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Integrating Artificial Intelligence in Human Resources Management: A Bibliometric Analysis of Emerging Trends and Influences

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***Abstract*—This study aims to analyze the integration of Artificial Intelligence (AI) in the field of Human Resource Management (HRM) from 2004 to 2024. By measuring productivity, impact, collaboration and research topics, this research tracks the development of the domain. These findings may provide a foundation for future research on the growth of AI-focused HRM research, lead authors, institutions, and emerging themes. Using the Scopus database, 381 relevant documents were identified and analyzed, showing an increase in publications year on year, with significant growth between 2020 and 2023. This shows the transformative impact of AI on HRM. This analysis reveals rapid growth and international collaboration in AI-enabled HRM research, demonstrating significant potential. Future research could explore specific applications of AI, ethical considerations, and long-term impacts on HRM practices.**

***Index Terms*—Artificial intelligence, human resource management, machine learning, bibliometric analysis.**

I. Introduction

Bibliometrics Analysis provides a way of quantitatively studying research trends of certain fields [1], [2], [3]. This allows researchers to find out the new areas, influential authors, and productive collaborations [3]. Artificial Intelligence (AI) refers to computer systems or machines acting as human beings that simulate its intelligent processes like those of the human mind [4]. This includes learning, which involves collecting information and rules for using the same information, reasoning through rules to get near or definite conclusions and self-correction [5]. A wide range of applications utilize AI which include; virtual assistants, autonomous vehicles, predictive analytics, and including Human Resource [6].

In the perspective of human resource management, Artificial Intelligence is used for recruiting, orienting, and evaluating others' contributions to HR [7], [8]. Even though there exist numerous studies investigating how AI is applied in HR practices no systematic bibliometric analysis has been conducted yet.

Most of the current studies focus on specific AI applications within human resource management thus missing out on broader research trends and influences.

To address this gap, this study aims to map the intellectual landscape of AI-integrated HRM research, identify emerging trends, reveal collaboration networks, and highlight research gaps. By employing a bibliometric analysis of scholarly articles, we will analyze publication and citation patterns to understand the key themes, trends, and influential authors in the field [9].

Bibliometric analysis is a suitable method for this research as it provides a quantitative and qualitative approach to understanding the intellectual structure of a research field. By analyzing publication and citation data, we can identify key trends, influential authors, and emerging research areas. This method allows us to systematically map the knowledge domain and uncover hidden patterns that may not be apparent through traditional literature reviews [10].

This study is expected to contribute to the field of AI-HRM research by providing a comprehensive overview of the current state-of-the-art, identifying emerging trends and future research directions, highlighting the most influential authors and institutions, revealing collaboration networks and geographical trends, and uncovering potential research gaps and opportunities. By addressing these research objectives, this study will provide valuable insights for researchers, practitioners, and policymakers to understand the potential of AI in transforming the field of Human Resource Management.

II. Research Method

A. Data Source

The Scopus database was selected as the primary data source for this bibliometric analysis due to its accessibility to the author. As the sole database readily available to the researcher, Scopus provided a comprehensive and up-to-date collection of scholarly literature, particularly in the

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interdisciplinary field of AI-HRM. Its robust search capabilities, consistent indexing, and data quality make it a suitable platform for conducting large-scale bibliometric studies.

B. Data Collection

A systematic search strategy was employed to identify relevant articles. The following search string was used:
("artificial intelligence" OR "large language models" OR "machine learning") AND ("human resource management" OR "HRM" OR "Talent Management" OR "Performance Appraisal")

The search was limited to articles published between 2004 and 2024 to focus on recent trends and advancements in AI-HRM research. To ensure a comprehensive analysis, only Open Access articles written in English were included. This decision was made to maximize accessibility and facilitate data extraction. Books, conference proceedings, editorials, letters, notes, and short surveys were excluded as they may not provide the depth and breadth of information required for a rigorous bibliometric analysis.

C. Data Selection and Cleaning

The initial search yielded 453 documents. These documents were screened based on their titles, abstracts, and keywords to eliminate irrelevant articles. Duplicates were also removed. The final dataset consisted of 381 articles that met the inclusion criteria.

D. Metadata Extraction and Analysis

The bibliographic metadata of the selected articles, including author names, affiliations, publication year, journal titles, keywords, and abstract, was extracted from Scopus using *RStudio* and the *biblioshiny* R package. As shown in Table 1, an analysis of missing metadata fields was conducted to assess the potential impact on the analysis. While missing data can limit the scope of analysis, careful consideration was given to the nature and extent of missing information. For instance, missing author affiliations may affect network analysis, while missing keywords may limit topic modeling. To mitigate the impact of missing data, imputation techniques or sensitivity analysis could be employed.

Table 1. Analysis of Missing Bibliographic Metadata

Metadata	Description	Missing Counts	Missing %	Status
AB	Abstract	0	0	Excellent
AU	Author	0	0	Excellent
DI	DOI	0	0	Excellent
DT	Document Type	0	0	Excellent
SO	Journal	0	0	Excellent
LA	Language	0	0	Excellent
PY	Publication Year	0	0	Excellent
TI	Title	0	0	Excellent
TC	Total Citation	0	0	Excellent
CI	Affiliation	2	0.52	Good
RP	Corresponding Author	39	10.24	Acceptable
DE	Keywords	63	16.54	Acceptable
ID	Keywords Plus	108	28.35	Poor
CR	Cited References	381	100	Completely missing
WC	Science Categories	381	100	Completely missing

E. Data Analysis

The extracted metadata was subjected to a range of bibliometric techniques to achieve the research objectives. These techniques included:

- Citation Analysis: To identify influential authors, articles, and journals.
- Co-authorship Analysis: To explore collaboration patterns and networks among researchers.
- Keyword Analysis: To identify emerging research themes and trends.
- Temporal Analysis: To track the evolution of AI-HRM research over time.
- Geographical Analysis: To map the geographical distribution of research activity.

F. Validation and Verification

To ensure the accuracy and reliability of the results, several measures were taken:

- Data Cleaning and Quality Control: The extracted data was carefully cleaned and checked for errors or inconsistencies.
- Inter-Rater Reliability: Multiple researchers independently screened a sample of articles to assess the consistency of the selection process.
- Sensitivity Analysis: The impact of different search strategies and inclusion/exclusion criteria was explored to assess the robustness of the findings.
- Peer Review: The research methodology and findings were reviewed by experts to identify potential biases and limitations.

III. RESULT

A. Annual Scientific Production

From 2004 to 2011, this study area was dormant with only one article in 2004 and none afterward, indicating low interest or awareness of AI's potential in HRM. Starting from 2012 there has been a slight but consistent rise in publications with three articles annually until 2016 which marked the inception phase of academic interest. This period, between 2017 and 2019 experienced moderate growth with 6 articles published in 2017 growing to twenty by end of 2019 showing that AI is gaining salience in HRM.

In Fig. 1, between 2020 and 2023, it showed a remarkable rise, increasing from thirty one (31) to one hundred four (104), indicating a phase of intense academic and industry attention coinciding with significant technological advancements in AI and improved funding opportunities. However, even though the number declined to fifty-one (51) articles by the year twenty four (2025), it is still much higher than before signifying continued interest and research efforts. This indicates that AI is emerging as a transformative force within the field by evolving

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from slow start up to rapid expansion therefore creating much attention among academics as well as business circle. An additional study could consider citation rates, find out important contributors and co-authors.

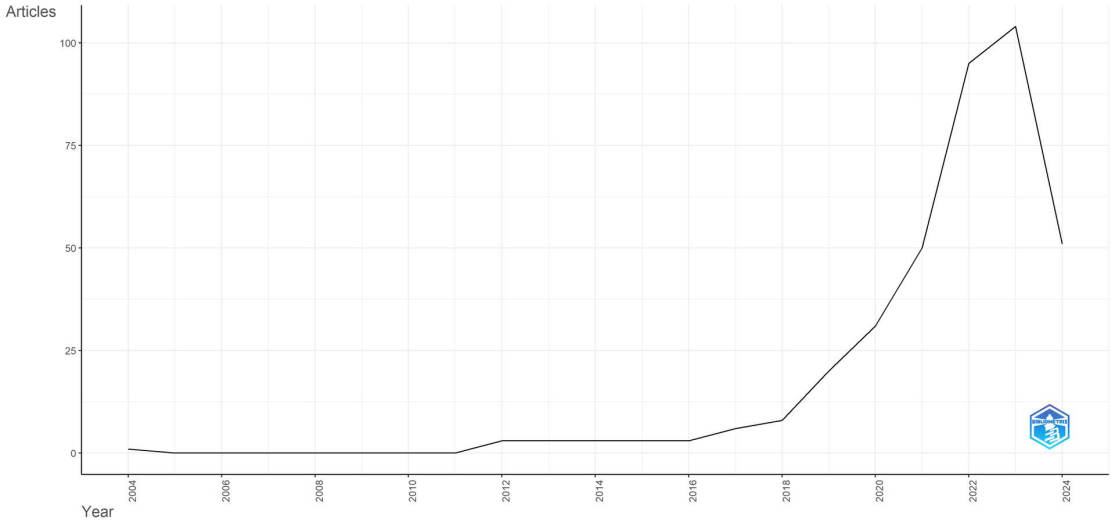

Fig. 1. Annual scientific production

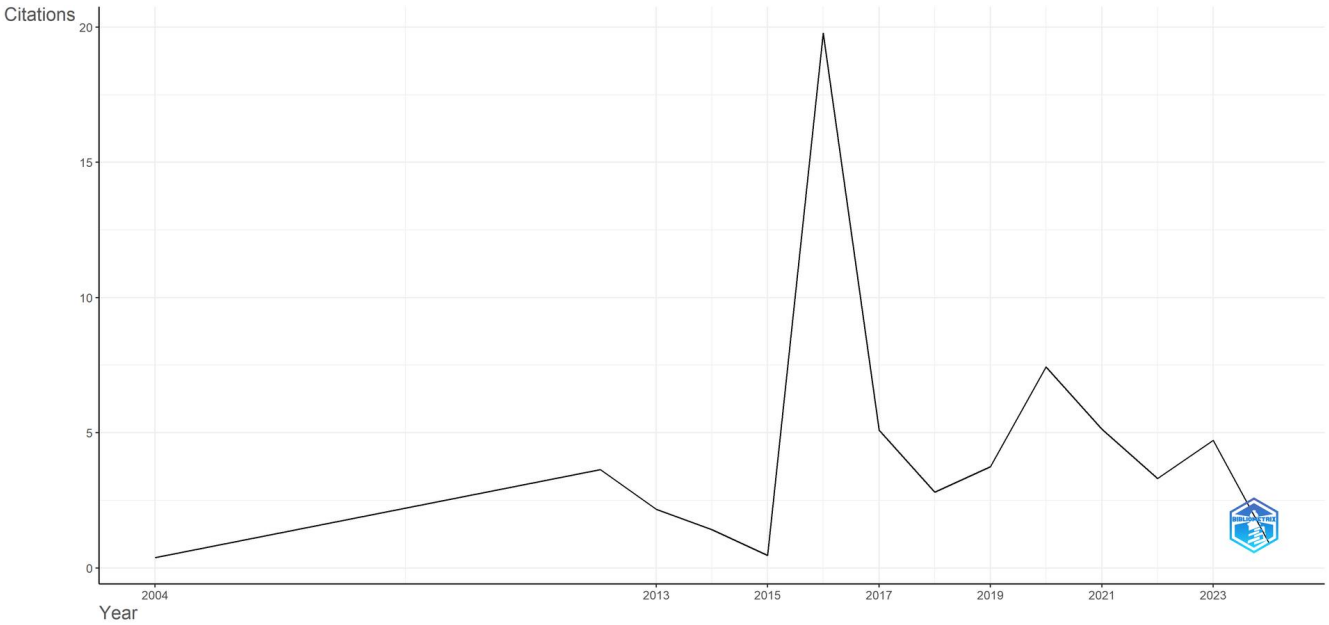

Fig. 2. Average Citations Per Year

B. Average Citations Per Year

The citation impact of a single article has varied over the years, it shows in Fig. 2. In 2004, it had a modest impact with a MeanTCperArt of 8.00 and a low MeanTCperYear of 0.38 over 21 years. The impact increased significantly in 2016 with a MeanTCperArt of 178.00 and a high MeanTCperYear of 19.78 over 9 years, indicating significant research breakthroughs.

From 2020 to 2023, the citation impact remained significant, with notable MeanTCperYear values. In 2024, the MeanTCperArt dropped to 0.94, reflecting the recency of publications. Overall, the data shows periods of high impact, especially in 2016 and 2020, amidst growing research interest and varying citation influence.

C. Most Relevant Authors

The data on the most relevant authors in the field of integrating AI in HRM highlights the key contributors based on the number of documents they have published. These authors have oriented significantly to research, and constantly add new

facts to their common knowledge (Fig. 3 and 4).

For instance, four authors (Carlson DA, Kou W, Pandolfino JE, and Zhang Y) each has six articles; so that they are the most productive contributors of this kind. The research agenda of these scholars had a significant impact on developments in their discipline.

Following Budhawar P., Fraley SI and Malik A. with five published documents each is another group of researchers who are playing an important role in advancing knowledge about AI's usefulness to HRM. For example studies undertaken by them focus on the examination of applications for artificial intelligence involving human resource management activities.

Further, Athamanolap P, Etemadi M and Kahrilas PJ each produced four papers which demonstrate that they were still among top authors albeit much less frequent contributors than what had been mentioned before. Together these scholars form a core group of researchers who are making an important contribution towards discussions and innovation in this area.

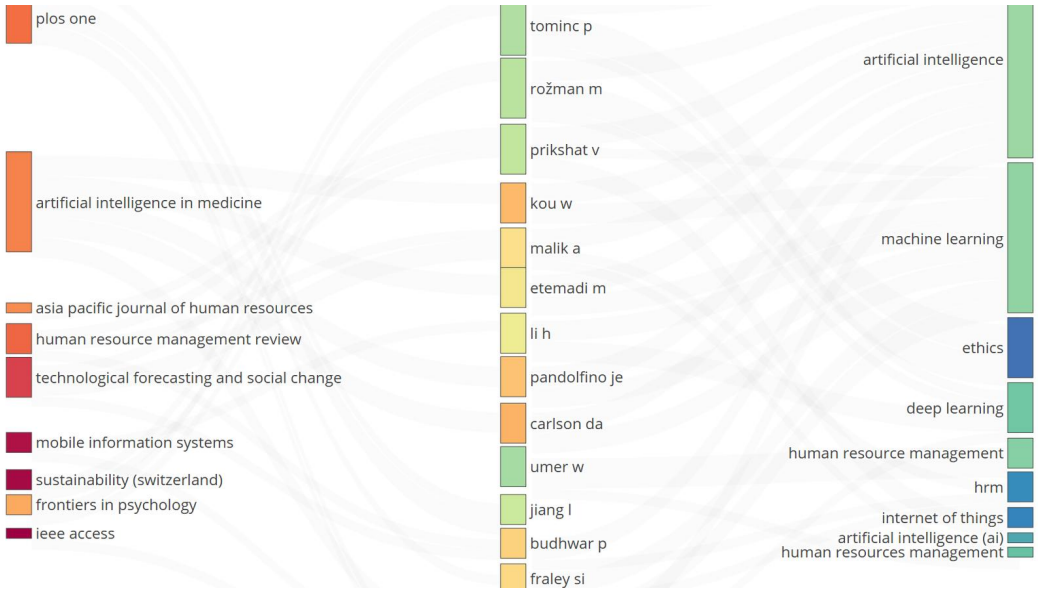

Fig. 3. Three field plot

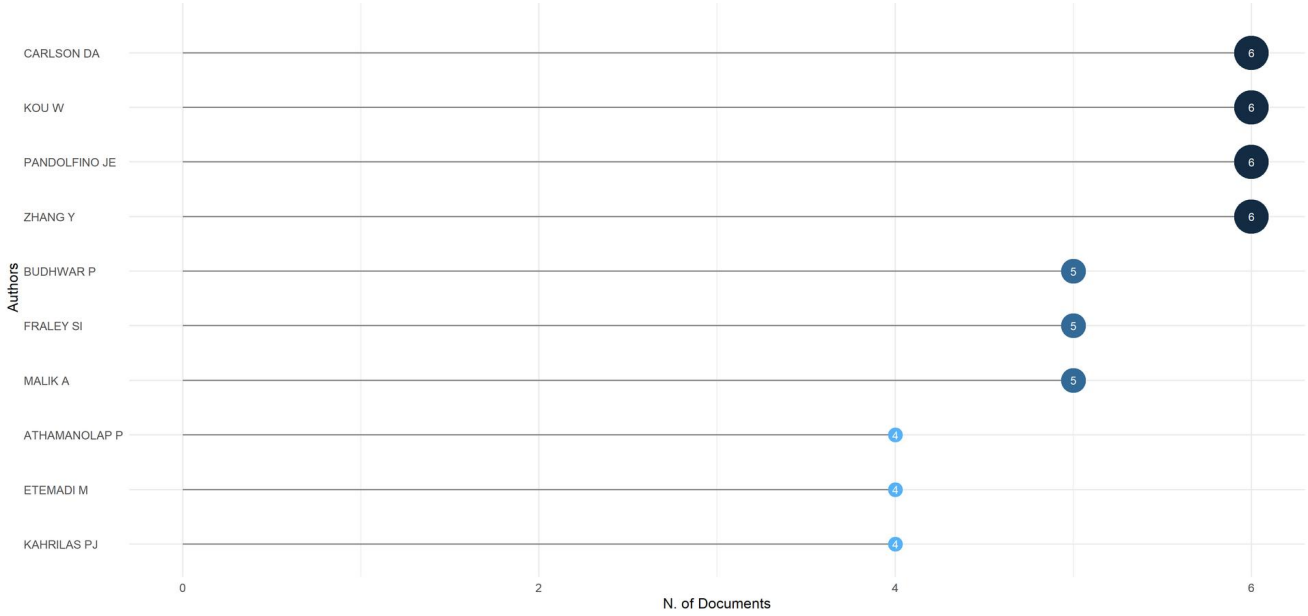

Fig. 4. Most relevant authors

D. Affiliations Production Over Time

When we take into account the affiliations over time, a number of institutions appear as key contributors to research on integrating AI in HRM. For instance, Carnegie Mellon University and MIT had one article each annually between 2012-2021. This increased to four articles every year between 2022 to 2024. On the other hand, the University of Maryland never ceased its output with its apex being five articles in 2024. From three articles only in 2014 Johns Hopkins University experienced substantial growth to thirteen from 2019-24. A similar trend was noted at Stanford University, which went from producing two articles annually in 2000 to six in 2045.The same applies for the University of California San Diego where there were three papers published in 2000 and nine by end of 2045.Other leading contributors to this field are Hong Kong Polytechnic University, Purdue University, Islamic Azad University, Northwestern University,theUniversity of Calgary and Aston university all whose number of publications within recent years has significantly grown.Excepting Carnegie Mellon's findings (22), data suggests that there is an increasing global interest in AI and HRM researches (Fig. 5).

E. Corresponding Author Countries

The data on locations of corresponding authors reveals the distribution of this research globally as well as its collaborative nature. China comes first with 71 papers that represent 18.63% of them all, out of which there are 59 SCPs and 12 MCPs implying a high degree of international collaboration (MCP 16.90%) as shown in Fig. 6. This is followed by the USA with 48 articles (12.60%) which include, however, more single-country publications (39 SCP) than multi-country publications (9 MCP) but still shows a higher collaboration rate at 18.75%. India has got 18 articles (4.72%) with an MCP percentage of 33.33% indicating relatively high amount of international cooperation.

Italy contributed fifteen journals or approximately three point nine four percent while Australia had thirteen entries or around three point four one percent with large proportions for MCPs such us sixty percent for Italy and sixty-nine point two three percent for Australia signifying their close relationships. The United Kingdom and Malaysia also have significant levels of cooperation with each other in terms of percentages being at fifty-five point fifty-four percent and fifty six point thirty-six respectively., There are countries like France, Germany, Poland and Czech Republic who also provided fewer materials but show different levels of international cooperation ranging from thirty seven to seventy per cent., France recorded the highest value in this category-66.67%.

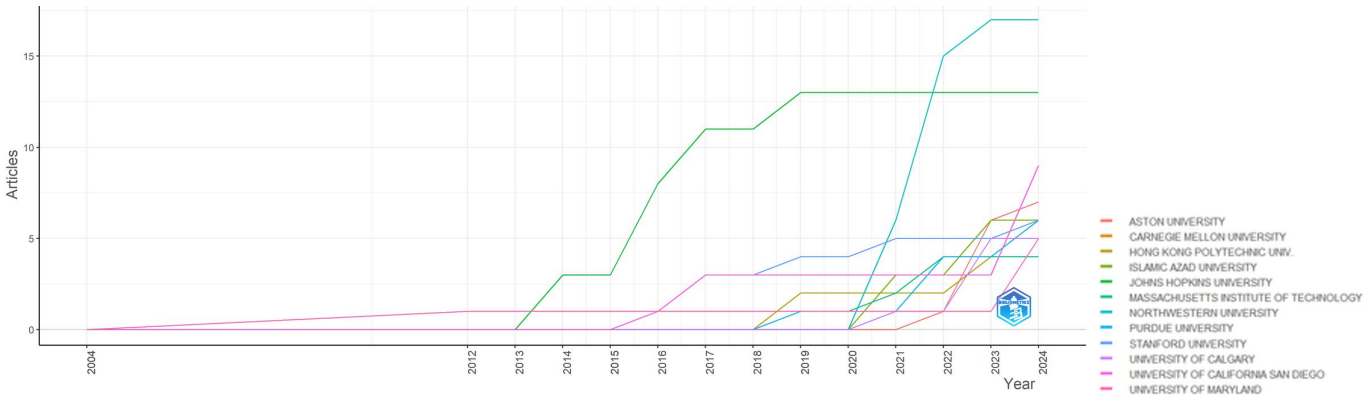

Fig. 5. Affiliations production over time

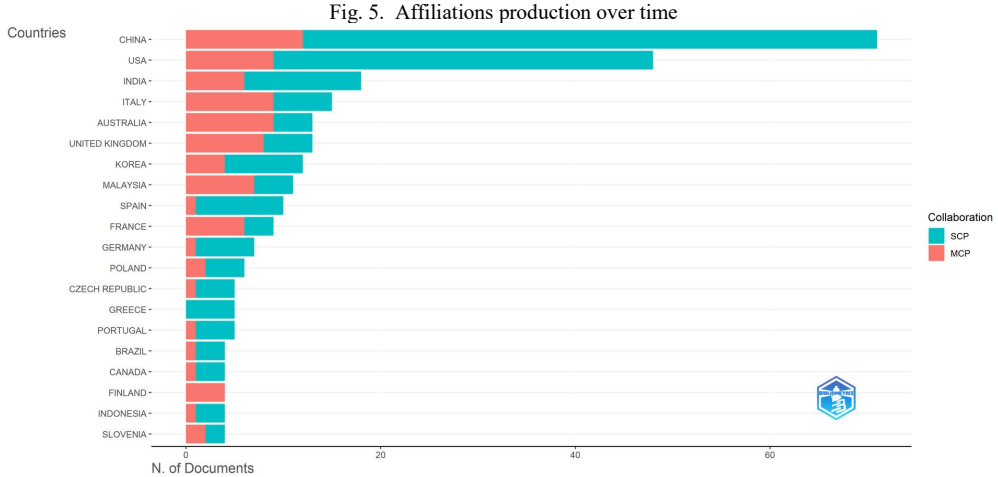

Fig. 6. Corresponding author countries

F. Country Scientific Production

In this research domain as shown in Fig. 7, the United States stands out as the top contributor with 219 publications while China follows closely behind at 163 proving its dominance in this field. The extensive contributions made by other countries such as United Kingdom, India and Australia with 75, 71 and 34 publications respectively highlight a widespread of scientific activities. Global patterns of cooperation confirm strong international networks, especially among leading countries concerning AI-based HR management, creating a global exchange of information and expertise. These findings speak about how dynamic AI-driven HRM is and lay the foundation for future studies on strategic collaborations to enhance the integration of AI technologies into human resource practices at international level.

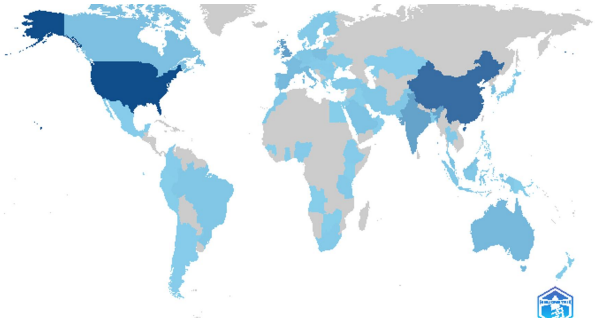

Fig. 7. Country scientific production

G. Word Cloud

"Human resource management" is the most common term used 223 times, which underscores its central significance in research debates. "Artificial intelligence" comes next with 152 times mention showing that AI technology is extensively used in reforming HR systems (Fig. 8). Mentioned 84 times, it also shows a preference for an algorithmic approach to solving human resource problems. For instance, “decision making” (38), “deep learning” (38), and “data mining” (20) indicate the focus on employing AI-driven decision support systems, and advanced learning techniques as well as data-based HR insights. The frequency of terms such as ‘gender’ (19), ‘workforce diversity’, and ‘risk management’ (17) indicates ongoing concerns about responsible AI adoption in HR strategies. This analysis highlights the complex investigation into technological advances and socio-economic impacts inherent in emerging AI-enhanced human resources management environment.

Fig. 8. Word cloud

IV. Discussion

This bibliometric analysis shows the development of AI integration in HRM research. Between 2004 and 2011, there was little activity, indicating the field was just starting. However, from 2012 onwards, a steady rise in publications indicates growing academic interest. Several key studies highlight the use of AI in various contexts. From team-building and information exchange to strategic decision-making and disruption management. They reinforce the multifaceted nature of AI's impact on HRM, supporting the notion that AI is a transformative force driving significant advancements in the field [11], [12], [13], [14].

The study increased between 2020 and 2023, coinciding with significant advancements in AI technology. The trend highlights AI's emergence as a transformative force in HRM. AI-based HRM tools can reduce biases in selecting candidates, assess motivation, and improve talent management practices, impacting service quality and customer satisfaction [15], [16]. Additionally, AI can assist in employee appraisals and decision-making processes, recognizing valuable employees who might leave the company [17], [18]. Furthermore, AI allows operators to make quick, advantageous decisions, such as in the airline industry [19].

The year 2023 shows the largest number of studies in this field. Even though 2024 shows a decrease, the data still has the potential to increase, considering that this bibliometric analysis was carried out in mid-2024. Main results from 2023 revealed that AI is a tool that HR departments use to ensure that employees are satisfied and businesses operate smoothly [20]. It can also analyze data to understand why people quit, recommend methods of retaining them, and provide marketing assistance [21], [22], [23]. This improves efficiency in businesses and their ability to withstand economic downturns [24]. In essence, AI is an assistant for human resources geared towards bettering things for all parties involved; the companies themselves as well as the staff members who work in those company [25]. This overall trend highlights AI's emergence as a transformative force in HRM.

The analysis also explores the impact of research. Citation rates show periods of high impact, particularly in 2016 and 2020, which aligns with the increase in publications. This suggests significant research breakthroughs during these periods. The recent drop in citations (2024) likely reflects the recency of publications, as citations typically accumulate over time.

Several scholars have emerged as key contributors to this field. Authors like Carlson, Kou, Pandolfino, and Zhang have published extensively, shaping the research agenda [26]. Others like Prikshat, Fraley, and Malik have also made significant contributions by examining practical applications of AI in HRM activities [27], [28]. These researchers form a core group leading discussions and driving innovation in this domain.

Looking at institutional contributions, universities like Carnegie Mellon, MIT, Johns Hopkins, Stanford, and California San Diego have all shown increasing publication output in recent years. This, along with contributions from universities worldwide, reflects a global upsurge in research on AI-powered HRM.

The data on corresponding author countries reveals a

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collaborative research landscape. China and the USA lead in publications, with China demonstrating a higher degree of international collaboration. India, Italy, Australia, and others also contribute significantly, with varying levels of collaboration. This highlights the international exchange of knowledge and expertise in this dynamic field.

Finally, the word cloud analysis sheds light on the core research themes. "Human resource management" and "artificial intelligence" unsurprisingly dominate, emphasizing the centrality of these concepts. The frequent mention of terms like "decision making," "deep learning," and "data mining" suggests a focus on AI-driven decision support systems and data-based HR insights. Additionally, terms like "gender," "workforce diversity," and "risk management" indicate ongoing concerns about the responsible adoption of AI in HR practices. This reinforces the multifaceted nature of research in this domain, which considers both technological advancements and their socio-economic implications.

In conclusion, this analysis paints a clear picture of the evolving landscape of AI-powered HRM research. From a dormant state to a period of rapid growth and international collaboration, the field is brimming with potential. Future studies could delve deeper into specific applications of AI in HRM, explore ethical considerations, and analyze the long-term impact on workforces and HR practices.

V. Conclusion

This bibliometric study offers the initial investigation into the emerging field of AI-integrated human resource management research. The findings indicate a growing volume of scholarship, particularly in recent years, suggesting AI is becoming more widely integrated and considered within HR practices. Several key areas can be highlighted from the current analysis, including the role of AI in decision-making, talent management, employee assessment, and organizational strategy.

The analysis successfully achieved the research objectives by:

- Mapping the Intellectual Landscape: Identifying key authors, institutions, and countries actively engaged in AI-HRM research.
- Identifying Emerging Trends: Highlighting the increasing focus on AI-driven decision-making, automation, and data-driven insights.
- Revealing Collaboration Networks: Demonstrating the growing international collaboration among researchers in this field.
- Highlighting Research Gaps: Identifying potential areas for future research, such as the ethical implications of AI in HR, the impact of AI on organizational culture, and the development of AI-driven HR analytics tools.

Future research could focus more on specific AI applications in HRM, such as the use of chatbots for employee support, the development of AI-powered recruitment tools, and the impact of AI on workplace diversity and inclusion. Furthermore, exploring the ethical implications of AI in HR, including issues of bias, privacy, and job displacement, is crucial. By addressing these research gaps, future studies can contribute to the responsible and effective integration of AI in HR practices.

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