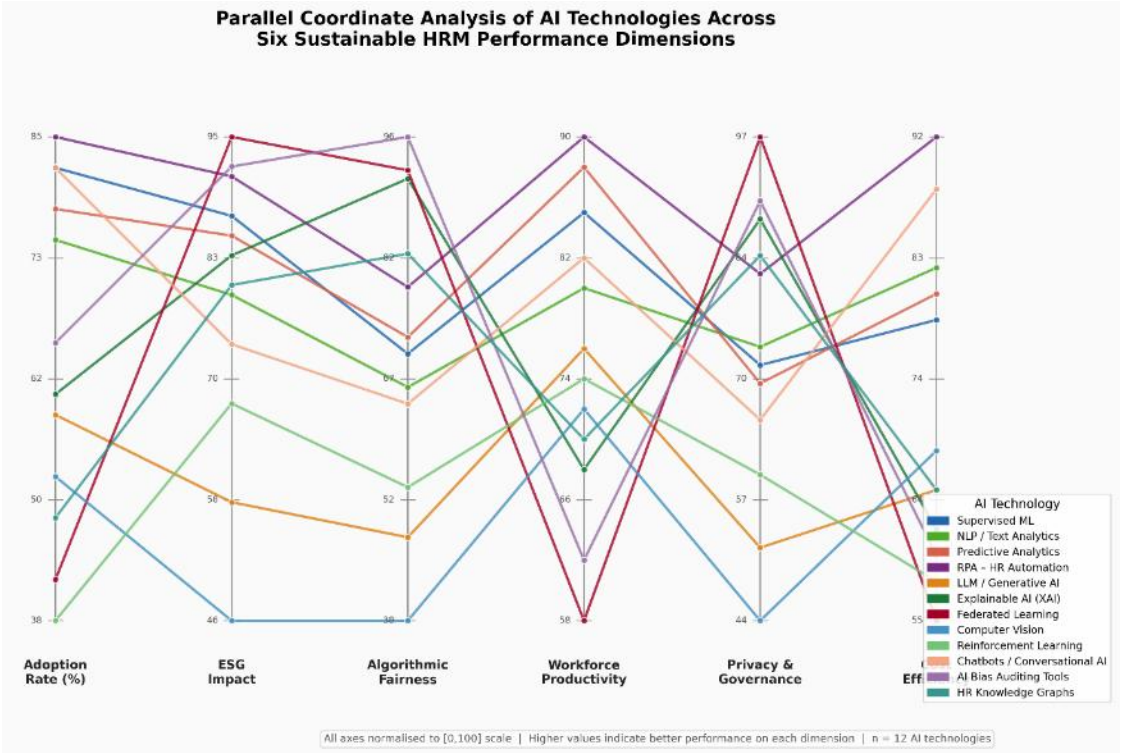

Fig. 5 Parallel Coordinates Plot

Fig. 5 shows Twelve AI technologies are each represented as a polyline threading through six normalised performance axes: Adoption Rate, ESG Impact, Algorithmic Fairness, Workforce Productivity, Privacy & Governance, and Cost Efficiency. RPA traces the highest overall profile (especially Cost Efficiency

= 92, Productivity = 90, ESG = 91). Federated Learning scores highest on Privacy (97) and Algorithmic Fairness (92) but trails on Adoption (42) and Cost Efficiency (55), highlighting an important technology-readiness gap. Computer Vision shows the weakest fairness and privacy profile (38, 44), reinforcing governance concerns.

Table 2. Comparison of Challenges, Opportunities, and Future Directions

Sr. No.	Aspect	Challenge	Opportunity	Future Direction
1	AI adoption	Skill gap	Training	AI literacy
2	Ethics	Bias	Fair AI	Governance
3	Data	Privacy	Insights	Secure data
4	Automation	Job fear	Efficiency	Reskilling
5	ESG	Integration	Sustainability	ESG HRM
6	HR analytics	Complexity	Accuracy	Smart analytics
7	Learning	Cost	Personalization	AI learning
8	Performance	Trust	Objectivity	Explainable AI
9	Recruitment	Bias	Speed	Fair hiring
10	Well-being	Monitoring risk	Health support	Ethical analytics
11	Remote work	Control issue	Flexibility	Hybrid AI
12	Leadership	Resistance	Insight	AI leadership
13	Governance	Regulation gap	Trust	Global policy
14	Industry 5.0	Skill need	Collaboration	Human-AI
15	Smart org	Integration	Innovation	Hybrid systems
16	Sustainability	Cost	Long-term value	Green HRM
17	Culture	Resistance	Adaptation	Change mgmt
18	Decision	Over-reliance	Accuracy	Human oversight
19	Future work	Uncertainty	Flexibility	Adaptive HR
20	AI HRM	Ethics risk	Efficiency	Responsible AI
21	Talent mgmt	Data bias	Prediction	Transparent AI
22	ESG HR	Measurement	Reporting	AI dashboards
23	HR digitalization	Security	Speed	Secure cloud
24	Innovation	Complexity	Growth	AI strategy
25	Workforce	Burnout	Balance	Well-being AI

Even with these advantages, the review cites some challenges that prevent the successful application of Artificial Intelligence in Sustainable Human Resource Management. Among the most common cases, there is the risk of bias in the automated decision-making that can be caused by the training of algorithms on either incomplete or unbalanced data [9,15]. The idea of privacy, transparency, and accountability is also a matter of concern that has been repeatedly reported in literature especially when employee information is utilized to predict. The second significant issue is that not all HR professionals have digital skills, and it is challenging to utilize advanced technologies, including people analytics and machine learning, to the full extent. Resistance to change is also a factor in the organization since workers are likely to lose their jobs with the introduction of automation or not trust the decisions made by AI. In terms of sustainability, overreliance on technology that lacks the appropriate governance can lower the well-being of employees and undermine the culture of a given organization. These results indicate that the effective deployment of AI-based HRM is possible only with the help of technology investment, as well as training, ethical principles, and the will of the leadership.

Another aspect that the review points to is the increasing significance of AI governance, regulations, and ethical principles in the context of steering the application of AI in HRM. There is a growing trend by governments and other organizations in coming up with policies that help make sure that AI systems are fair, transparent and accountable. These guidelines aim at data, algorithmic, and ethical use and application of information about employees, and correspond to the larger issue concerning the social cost of digital technologies. Under Sustainable Human Resource Management, ethical behavior has to be observed to ensure trust is persisted with. To make sure that AI systems do not conflict with ESG and sustainability, many organizations are developing internal governance systems to assess the effects of these systems before implementation. According to the literature, the appropriate regulation will not

restrain innovation but will promote the long-term development by making AI technologies aid social and environmental responsibility.

The second theme that is essential in the discussion is the potential of human-AI cooperation in the creation of the next generation HR systems. Although automation enhances efficiency, the literature highlights that human judgment is still necessary in making ethical decisions, creativity and leadership. Industry 5.0 is the idea that emphasizes the necessity of the relationship between humans and intelligent machines instead of complete automation. AI systems in this model give information-based suggestions to decisions, and the human resources can make decisions based on their expertise and emotional intelligence. This strategy will facilitate the sustainability of the work force since employees are not substituted by technology but will be proactively engaged in the activities of the organization. The creation of AI-based leadership and decision support systems will likely be a central figure in this move, as they will assist companies to strike the right balance between technological advancements and human values.

The research directions that may be proposed in the future based on the identified literature involve the creation of the integrated frameworks that would enable combining Artificial Intelligence, Sustainable Human Resource Management, and the organizational performance in dynamic and uncertain environments. The new topics are generative AI in HRM, sustainability dashboards, workforce analytics based on ESG, and hybrid decision support systems. The researchers are also to investigate the application of AI in achieving diversity, inclusion, and ethical leadership so that technological advancements can be used to facilitate social responsibility. The HR-environmental and social indicators integration will allow organizations to assess the effect of HR policy on sustainability instantly. Moreover, the interdisciplinary study of management science, artificial intelligence, and sustainability research will yield the new AI-driven Sustainable HRM models that have a high potential of being cited in the future.

5. Conclusion

The following systematic literature review based on the PRISMA 2020 model is a synthesis of the literature on the topic of Artificial Intelligence and Sustainable Human Resource Management, which is redefining the future of the digital-era workforce, through the convergence of AI-driven HRM and Green HRM with organizational sustainability. The results prove that the convergence of Artificial Intelligence, HR analytics, and digital HRM systems has been influential in changing the conventional functions of the human resource so that the organizations can shift towards the use of data-driven, transparent, and sustainability-focused decisions. Machine learning in HR, predictive analytics, intelligent recruitment, and automation in HR processes are not only helping to enhance efficiency but also assisting more comprehensive sustainability goals by efficiently using resources, cutting down on administrative waste, and improving the well-being of employees. It is always demonstrated that organizations that have implemented AI-enabled Sustainable Human Resource Management fare in a better position to realize the long-term competitiveness, workforce flexibility, and alignment with Sustainable Development Goals, especially when it comes to social responsibility, environmental consciousness, and ethical governance.

The other critical finding that comes out after reading the review is that Sustainable HRM enabled by Artificial Intelligence may help in the creation of sustainable workforce models that are characterized by lifelong learning, personalized career development, and increased employee engagement. With the emergence of people analytics, talent analytics, and AI-enhanced performance management systems, the organizations will be able to have a deeper understanding of how their employees behave, anticipate whether they will need more or less workforce, and develop sustainable talent strategies that would balance productivity and employee welfare. Simultaneously, the literature underlines that the shift towards smart organizations and Industry 5.0 surrounding presupposes the change in technology-focused approaches of HR practices to human-AI relations, in which intelligent systems will assist but not override human decision-making. This anthropocentric approach is necessary to question that AI

implementation in the HRM will adhere to fairness, inclusiveness, and sustainability of the organization in the long run.

The review also establishes the key challenges that should be tabled to make sure thatArtificial Intelligence is implemented responsibly in Sustainable Human Resource Management. Throughout all the literature, the issue of algorithmic decision-making, AI ethics, data privacy, and AI governance seem to emerge consistently, which means that, unless the ethical aspects of technological development are controlled, it could negatively affect the sustainability objectives. Biased hiring through automated recruitment, physical non-transparency in AI-driven analysis, and unequal access to digital competencies can introduce various new types of inequalities in organizations. Thus, responsible AI, ethical AI models, and robust governance systems should be included in HR strategies in the future to make sure that technological innovations would help the workforce to be sustainable instead of causing unintentional social or organizational threats. In this respect, the combination of ESG principles, responsible innovation, and sustainable leadership will be necessary to gain trust in AI-enhanced HR systems.

The results also imply that the upcoming literature needs to go beyond the single applications of technology and concentrate on more holistic frameworks that can relate Artificial Intelligence, Sustainable HRM, and organizational performance in dynamic and uncertain environments. New areas of research, including AI-assisted ESG management, digital sustainability approaches, AI-enhanced employee well-being metrics, and human-centered Industry 5.0 HR frameworks have good prospects of further scholarly research with high citation rates. More empirical research on the long-term effects of adoption of AI on sustainable organizations is also needed, especially in developing economies, institutions in the public sector, and knowledge-based industries in which sustainability issues are compound and multidimensional. Also, interdisciplinary studies and research that involve management science, artificial intelligence, sustainability research, and organizational psychology will be crucial in generating holistic theories of AI-enabled Sustainable Human Resource Management.

Conflict of interest

The authors declare no conflicts of interest.

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