

REINVITING HUMAN RESOURCE MANAGEMENT IN THE AGE OF ARTIFICIAL INTELLIGENCE

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ABSTRACT

This study conducts a systematic literature review and bibliometric analysis to map the intellectual structure and thematic evolution of Artificial Intelligence (AI) and Machine Learning (ML) in Human Resource Management (HRM), with a focus on sustainability implications in business. Using PRISMA 2020, 62 articles were selected from Scopus-indexed publications. Bibliometric analysis via VOS viewer reveals three dominant thematic clusters: technical foundations of AI/ML, HRM-oriented applications, and data-driven decision-support systems. Key findings identify India, China, Malaysia, and the United States as leading contributors, with strong South–South collaborations especially between India and Malaysia highlighting emerging innovation pathways in plural economies. The results demonstrate that AI–HRM synergy significantly enhances business sustainability by enabling data-driven strategic decisions, optimizing resource allocation, and supporting personalized and inclusive HR practices. However, ethical risks such as algorithmic bias pose challenges to sustainable implementation. The study recommends transparent AI governance, regular algorithmic audits, and Human-in-the-Loop (HITL) protocols to ensure that AI integration strengthens rather than undermines human-centric and sustainable HRM. These insights provide a foundation for policymakers and organizations pursuing responsible digital transformation in dynamic regions such as Southeast Asia.

Keywords: *Artificial Intelligence; Bibliometric Analysis; Human Resource Management; Machine Learning; Systematic Literature Review.*

INTRODUCTION

The Fourth Industrial Revolution and the accelerating pace of digital transformation have brought significant disruptions to human resource management (HRM) practices worldwide. The integration of artificial intelligence (AI) and machine learning (ML) into HRM has introduced a transformative paradigm, enabling organizations to optimize talent management processes with unprecedented precision (Strohmeier & Piazza, 2013). In the Southeast Asian region, these technological changes intersect with complex socio-economic realities, requiring organizations to balance efficiency with long-term sustainability an issue reflected in the broader discourse on “Plural Economies and the Politics of

Value: Rethinking Business and Sustainability in Southeast Asia.”

Recent advancements indicate that AI and ML have evolved from optional tools to strategic imperatives in modern HRM. Their adoption spans multiple HR functions, including algorithmic recruitment, predictive turnover analytics, career development recommendations, and personalized training systems (Tambe et al., 2019). Despite these benefits, the deployment of AI-based systems introduces new challenges, particularly concerning algorithmic bias, transparency in automated decision-making, and ethical implications in predictive analytics (Bodie et al., 2017). These complexities highlight the need for a deeper and more structured understanding of how AI and ML are being applied within HRM across different contexts.



Figure 1: Artificial Intelligence and Machine Learning in Human Resource Management

Source: (Tambe et al., 2019)

Although scholarly interest in AI–HRM integration has grown rapidly, existing literature remains fragmented. Many prior studies lack comprehensive mapping of thematic evolution, methodological rigor, or insights into global research collaboration. Reviews such as Votto et al., (2021) and Minbaeva & Vardi, (2023) provide valuable contributions but remain limited in scope, failing to incorporate bibliometric visualization or to capture emerging collaboration patterns within Southeast Asia. Furthermore, the connection between AI-driven HRM research and sustainability indicators has been largely overlooked, despite its increasing relevance for organizations pursuing responsible and inclusive digital transformation.

These gaps underscore the urgency of conducting a systematic investigation that not only synthesizes existing research but also identifies dominant themes, collaborative structures, and future research trajectories. Accordingly, this study aims to: (1) identify publication trends and geographical distributions of AI and ML research in HRM; (2) analyse collaboration networks and conceptual structures through

co-occurrence keyword mapping; and (3) map the evolution of research themes and highlight unresolved gaps, particularly concerning sustainability in Southeast Asia.

Recent developments in next generation AI technologies such as deep learning and natural language processing (NLP) further reinforce the significance of this inquiry, as these innovations enable advanced HRM functions including sentiment analysis and real-time skill gap identification (Minbaeva & Vardi, 2023). In the context of Southeast Asia’s dynamic labour markets and increasing global competition, understanding these technological shifts becomes essential. This study seeks to provide a solid empirical foundation for scholars, practitioners, and policymakers, offering insights that can inform future innovations, strategic HRM practices, and regulatory frameworks for sustainable digital transformation.

Previous studies have consistently highlighted that AI significantly transforms HRM by automating administrative tasks and enhancing analytical capabilities. For instance, research by Tambe et al., (2019) indicates that AI-driven tools improve recruitment efficiency and employee

engagement through data driven personalized experiences. Furthermore, the shift toward human-machine transformation is evidenced by the evolving roles of HR professionals, who are moving from transactional tasks to strategic decision-making roles facilitated by AI insights. This evolution underscores a paradigm shift where machines handle data-heavy processes, allowing humans to focus on high-value emotional intelligence and complex problem solving.

MATERIALS AND METHODS

This study employs a systematic literature review (SLR) approach guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) framework to ensure methodological transparency, reproducibility, and rigor (Page et al., 2021). The PRISMA protocol was selected due to its recognized effectiveness in minimizing selection bias and providing a structured reporting mechanism for literature reviews in emerging interdisciplinary fields such as AI-driven HRM

Data Source and Search Strategy

The data collection was exclusively conducted using the **Scopus database**, chosen for its comprehensive coverage of over 25,000 peer-reviewed journals and its provision of complete bibliometric metadata required for network and trend analysis (Baas et al., 2020). Scopus is widely regarded as a leading citation database in social sciences, engineering, and management studies, ensuring the inclusion of high-impact and methodologically sound publications.

A systematic search was performed on October 24, 2025, using the following Boolean query applied to the Title, Abstract, and Keywords (TITLE-ABS-KEY) fields: ("human resource management" AND "artificial intelligence" AND "machine learning"). No temporal restrictions were applied to capture the full evolution of the research domain from its inception. An open-access filter was

activated to enhance the practical accessibility of the findings for HR practitioners, policymakers, and researchers in resource-limited settings.

Study Selection Process

The study selection protocol was defined using the PICOS framework (Population, Intervention, Comparison, Outcomes, Study design) as follows:

1. Population: Studies focusing on Human Resource Management (HRM) processes or functions.
2. Intervention: Application or integration of Artificial Intelligence (AI) and/or Machine Learning (ML) technologies.
3. Comparison: Not applicable (review focuses on mapping research trends).
4. Outcomes: Thematic patterns, collaboration networks, and sustainability implications.
5. Study design: Peer-reviewed journal articles, conference proceedings, and review articles.

Inclusion criteria comprised:

1. English language publications.
2. Explicit linkage between AI/ML and HRM domains.
3. Peer-reviewed academic journals or conference proceedings.
4. Availability of full text in open-access or institutional repositories.

Exclusion criteria included:

1. Non primary literature (editorials, books, theses).
2. Non-English publications.
3. Restricted access articles where full text was unavailable.
4. Studies with no clear AI/ML–HRM thematic connection.

PRISMA Flow Diagram and Screening Rigor

The PRISMA 2020 flow diagram (Figure 2) outlines the four-phase screening process:

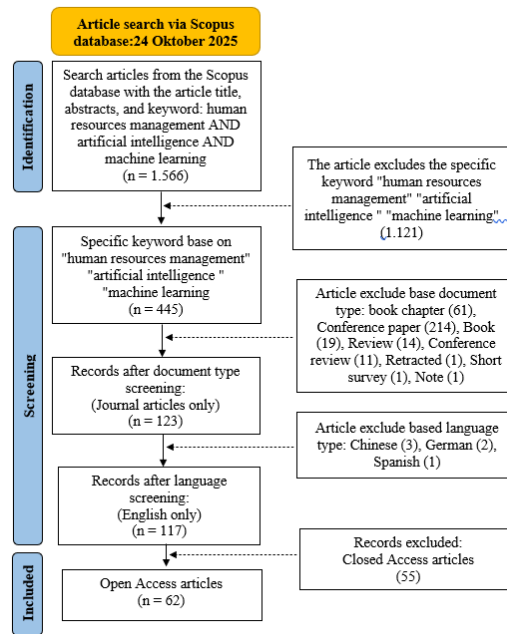


Figure 2. Systematic Literatur Reviews Information Flow Using PRISMA

Source: Processed Data, 2025

1. Identification: 1,566 records were retrieved from Scopus.
2. Screening: 1,121 records were excluded based on title/abstract relevance.
3. Eligibility: Full text assessment of 445 records led to the exclusion of 383 records (321 due to document type, 6 due to language, 56 due to accessibility).
4. Inclusion: 62 studies met all eligibility criteria and were retained for final analysis.

To ensure reliability, two independent researchers conducted the screening and data extraction processes. Inter-rater agreement was measured using Cohen's $\kappa = 0.89$, indicating a high level of consistency (McHugh, 2012). Discrepancies were resolved through discussion and, when necessary, consultation with a third reviewer.

Data Extraction and Quality Assessment

A standardized data extraction form was used to capture:

1. Bibliographic details (authors, year, journal, citations).
2. Methodological characteristics (research design, AI/ML techniques).

3. Thematic focus and key findings.
4. Bibliometric indicators (keywords, affiliations, country data).

The methodological quality of included studies was evaluated using the Mixed Methods Appraisal Tool (MMAT v.2018), which allows for the appraisal of qualitative, quantitative, and mixed-methods research (Hong et al., 2018). Studies were classified as high, medium, or low quality, but none were excluded solely on quality scores to maintain a comprehensive mapping of the research landscape.

Analytical Techniques

The analysis integrated bibliometric, thematic, and descriptive statistical methods:

1. Bibliometric Analysis with VOS viewer (v.1.6.20):
 - a. Keyword co-occurrence mapping to identify conceptual clusters (van Eck & Waltman, 2010).
 - b. Country collaboration network visualization.
 - c. Thematic evolution and density analysis.

2. Thematic Content Analysis:
 - a. Inductive and deductive coding of research themes.
 - b. Triangulation between bibliometric clusters and qualitative insights.
3. Descriptive Statistical Analysis:
 - a. Publication trends by year, country, and journal.
 - b. Citation metrics and source impact analysis.

Synthesis and Validation

A convergent segregation approach was employed to integrate quantitative bibliometric findings with qualitative thematic insights. Methodological rigor was further strengthened through:

1. Methodological triangulation (multiple analytical techniques).
2. Researcher triangulation (independent screening and analysis).
3. Peer debriefing with HRM and AI experts.
4. Maintenance of an audit trail documenting all methodological decisions.

Publication Trends By Years

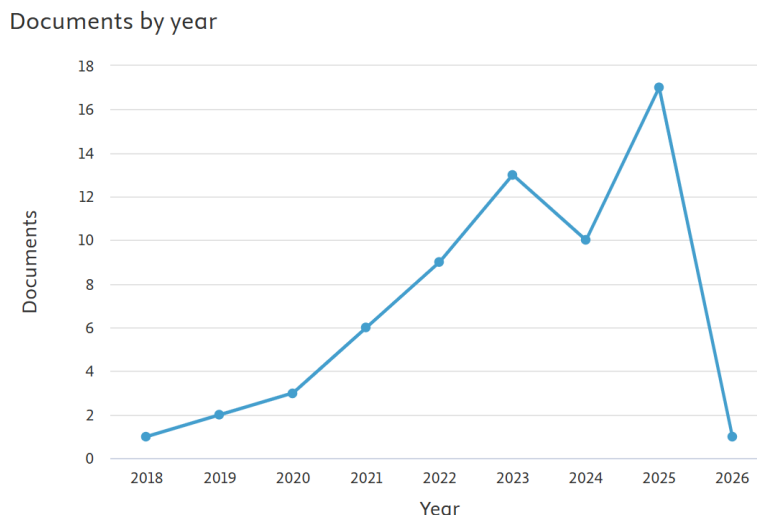


Figure 3. Documents by Year
Source: Scopus Database (2025)

Publication trends in the field of Human Resource Management (HRM) and its integration with Artificial Intelligence (AI) and Machine Learning (ML) from 2018 to

5. Researcher reflexivity to acknowledge and mitigate potential biases.

This rigorous and transparent methodological design ensures that the 62 selected studies represent the most relevant, credible, and impactful contributions to the AI–HRM research domain, providing a solid foundation for mapping trends, identifying gaps, and offering evidence-based recommendations for sustainable HRM digitalization.

RESULTS AND DISCUSSION

1. Research Result

Bibliometric analysis was performed on 62 scientific articles retrieved from the Scopus database covering the period from 2015 to 2025. Using VOS viewer software (version 1.6.20), bibliometric mapping generated several key findings that illustrate prevailing research trends, the geographical distribution of publications, and the dominant thematic and keyword foci within the field.

2025 demonstrate a clear pattern of significant growth. As illustrated in Figure 2, the number of publications has shown a consistent year-on-year increase. In 2018,

only one article was published, rising to three in 2020. This upward trajectory continued, with nine publications recorded in 2022 and a marked increase to thirteen in 2023. The highest level of research productivity was observed in 2025, with seventeen publications (Al-Qassem et al., 2025; Alqudah et al., 2025; Benabou & Touhami, 2025; Berriche & Loulizi, 2025; Burachynskiy & Shantyr, 2025; Campion, 2025; Dayan-Akman et al., 2025; Hatami et al., 2025; Madanchian & Taherdoost, 2025; Maghsoudi et al., 2025; Nishanthi et al., 2025; Priatna et al., 2025; Rahman et al., 2025; Ramasamy et al., 2025; Sakka, 2025; Vaiyapuri & Sbaï, 2025; Wang et al., 2025),

while data for 2024 indicated ten publications, suggesting ongoing momentum leading to the subsequent peak. This exponential growth pattern reflects the increasing scholarly and practical interest in the convergence of AI and ML technologies within HRM practices. Moreover, it signifies the maturation of this interdisciplinary research domain as a critical area of inquiry aligned with the evolution of digital industries.

Publication Trends By Geographic

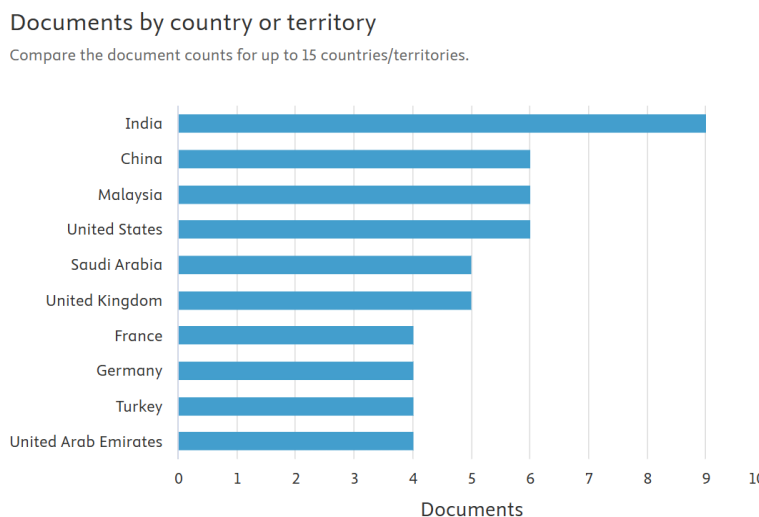


Figure 4. Documents by Country or Territory
Source: Scopus Database (2025)

The geographical distribution of publications (Figure 4) indicates that India serves as the leading contributor with nine publications (14.5%), followed by China, Malaysia, and the United States, each with six publications (9.7%). Notably, the

substantial contributions from Malaysia (six publications) highlight the dynamic advancement of the digital economy within the Southeast Asian region, aligning closely with the overarching theme of this conference.

Publication Trends by Journal Source

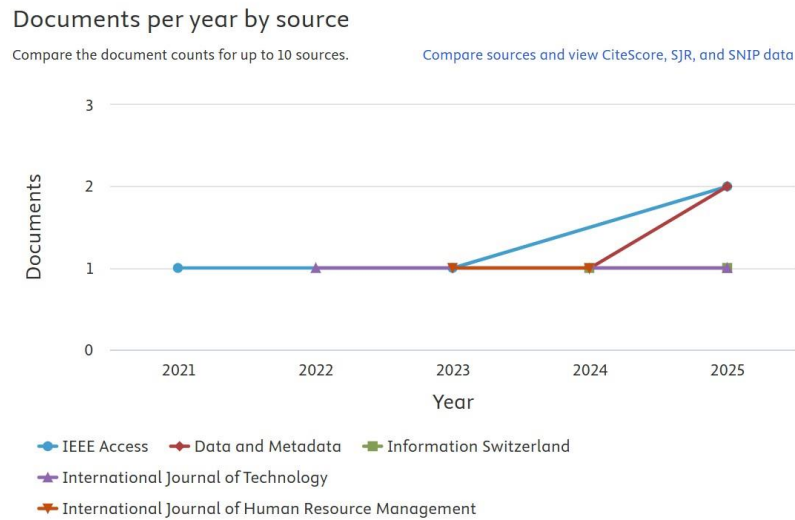


Figure 5. Documents per Year by Source
Source: Scopus Database (2025)

The analysis of publication distribution by source indicates that IEEE Access occupies the leading position as the most productive journal, contributing four publications. The second position is held by Data and Metadata, with three publications. Several reputable journals each contributed two publications, including Information Switzerland, the International Journal of Human Resource Management, and the International Journal of Technology. This distribution pattern underscores the interdisciplinary nature of the research domain, with publications dispersed across both technology-oriented outlets such as IEEE Access and Information Switzerland and management-focused journals such as the International Journal of Human Resource Management. The diversity of publication sources further reflects the convergence of technical innovation and

managerial application in the integration of artificial intelligence and machine learning within human resource management practices.

Country Collaboration Network Analysis

The visualization of international collaboration networks generated using VOS viewer (Figure 5) reveals three major clusters of research collaboration. The first cluster is led by India, which demonstrates strong collaborative linkages with Malaysia and the United Arab Emirates. The second cluster is centered on China, with the United States and the United Kingdom serving as its principal research partners. The third cluster is led by Germany, exhibiting a robust collaboration network with France and Turkey.

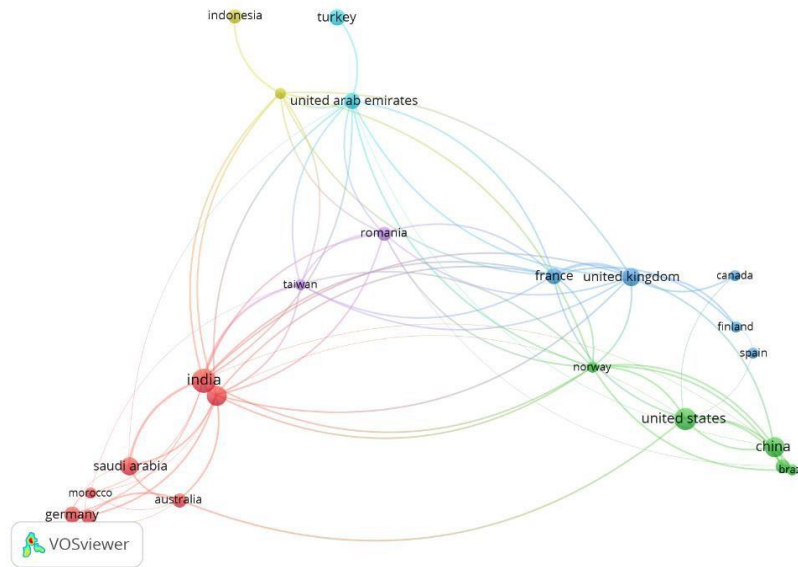


Figure 6. Network country visualization
 Source: Output Vos viewer Software

The strongest collaborative linkage was observed between India and Malaysia, with a total link strength of 8, followed by China and the United States with a strength of 6, and Germany and France with a strength of 5. This pattern of collaboration underscores the presence of both regional and international strategic partnerships that play a pivotal role in advancing research development within this field.

Keyword Co-occurrence Analysis

The co-occurrence analysis of the 20 most frequently appearing keywords (Table 1) revealed a complex and interconnected conceptual structure. “Machine learning” emerged as the central term, appearing 17 times with a total link strength of 45, followed by “human resource management” with 15 occurrences and a strength of 38, and “learning systems” with 11 occurrences and a strength of 32

Table 1. Keyword with the Highest Frequency

No	Keyword	Occurrences	Total link strength
1	machie-learning	17	162
2	learning systems	11	111
3	human resources management	15	104
4	information management	10	97
5	resource allocation	8	76
6	decision making	7	72
7	personnel training	5	57
8	project management	5	52
9	employment	4	51
10	big daya	5	50
11	predictive analytics	6	46
12	data analytics	3	43
13	forecasting	5	43
14	natural resources management	3	40
15	risk management	5	40
16	decisions makings	5	39
17	decisions trees	3	35
18	learning algorithms	4	33
19	decisions support systems	2	30
20	adaptive boosting	2	29

The keyword network visualization (Figure 7) forms three main interconnected clusters:

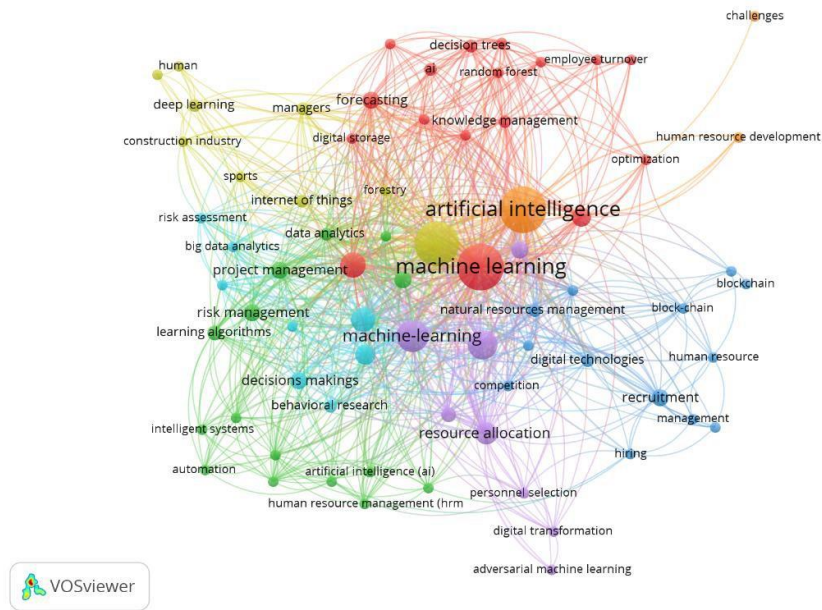


Figure 7. Co-occurrence framework and representation of key terms

Source: Output Vos viewer Software

- The red cluster focuses on the technical dimensions of the field, characterized by core keywords such as “machine learning,” “learning systems,” “learning algorithms,” and “adaptive boosting.”
- The green cluster emphasizes applications within the domain of human resource management, featuring keywords including “human resource management,” “personnel training,” “employment,” and “project management.”
- The blue cluster is associated with data analytics and decision-making processes, represented by keywords such as “decision making,” “predictive analytics,” “big data,” “data analytics,” and “forecasting.”

Overlay and Density Analysis

The temporal overlay analysis illustrates the progressive evolution of research themes over time. Keywords such as “machine learning” and “human resource management” emerged as foundational topics in the early stages of

research, while terms like “predictive analytics,” “big data,” and “adaptive boosting” represent more recent developments that are gaining increasing prominence in the academic literature.

The density visualization further distinguishes between mature and emerging areas of inquiry. High-density regions are concentrated around “machine learning” and “human resource management,” indicating well-established research domains, whereas lower-density areas such as “natural resource management” and “decision support systems” suggest promising directions for future exploration and theoretical advancement.

2. Discussion

The analysis reveals that human-machine synergies within human resource management signify a paradigm shift that extends beyond the simple adoption of technology. The pronounced pattern of South-South collaboration, particularly between India and Malaysia, highlights the emergence of distinctive innovation trajectories in developing economies that diverge fundamentally from traditional Western models. These findings hold important theoretical implications, as they

challenge the presumed universality of existing HRM frameworks and underscore the need for context-sensitive approaches that account for regional, cultural, and developmental variations in the integration of artificial intelligence and machine learning within HRM practices.

Global Collaboration Patterns in Research

The finding of India's dominance in research contributions aligns with the World Bank, (2023) report highlighting the country's substantial investment in digital technologies. Notably, the strength of the India and Malaysia collaboration surpasses that of more traditional partnerships, such as with the United States. This pattern can be attributed to the "Digital India" initiative and the intensification of academic exchanges within the ASEAN region (Minbaeva & Vardi, 2023).

Meanwhile, the continued strength of the China–United States collaboration despite prevailing geopolitical tensions corroborates the observations of Zhao et al., (2022), who found that research in artificial intelligence often transcends political boundaries, driven by the necessity for complementary expertise and shared technological resources.

Conceptual Evolution and Research Fronts

The three-cluster structure identified in the keyword analysis validates and extends the theoretical framework proposed by Tambe et al., (2019). The findings demonstrate that predictive analytics has evolved into a pivotal bridge linking technological innovation with human capital management applications an aspect that has received limited attention in prior research.

Furthermore, the emergence of adaptive boosting as a recent focal term within the technical cluster substantiates Strohmeier, (2020) argument regarding the transition from generic artificial intelligence approaches toward algorithms specifically tailored to the human capital management context

Implications for Business Sustainability in Southeast Asia

In the context of plural economies and sustainability within Southeast Asia, the findings of this study provide important practical implications. The integration of predictive analytics with personnel training as evidenced by the strong linkage between these two keywords has the potential to facilitate the development of more personalized and sustainable training programs, minimize resource inefficiencies, and enhance the overall effectiveness of human resource investments.

However, the relatively low research density connecting artificial intelligence and human resource management with natural resources management reveals a critical research gap, particularly concerning sustainability dimensions.

Limitations and Future Research Directions

The main limitation of this study lies in the exclusivity of the Scopus database and the focus on open-access articles. However, the strength of the PRISMA methodology and the comprehensive bibliometric analysis provide a solid foundation for mapping the research landscape.

Based on these findings, three future research directions are recommended:

1. Exploration of the integration between artificial intelligence–human resource management and sustainability metrics.
2. Development of an ethical framework for the application of artificial intelligence in human resource management within the context of Southeast Asia. This framework should include regular algorithmic audits and the use of 'de-biasing' techniques to ensure that AI systems do not replicate historical human prejudices. Recommendations include implementing 'Human-in-the-loop' (HITL) protocols, where human oversight remains mandatory in

final HR decision-making to balance algorithmic efficiency with ethical fairness.

3. Comparative studies on the effectiveness of various machine learning algorithms for specific HRM functions.

CONCLUSION AND IMPLICATIONS

This research contributes to theory by proposing an integrated human-machine synergy framework that accounts for the distinctive socio-technical dynamics of developing economies, while simultaneously providing a comprehensive mapping of the knowledge development landscape concerning the integration of artificial intelligence and machine learning into human resource management. The findings identify three fundamental pillars underpinning the knowledge structure in this domain: technological aspects, practical applications, and decision-support systems, each interconnected through the use of predictive analytics. The novelty of this research lies in its identification of global collaboration patterns that reveal strategic partnerships between developed and developing countries, particularly in the Southeast Asian context, which have received limited attention in prior literature reviews. From a scientific standpoint, this research offers an original contribution by mapping the evolution of research themes, highlighting a transition from general approaches toward the development of context-specific algorithms designed to address HRM needs.

The findings open avenues for developing digital human resource management theories that are more adaptive to local characteristics and industry specific requirements, with consistent patterns of knowledge

development observed across various geographical regions. The implications of this study extend across social and cultural aspects where AI and ML integration may foster more inclusive recruitment practices and personalized training systems; economic aspects where operational efficiency, optimized resource allocation, and enhanced decision-making support organizational competitiveness; policy and legal aspects where regulatory frameworks must balance innovation with data privacy, fairness, and ethical use of AI; and environmental aspects where AI-enabled HRM optimization can support sustainable business practices, reduce resource inefficiencies, and advance green HRM initiatives. Overall, this research underscores the need for a transdisciplinary approach integrating technological, managerial, and socio-humanities perspectives, alongside strong collaboration among academics, industry practitioners, and policymakers to ensure that technological innovations in HRM produce inclusive and sustainable benefits for all stakeholders.

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