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A BIBLIOMETRIC ANALYSIS ON THE ROLE OF ARTIFICIAL INTELLIGENCE-ENABLED RECRUITMENT TOWARDS SUSTAINABILITY: TRENDS AND FUTURE DIRECTIONS

Ms. Amita Yadav

PhD Scholar, Department of Management Studies, J.C. Bose University of Science and Technology, YMCA (Formerly YMCA UST) 6, NH-19, Sector 6, Faridabad, Haryana 121006
Email: amitayadav2911@gmail.com
ORCID ID: https://orcid.org/0009-0008-8274-9029

Dr. Ashutosh Nigam

Professor, Department of Management Studies, J.C. Bose University of Science and Technology, YMCA (Formerly YMCA UST) 6, NH-19, Sector 6, Faridabad, Haryana 121006
Email: drashutoshnigam@gmail.com

Abstract

Purpose: *By increasing productivity, decreasing bias, and promoting long-term workforce development, artificial intelligence (AI) in sustainable recruitment is revolutionizing talent acquisition. For HR experts, job seekers, employees, and AI developers, this study offers a thorough bibliometric review of AI-driven hiring processes. Through examination of research trends, methodologies, and applications of AI in sustainable recruitment, this study highlights key advancements, challenges, and future research directions.* ***Design/ Methodology/ Approach:*** *A comprehensive literature review using PRISMA was carried out, looking at 105 publications from the Scopus database that were published between 2015 and 2025. Multiple analytical software tools were utilized to conduct bibliometric and network analysis.* ***Findings:*** *According to the study's findings, the topic's considerable increase in researchers has led to a notable boom in research in recent years. The topic of "AI and Sustainable Recruitment" has seen expanding publications, now reaching a total of 49. Technological Forecasting and Social Change stands out as the leading contributing journal, having published four articles on the subject. India and the USA emerge as the most productive countries in this domain, challenging the traditional distinction between developed and developing nations. Additionally, the study identifies Malik A as the most prolific author, with three published papers and a total of 63 citations. Furthermore, the thematic analysis conducted in this study has helped outline epochal arenas for emerging research, offering priceless insights into forthcoming trends and directions within the field.* ***Originality:*** *This study offers a multi-dimensional analysis of AI-based sustainable recruitment literature. By employing advanced visualization techniques, this research provides a greater understanding on the topic. The perceptivity from this work bridges the gap between academic research and technology, fostering innovation, efficiency, and strategic decision-making in talent acquisition.*

Keywords: *Artificial Intelligence (AI), Bibliometric analysis, Recruitment, Systematic literature review (SLR), Human resource (HR) managers*

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INTRODUCTION

AI can be succinctly defined as a smart machine that can understand things it sees or hears, learn from them, and then use what it learned to do certain jobs in diverse manner as desired like humans (Manroop et al., 2024; Nawaz, 2019). The need to address time and cost restrictions has been the main driver of the gradual but unavoidable shift from traditional to technology-based talent acquisition approaches. To find qualified applicants for organizational positions, the talent acquisition process has historically depended on traditional, non-technical techniques (Tian et al., 2023). In the past, most people thought that human resources were in charge of talent acquisition. However, this picture has changed significantly, with the incorporation of AI technology into recruitment (Bukartaite & Hooper, 2023; Chakraborty et al., 2020; Nawaz, 2019; van Esch & Black, 2019; Votto et al., 2021; Abdul, 2020; Stanley DS, et al., 2019). Therefore, the limitations of traditional methods in navigating a fiercely competitive talent pool have accelerated the spread of technology, especially artificial intelligence (AI), in the hiring operation. AI provides an impartial and objective method that treats every applicant fairly, irrespective of their demographic characteristics. However, managers continue to express concerns about the expenses, privacy problems, and moral issues surrounding AI-driven hiring practices (Chen, 2023; Gélinas et al., 2022; Lin et al., 2021; Špadina, 2023; Ore, et al., 2022). However, among some racial or ethnic groups, AI has a detrimental impact on their conceptions of procedural and general justice, suggesting that AI systems may be biased and emphasizing ramifications for theory and practice (Bedemariam & Wessel, 2023; Drage & Mackereth, 2022; Keppeler, 2024; Nawaz, 2019, 2020).

The implementation of AI in recruitment involves significant investment and risk, necessitating managers to thoroughly assess its effects, outcomes, and potential changes prior to adoption (Lee & Cha, 2023). Analyzing the ethical risks linked to hiring algorithms within the framework of "International human rights law and the EU General Data Protection Regulation (GDPR)" aims to establish global standards for algorithmic accountability (Kim & Heo, 2022; Todolí-Signes, 2019; Yam & Skorburg, 2021; Franca, et al., 2023). Companies are using cutting-edge technologies to effectively satisfy their recruitment demands as the competition for skilled workers heats up. Time and money can be saved by highlighting the significance of using appropriate technology solutions, such as AI video recruitment programs (Bailao Goncalves et al., 2022; Dalv, 2021; Denis et al., 2020; Dominique-Ferreira et al., 2022; Elmohandes & Marghany, 2024; Gethe, 2022; Kazim et al., 2021; Kim & Heo, 2022; Tambe et al., 2019). To contradict AI-assessed job applicants often report feeling less certain and connected compared to evaluations conducted by humans, despite demonstrating greater fluency (Liu et al., 2023). However, as AI evolves from passive observation to a vital tool in talent acquisition, it enhances recruitment efficiency and accuracy (van Esch et al., 2019). Moreover, the widespread adoption of AI-driven recruitment systems, particularly through social platforms like LinkedIn and Facebook, is a significant aspect of modern talent acquisition. Nevertheless, the influx of data from these sources, along with Natural Language Processing (NLP) techniques, poses risks of unconscious bias and resulting inequalities (Simon, 2023; Drage E., 2022; Hunkenschroer, 2022; Lukaszewski et. al, 2024; Tilmes, 2022). Addressing discriminatory practices involves scrutinizing excessive data requests and potential biases in collected information, with a focus on uncovering legality issues related to candidate documents and data (Mačernyte-Panomarioviene, 2023; Manroop et al., 2024; Todolí-Signes, 2019). AI has overturned staffing by allowing businesses to quickly sort through a large applicant pool (Aydın & Turan, 2023; Bello et al., 2020; Nawaz, 2020; Almansoori, et al., 2021). To ensure fairness and transparency, hiring managers must integrate automated tools into a balanced evaluation process, addressing challenges posed by automated technologies (Johnson et al., 2020; Kong & Ding, 2024). Hiring time has been greatly shortened by this change, freeing up human resource departments to concentrate on other important duties (Kshetri, 2020; Sithambaram & Tajudeen, 2023). Motivated by the desire for efficiency and scalability, AI-enabled recruiting uses technology and algorithms to expedite several phases of the hiring process (Guyard & Deriaz, 2023; Pandya & Al Janahi, 2021; Wang et al., 2021). Moreover, companies are increasingly integrating technology into traditionally resistant divisions, contemplating the espousal of AI and Robot Process Mechanization for HR tasks (Chilunjika et al., 2022; da Costa et al., 2023; Gupta et al., 2018; Pan, et al., 2022). Sustainable development of the organisation is also assisted by system of learning management technology and AI, green HR practices (Saputra, et al., 2024) which offer employees new career prospects (Ogbeibu et al., 2024; Oncioiu et al., 2022; Shayegan et al., 2023).

These initiatives signify broader trend towards leveraging technology to optimize HR practices, ensuring organizational efficiency and sustainability. While extensive literature exists on the topic, Bibliometric analyses are limited and often focus on specific subdomains. This highlights the necessity for comprehensive reviews encompassing the breadth of AI applications in recruitment. Therefore, the study focuses on exploring emerging themes and trends to enhances understanding and offers recommendations for HR professionals to navigate AI adoption effectively and leverage its potential for organizational performance.

1.1 Rationale of the study

This subject has been the subject of extensive research. Prior research has examined the connection between AI and diversity, inclusion, and human resource practices; but there is limited research on application of AI in recruiting as an HRM function in organizations. Some review studies focus on entire HRM or just adoption of artificial intelligence or fairness, perception or a very small span of time, omitting the importance artificial intelligence can offer in recruitment. Therefore, the agenda of this research is to eliminate the literature gap exploiting bibliometric analysis with multiple tools. This study addresses the enumerated questions for research:

RQ1: What publication trend is there right now with respect to AI- enabled recruitment?
RQ2: Which countries are leading the publication in the field?
RQ3: Which writers and periodicals in this field are the most productive?
RQ4: What are the different emerging themes pertaining to AI- aided recruitment?
The bibliometric paper will adopt the enumerated framework to broaden the understanding of the topic. Define the study's methodology and present a exhaustive analysis of the topic, including factorial analysis, three plot fields, keyword analysis, and year-by-year publication pattern, and theme mapping, to make recommendations for more research. The analysis and discussion section will be followed by implications and limits to summarize the study's findings.

LITERATURE REVIEW

2.1 Recruitment It focuses on attracting and selecting individuals with the right skills and attributes to meet organizational needs (Abdul, Wang, & Li, 2020). In the dynamic job market, recruitment has become more challenging due to increased competition, technological advancements, and the need for diverse and inclusive workplaces (Pan et al., 2022). Artificial intelligence has overturned recruitment processes by efficiently ranking prospects supported with their skills, experience, and requirement for the employment, thus minimising the time and exertion needed for hand-handled shortlisting (Pessach et al., 2020). This efficiency is particularly beneficial in the tourism sector, where social networks like LinkedIn and Twitter play a crucial role (Oncioiu et al., 2022). However, transparency and fairness in AI applications is critical to maintain trust in the recruitment process (Drage and Mackereth, 2022). Theories such as the Person-Environment Fit and Resource-Based View underpin modern recruitment practices, emphasizing the alignment of employee values and skills with the organizational environment and the strategic value of unique employee capabilities (Abdul, Wang, & Li, 2020; Rab-Kettler & Lehnervp, 2019). AI also offers potential benefits in terms of inclusivity and diversity in recruitment (Lee and Cha, 2023). By enhancing explainability and augmenting traditional hiring procedures, AI can aid in greater impartial hiring environment (Lee Cha, 2023).

2.2 Artificial Intelligence The advancement in innovation lies within the ambit of AI as it is capable of performing complex tasks. In human resource management, AI has significantly enhanced recruitment and selection processes. AI-driven applicant tracking systems (ATS) quickly scans curriculum vitae and application to select the suitable person depending on established criteria (Pessach et al., 2020). AI-dependent chatbots and virtual support are growingly being used to communicate with job seekers, answer questions, and schedule interviews. These solutions ensure a consistent applicant experience while permitting managers to concentrate on strategic duties (Pan et al.,2022). "The Socio-Technical Systems Theory" enumerates the mix of people and technology in an organizational setting. It suggests that successful AI implementation requires a balance between technical capabilities and social factors (Prikshat et al., 2023). Another relevant framework is the "Technology Acceptance Model (TAM) and Unified Theory of acceptance and use of technology (UTAUT)" model, explores how users learn to adopt and utilize technology. TAM contends that perceived usefulness and ease of use are significant factors of AI adoption for sustainability (Kaushal & Ghalawat, 2023). AI's impact extends beyond recruitment to performance management and training. Predictive analytics forecasts employee performance and identify potential areas for improvement and helps organizations address issues before they escalate, fostering a more productive and engaged workforce (Kim and Heo, 2022). However, corroboration of AI in hiring processes presents ethical difficulties, like data privacy and algorithmic prejudice (Drage and Mackereth, 2022). Algorithms and technologies are subject to errors alike humans but individuals tend to react more negatively, showing reluctance to assign blame, irrespective of understanding the algorithm's maturity or the severity of the mistake committed by it (Renier et al., 2021).

2.3 Relationship between recruitment and artificial intelligence There is an uneven distribution in prior studies focusing on integration of Human Resource Management, with fewer investigations dedicated to specific sectors or countries, favoring routine HR functions like recruitment while overshadowing other empirical domains (Prikshat et al., 2023). Despite the surge in digital job offers, skills and managerial competencies (Anghel D, 2023; Deepa et al., 2024), particularly in fields like data engineering and cybersecurity, traditional roles remain prevalent, primarily revolving around technology tasks with limited integration of advanced functions like machine learning or AI (Ceide C.F, 2023; Soleimani, et al., 2022). These advancements highlight how AI and digital technology have the power to revolutionize hiring procedures and boost organizational effectiveness. They also emphasize how important it is to make strategic decisions and conduct regular assessments in order to fully utilize these technologies. AI implementation aids recruiters by streamlining applicant sourcing and improving recruitment procedures (Black & van Esch, 2021). Business psychologists contribute to the development of AI systems for measuring individual differences in work settings, while advocating for systematic algorithm audits to ensure fair hiring practices (Kazim et al., 2021). Concurrently, delveing into AI's potential in revolutionizing human resource management ethically, stressing the importance of careful consideration is found in studies (Sharif & Ghodoosi, 2022). Despite the nascent adoption of modern algorithms, a study aims to identify antecedents of AI-based technology adoptionn in recruitment, leveraging the UTAUT and TAM model (Islam et al., 2022). In addressing the digital talent gap in SMEs, research proposes a pragmatic solution by analyzing digital skills literature and utilizing AI algorithms. It

underscores the accessibility of powerful and affordable AI tools for SMEs, challenging assumptions about constraints and usability barriers (Sommer, 2023).

2.4 AI- Driven Sustainability

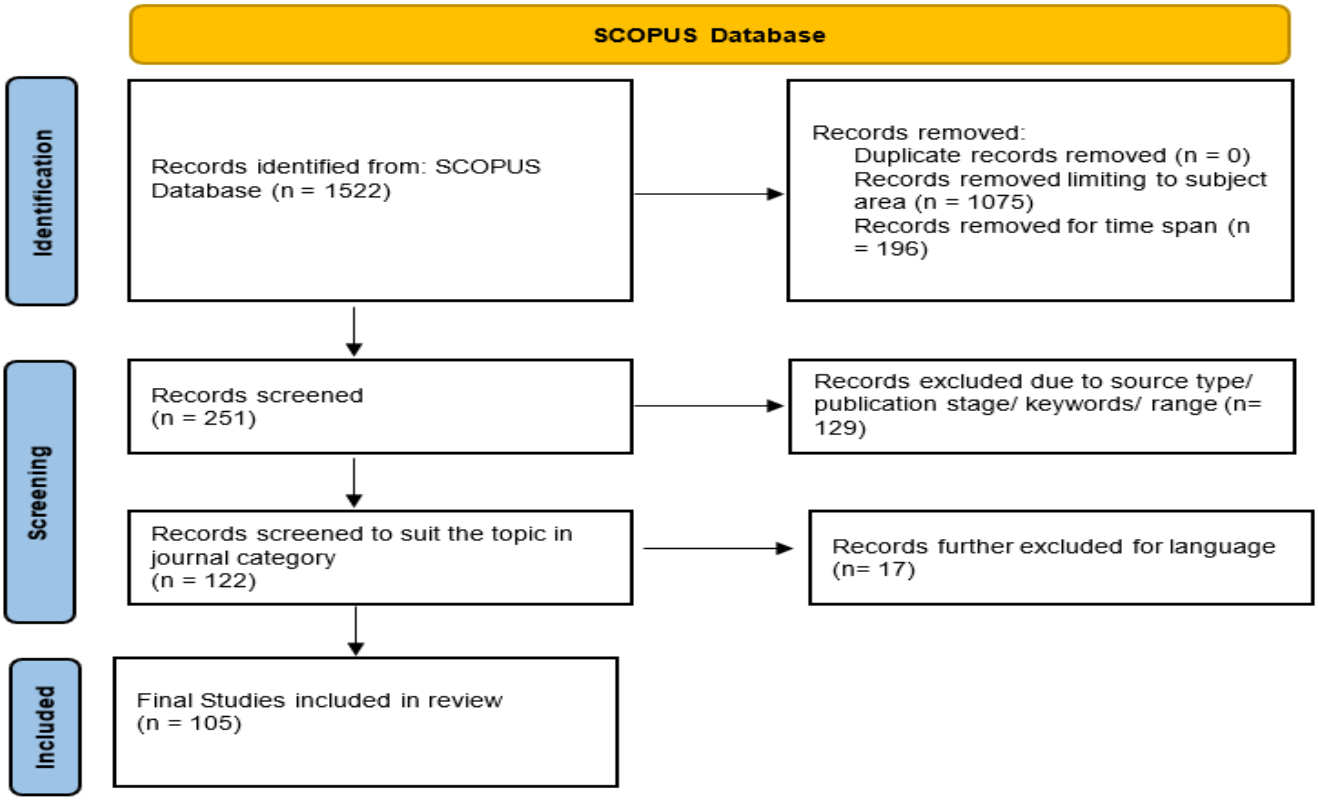
This cluster highlights the transformative image of technology in human resource management, especially in AI-driven recruitment, human analytics, and digital platforms that enhance employee engagement (Shao et al., 2024). Corroboration of AI and big data into HR decisions has gained substantial attention from both academia and industry, as machine learning contributes to performance optimization (Agarwal et al., 2022; Gamage et al., 2024; Lee & Ma, 2021). The increasing acceptance of HR technology has reshaped traditional employee handling with enhanced efficiency, promoting data-driven decisions, and enabling personalized career development initiatives (Nayal et al., 2023; Sharma et al., 2022; Sinicropi & Cortese, 2021).

RESEARCH METHODOLOGY

3.1 Article Identification and Screening

For article identification it is necessary to formulate an appropriate search string. Multiple keywords and combinations were used to identify the appropriate papers in the area of artificial intelligence-based hiring. Abstracts and relevant sections of articles were examined to align with research questions. Articles focusing on AI in recruitment from 2015 to 2025 were identified based on the keywords- AI, artificial intelligence, and recruitment. Boolean operators or/ and were combined with the search string: "AI" OR "Artificial Intelligence" AND "Recruitment" ranging from 2015 to 2025, limited to business and management area of study that were in final stage of publication and in English. The search commenced with a predefined set of criteria aimed at identifying pertinent documents concerning AI-based recruitment. Initially, 1522 articles were identified across Scopus databases. Scopus has comprehensive coverage (Dhingra et al., 2024). However, those that did not fit within the business/management categories, proceedings, conference papers, book chapters, editorials, or articles with non-English language material were not included. The "inclusion and exclusion" criteria are then utilized to choose the desired research papers for the review. Following this refinement, 105 articles meeting the inclusion criteria were meticulously compiled into an Excel spreadsheet.

Fig. 1 Systematic Literature Review using flow of PRISMA



Source: Authors own criteria from Scopus Database

3.2 Software

The current study presents a comprehensive assessment of the field using bibliometric analysis. The bibliometric analysis software's including BibExcel, Citespace, Bibliometrix R (Cuccurullo and Aria, 2017) and Vosviewer (Eck and Waltman, 2009) were used. The authors employ them because they offer a better visual representation than other tools and are commonly utilized for bibliometric analysis. The software and tools mentioned above can also be readily evaluated.

3.3 Objectives

In the domain of technology adoption, pivotal factors like perceived usefulness, organizational support, and ease of use significantly influence the adoption of innovative tools. The theories on AI interaction underscore the paramount importance of user experience and interface design in shaping user perceptions and behaviors. As such, the forthcoming objectives aim to delve into the technological factors influencing acceptance of AI in the staffing procedures, while also scrutinizing how candidate experience influences the involvement of AI in HRM functions. Through this investigation, the research focuses to illuminate the intricate interplay between human factors and technological adoption in talent acquisition.

1. To investigate the status of countries contribution in shaping the evolution of AI in the recruitment process.
2. To identify top authors, journals and keywords of the research.
3. To employ thematic analysis of AI applications in recruitment using bibliometric tools to suggest future scope.
4. To develop the connection between references, authors and keywords.

BIBLIOMETRIC ANALYSIS AND DISCUSSION

AI emerged as a pivotal theme alongside recruitment, HRM, machine learning, and technology, showcasing the transformative potential of these domains in reshaping organizational paradigms. Innovatively, this synthesis encapsulates AI's evolution from nascent technology to a linchpin of HRM, transcending geographical boundaries and fostering interdisciplinary collaborations.

4.1 Summary statistics

The study on AI-enabled recruitment spans the period from 2015 to 2025, covering a total of 90 sources (Table 1), including journals and books. Over this timespan, 105 documents have been published, demonstrating a significant annual growth rate of 22.28%. Table 1 represents the documents having an average age of 2.3 years, indicating that the field is relatively young and rapidly evolving. On average, each document has received 22.38 citations, reflecting the impact and relevance of research in this area. In terms of references, the study incorporates a substantial number, totaling 6,565. The analysis includes keywords, highlighting the diversity of research topics and emerging themes in AI-aided recruitment. The research has been contributed by 288 authors, with 21 of them publishing single-authored documents. Collaboration among researchers is evident, with a co-author per document ratio of 2.84. Additionally, 22 documents were single-authored, showing a mix of independent and collaborative efforts in this domain. International co-authorship accounts for 20.95% of the total publications, demonstrating a significant level of global collaboration in research on AI-driven recruitment. These statistics underline the dynamic and multifaceted scope of the field, with growing interest and contributions from researchers worldwide.

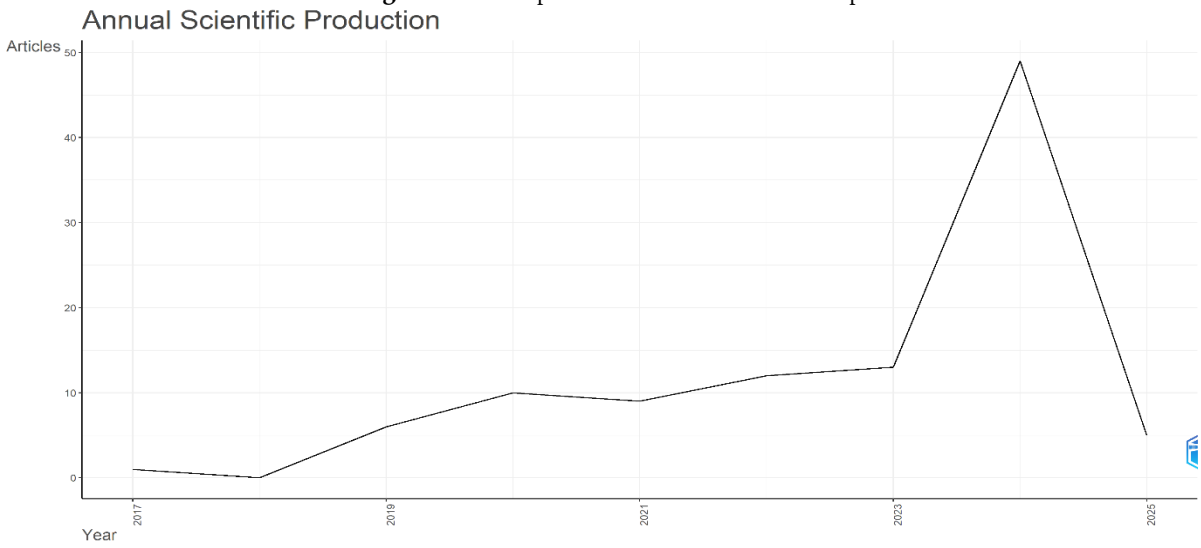
Table 1 Summary Statistics

Particulars	**Results**
Time-period	2015- 2025
Sources	90
Documents	105
Annual Growth Rate %	22.28
Document Average Age	2.3
Average citations per doc	22.38
References	6565
Keywords Plus (ID)	173
Author's Keywords (DE)	410
Authors	288
Authors of single-authored docs	21
Single-authored docs	22
Co-Authors per Doc	2.84
International co-authorships %	20.95

4.2 Trend Analysis

The depicted Fig. 2 reveals a striking surge in research publications concerning the mix of AI within staffing practices. A discernible upward trajectory is evident upon scrutinizing the chronological progression. Notably, from 2019, the corpus comprised a solitary publication, which burgeoned gradually to thirteen in 2023 from almost negligible before 2020. In particular, the authors could not find any publications before 2017, omitting it from the graph. However, the pinnacle was reached in 2024, marked by a substantial leap to forty-nine publications. A zenith underscored by the promising inception of 2025, which has already witnessed the emergence of five publications as of February 12th, 2025 with anticipations for further contributions throughout the remainder of the year. Indeed, this exponential surge in academic inquiry underscores AI's transformative potential in revolutionizing recruitment paradigms, thereby attracting both seasoned academicians and nascent researchers to explore and enrich this burgeoning field.

Fig. 2 Year- wise publication between the time span of 2015- 2025



Source: Authors own creation

4.3 Top Productive Journals

From Table 2, it is evident that the most productive journal is Technological Forecasting and Social Change, which has published four papers, making it the leading source of research in this domain. Following closely are Administrative Sciences and the International Journal of Scientific and Technological Research, each with three papers, demonstrating their significant contributions to the topic. Several other journals, including Business Horizons, Cogent Business and Management, and the IEEE Transactions on Engineering Management, have each published two papers, reflecting their involvement in AI-driven recruitment discussions. Additionally, journals such as the International Journal of Business Innovation and Research, the International Journal of Information Management Data Insights, the International Journal of Organizational Analysis, and Issues in Information Systems have also contributed two papers each to the field. The cumulative number of papers from these top 10 journals reaches 24, emphasizing their pivotal role in shaping research trends. The concentration of publications in Zone 1 suggests that a few journals have majority of impactful research in AI-enabled recruitment.

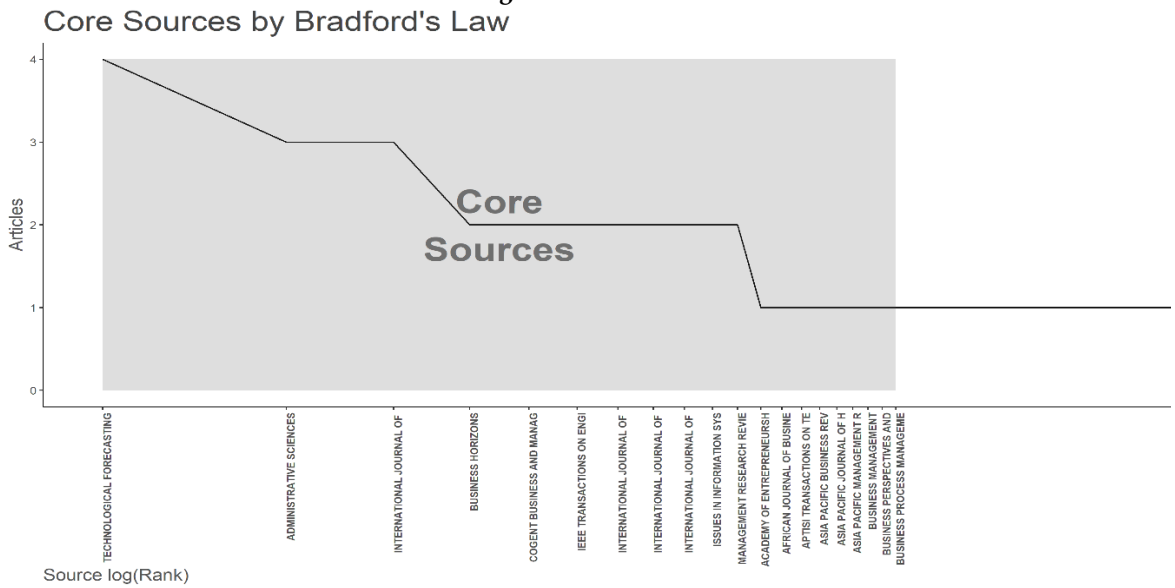
Table 2 Leading Journals

SOURCE	Frequency	Publishers
Technological Forecasting and Social Change	4	Elsevier
Administrative Sciences	3	MDPI
International Journal of Scientific and Technology Research	3	IJSTR Publications
Business Horizons	2	Elsevier
Cogent Business and Management	2	Taylor & Francis
IEEE Transactions on Engineering Management	2	IEEE
International Journal of Business Innovation and Research	2	Inderscience Publishers
International Journal of Information Management Data Insights	2	Elsevier
International Journal of Organizational Analysis	2	Emerald Publishing
Issues in Information Systems	2	International Association for Computer Information Systems

Source: Authors own creation

S. C. Bradford proposed ***Bradford's law*** (Brookes, 1977), which states that a small number of journals dominate a certain field. It emphasizes that journals are selected depending on both their popularity and the quantity of papers they have published. The sources are divided into three Zones. Because of their intensive emphasis on the subject, Bradford referred to the initial group as the "nucleus" of journal's (Aria and Cuccurullo, 2017). According to Fig. 3, the core journal, or Zone I, has 33.33% of the collection's total papers. According to Bradford's estimated categories, journals and articles are dispersed below: Zone I: 35 papers and 20 journals; Zone II: 36 papers and 36 journals; and Zone III: 34 papers and 34 journals. By analysing all the three zones, the research output is distributed unevenly across journals, with a core set (Zone 1) publishing the highest number of relevant papers.

Fig. 3 Bradford's law



Source: Authors own creation

4.4 Most Relevant Authors

The analysis from Table 3 on the most relevant authors in AI-enabled recruitment research highlights key contributors based on their productivity and impact. Malik A emerges as the most prolific author, with three papers published since 2023, an h-index and g-index of 3, and a total of 63 citations. Other significant contributors include Kaushal N and Islam M, each with two publications, accumulating 78 and 52 citations, respectively. Lukaszewski KM and Stone DL, both starting in 2020, have 100 citations each, indicating strong impact despite fewer papers. Authors like Nawaz N, Abdelhalim E, Abdul C, Afrin S, and Aggarwal V have made individual contributions, with citation counts ranging from 8 to 23. Overall, the distribution of citations suggests that while some authors have a strong presence in AI recruitment research, the field remains relatively diverse in authorship.

Table 3 Most Relevant Authors

Author	h_index	g_index	Total Citations	No. of Papers	PY_start
Malik A	3	3	63	3	2023
Islam M	2	2	52	2	2022
Kaushal N	2	2	78	2	2023
Lukaszewski KM	2	2	100	2	2020
Nawaz N	2	2	38	2	2019
Stone DL	2	2	100	2	2020
Abdelhalim E	1	1	11	1	2024
Abdul C	1	1	8	1	2020
Afrin S	1	1	16	1	2022
Aggarwal V	1	1	23	1	2019

Source: Authors own creation

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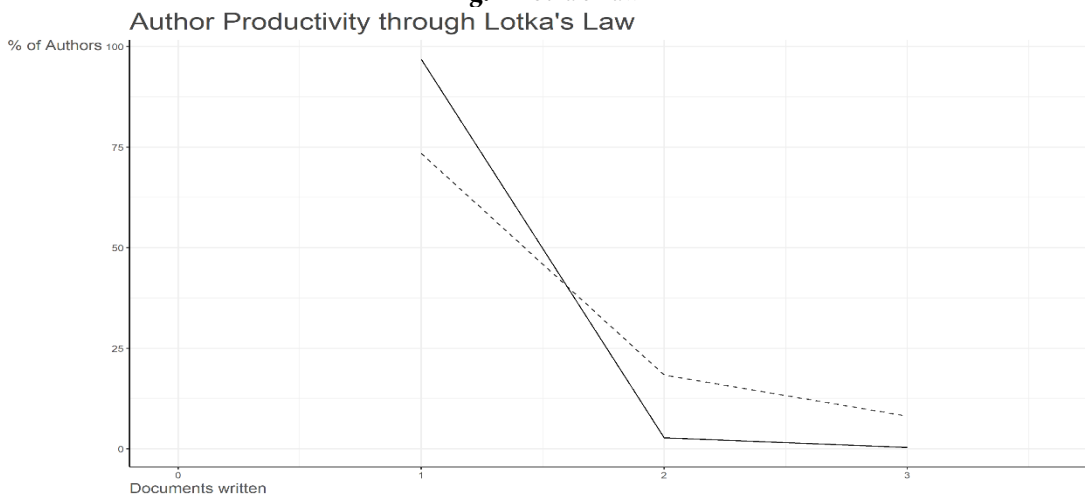
The majority of authors only contribute one publication, while very few create several works, according to **Lotka's Law**, which asserts that the count of authors writing n articles is inversely related to n^2. The analysis here supports Lotka's Law, as 279 authors (96.9%) have published just one document, indicating a large pool of occasional contributors. Only eight authors (2.8%) have published two papers, and just one author (0.3%) has written three papers, confirming the characteristic skewness of scientific productivity. This pattern suggests that AI-enabled recruitment research is a growing but highly distributed field with limited repeated contributions from individual researchers.

Fig. 4 Lotka's Law

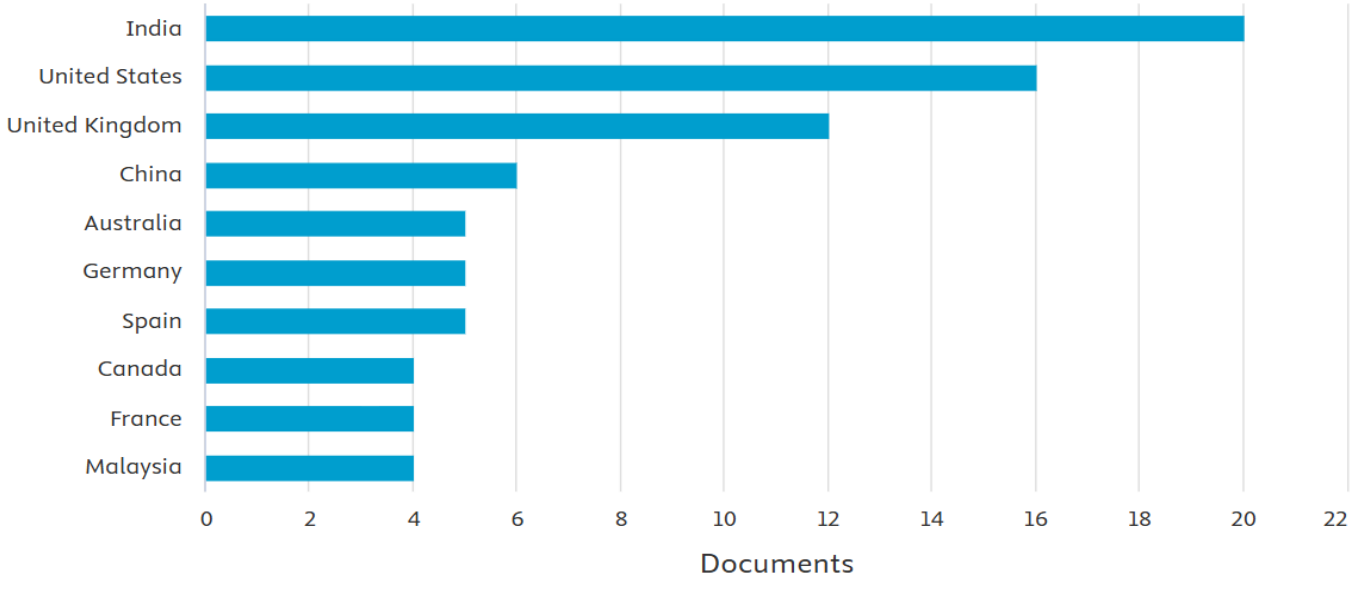


Source: Authors own creation

4.5 Geographic Distribution of Articles

The geographical analysis of research publications in Fig. 5 underscores a notable dominance of contributions from a developing country, India with twenty articles. The horizontal bar chart highlights other notable leading contributors, the United States, and the United Kingdom, followed by China, Australia, and Germany in a mid-range category. Countries like Spain, Canada, France, and Malaysia show lower contributions. The sharp decline in document counts between the top three contributors and others indicates an uneven distribution of research output. This might be due to varying levels of investment in research, the number of researchers in the field, or institutional priorities. However, a broader examination of literature revealed a significant disproportionality, with developed nations commanding a larger share compared to their developing and underdeveloped counterparts. Remarkably, this gap can be set- off in years to come seeing the contribution of India and China with a total of twenty-six papers (24.76%).

Fig. 5 Geographic location-based depiction of documents under study



Source: Authors own creation

4.6 Three- field plot

A Three-Fields Plot, visually connects three categories: Cited References (CR), Authors (AU), and Keywords/Descriptors (DE). It illustrates how the size of the boxes shows how often an item come along in a box. It confirms the results of performance evaluations of countries and sources. It also connects the keywords to the source and country. In Fig. 6, the left column represents the most influential cited references, with Tambe P., Upadhyay A.K., and Pillai R. emerging as the most frequently cited authors. Their work focuses on AI applications in recruitment, and human resource management demonstrating their influence on shaping the field. The middle column highlights the most productive authors, including Kaushal N., Malik A., Nawaz N., and Stone DL, who have significantly contributed to AI-driven recruitment research. On the right, the Keywords (DE) column showcases the primary research themes, with Artificial Intelligence, Recruitment, Human Resource Management, and AI-driven selection processes being dominant. This suggests that AI's role in streamlining hiring, improving decision-making, and enhancing HR practices is a central focus of scholarly discussion. The strong interconnections between references, authors, and keywords illustrate that AI-driven recruitment is an evolving field with a few highly influential studies and authors shaping its direction. The visualization underscores the multi-disciplinary nature of AI adoption in recruitment, integrating insights from HR, business, and technology.

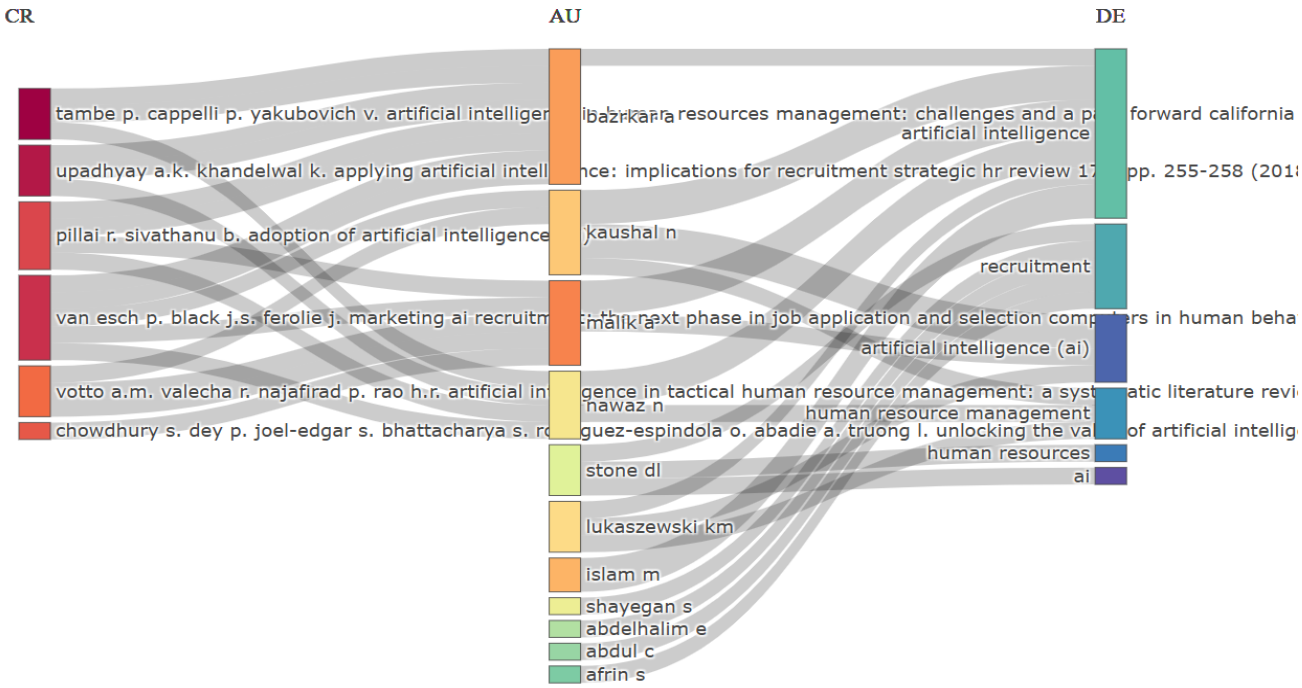


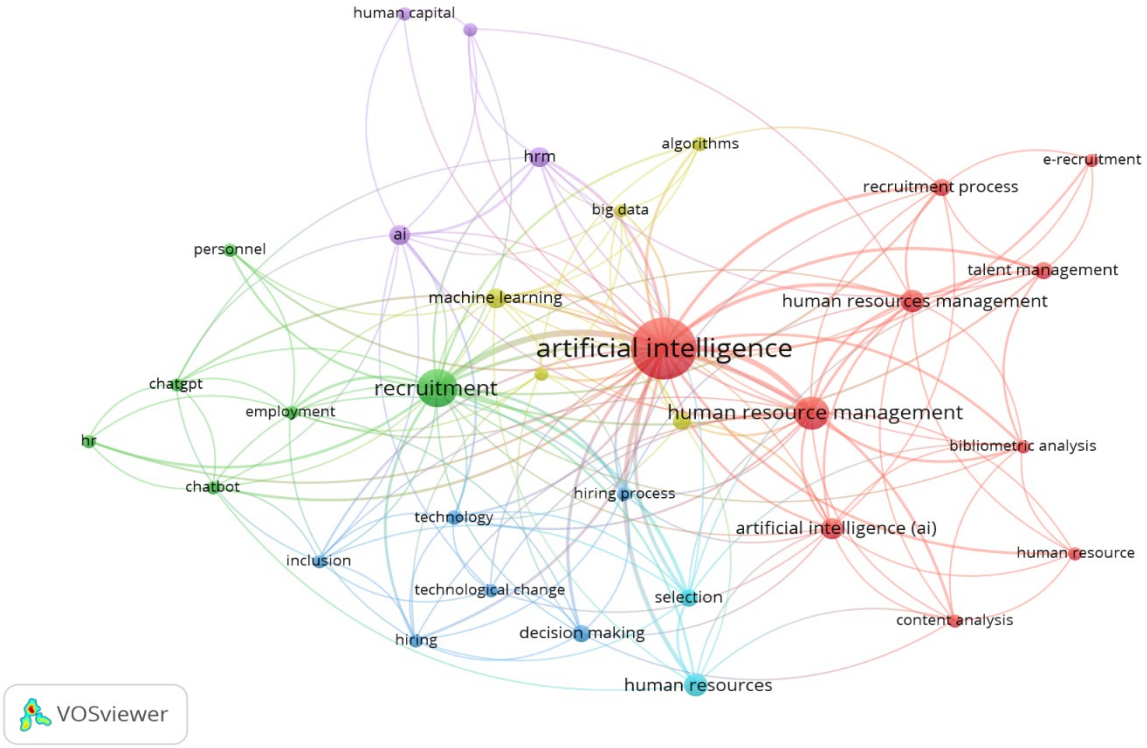
Fig. 6 Three- field plot
Source: Authors own creation

SCIENCE MAPPING

5.1 Network of Keywords

The visualization in Fig. 7 provides a comprehensive overview of the prevalent keywords within the realm of technology, digitalization, and automation over the past decade. Six distinct clusters were formed based on the interconnections among all keywords. Among these clusters, AI emerged as the most prominent keyword, exhibiting a frequency of sixty-three, followed by recruitment twenty-five, and human resource management eighteen. In particular, it highlights key research themes in AI-enabled recruitment through different clusters. Each color represents a distinct research focus, with larger nodes indicating central concepts. Below is a breakdown of each cluster with relevant references to enhance authenticity.

Fig. 7 Network Visualization of all keywords



Source: Authors own creation

5.1.1. Role of AI in Human Resource Management (Red)
This cluster reflects AI's growing role in automating HR functions, streamlining recruitment, and analyzing HR data. AI-driven HRM strategies improve hiring efficiency (Tambe et. al, 2019), and emphasizes how e-recruitment and talent management are increasingly AI-driven, optimizing candidate selection and reducing biases (Pan et. al, 2022).

5.1.2 Importance of Recruitment in Employment (Green)
The emergence of AI-driven tools like chatbots and ChatGPT in recruitment are playing prominent role. AI-powered chatbots improve candidate engagement and screening (Van Esch et al., 2019). Further, automated HR systems reduce manual workload in hiring (Votto et al., 2021).

5.1.3 Role of technology in Selection Decision-Making (Blue)
AI enhances decision-making in recruitment by minimizing biases and improving selection criteria. AI's role can be seen in ethical hiring (Kshetri, 2020), and predictive analytics optimize recruitment strategies, ensuring data-driven hiring decisions (Pessach et al., 2020).

5.1.4 Developing algorithms for Machine Learning (Yellow)
This cluster focuses on AI techniques enhancing recruitment accuracy. Big data plays crucial lrole in HR analytics and improves candidate profiling and performance predictions (Johnson, 2020; Allal-Chérif, 2021).

5.1.5 Strategic involvement of AI (Purple)
Involvement of AI in human capital advancement and strategic HRM is a growing focus. Its contribution to workforce skill mapping and career development cannot be ignored (Ore et. al, 2022) as it is helping in devising HR policies for talent acquisition and retention (Kaushal, 2023).

5.1.6 AI's Impact on Hiring (Light Blue)
This cluster highlights AI's role in modernizing hiring by explores how AI is revolutionizing workforce recruitment through automation (Kshetri et. al, 2020). Additionally, technological adoption in HR is bridging the gap between AI potential and practical implementation (Upadhyay & Khandelwal 2018).

Therefore, in Vosviewer the large nodes of "Artificial Intelligence" and "Recruitment" indicate their dominant role in research, showing AI's deep integration in hiring, talent management, and decision-making. This is also supported by the word cloud in Fig. 9. This network reveals how AI automates, enhances efficiency, and introduces data-driven strategies in recruitment, reshaping the future of HR practices. Furthermore, Fig. 8 and Table 4 claim that the frequency of occurrence of word artificial intelligence is fifteen and gradual increase has been seen in frequency of recruitment and human resource management with the count being four each.

Fig. 8 Words frequency over time

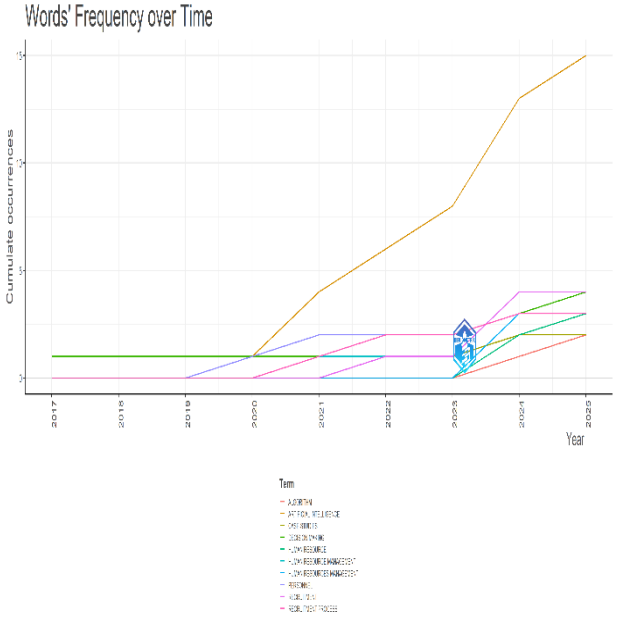


Fig. 9 Word Cloud

Source: Authors own creation

Table 4 Most frequently occurring words

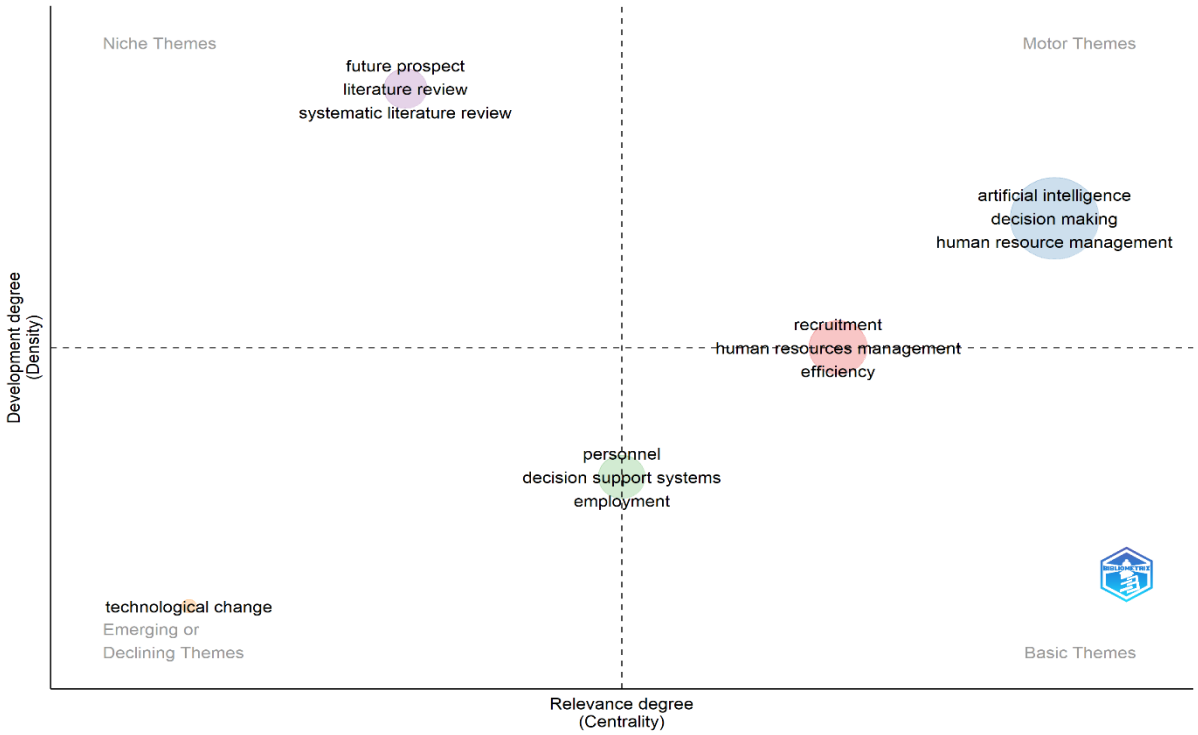
Year	ARTIFICIAL INTELLIGENCE	DECISION MAKING	HUMAN RESOURCE MANAGEMENT	RECRUITMENT	HUMAN RESOURCE
2017	1	1	0	0	0
2018	1	1	0	0	0
2019	1	1	0	0	0
2020	1	1	0	0	0
2021	4	1	1	0	0
2022	6	2	1	1	0
2023	8	2	1	1	0
2024	13	3	4	4	2
2025	15	4	4	4	3

Source: Authors own creation

5.2 Thematic Map
The density on the thematic map depicts the breadth of the network link and its inherent strength. A strategic overview of research topics in human resource management and artificial intelligence (AI) is given in Fig. 10, which is arranged according to the subjects' level of development and relevance. The motor themes in the top-right quadrant, including AI, HRM, and decision-making, indicate well-established and highly relevant research areas that are driving innovation in the field. These topics are central to current discussions and are

likely to remain influential. The basic themes in the bottom-right quadrant, including recruitment, HR management, and efficiency, are essential but less specialized, forming the foundational concepts upon which further research builds. Meanwhile, niche themes like future prospects, literature reviews, and systematic reviews occupy the top-left quadrant, showing that while they are highly developed, they are not as widely connected to other research topics. These themes are useful for academic analysis and bibliometric studies but do not form the core of AI applications in HR. Finally, emerging or declining themes such as technological change appear in the bottom-left quadrant, suggesting that while the concept is relevant, it is either an evolving area of research or one that may lose significance. This thematic map is valuable for researchers in identifying which areas are central, which are specialized, and which may present opportunities for new studies, helping them align their focus with high-impact topics in AI-driven recruitment.

Fig 10. Thematic map of the documents under study

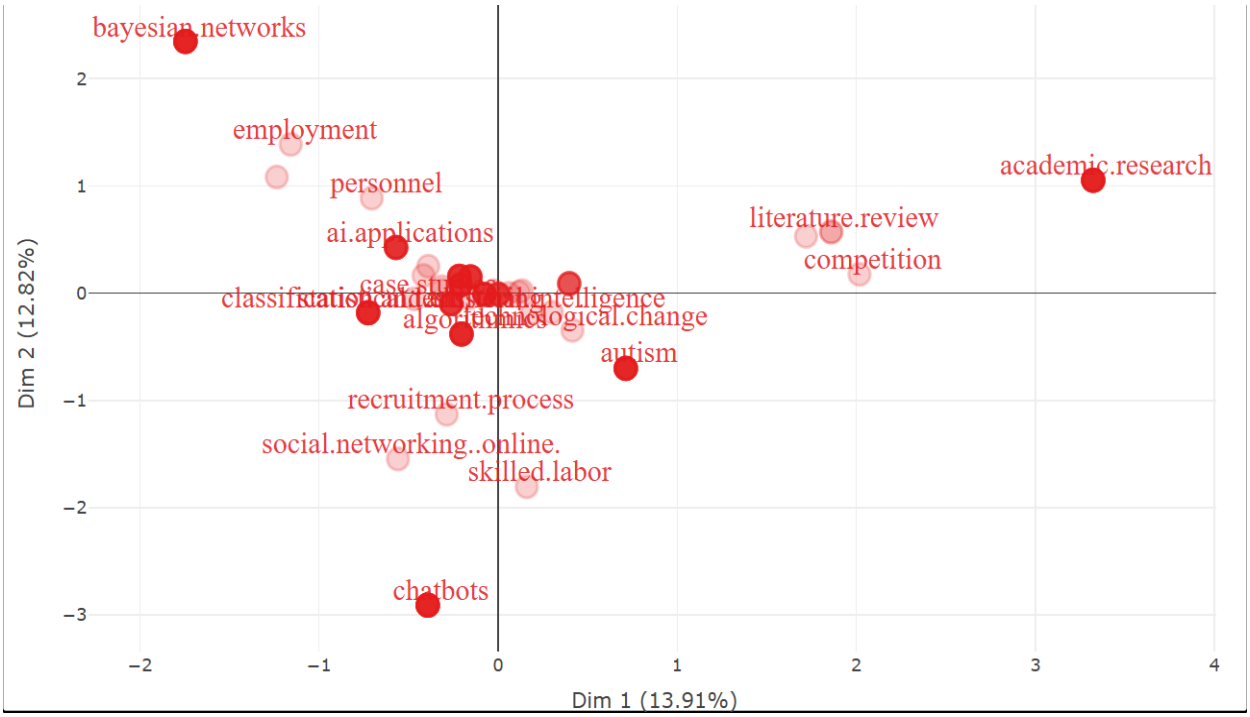


Source: Authors own creation

5.3 Factorial Analysis

Factorial analysis reveals key insights about the structure of relationships among variables. Fig 11. visualizes the connection between different keywords used in AI and HR research, positioning them based on their occurrence and co-word associations. The central cluster of keywords, including AI applications, classification, recruitment process, and social networking, highlights the main focus areas in AI-driven hiring, suggesting that research is primarily concerned with how AI enhances workforce selection and engagement. Distinctive outliers such as Bayesian networks indicate a focus on machine learning approaches in recruitment, while chatbots, appearing separately, reflect an evolving trend in AI-based HR automation. Additionally, academic research, positioned far from the main cluster, suggests a strong independent body of work analyzing AI's role in HR but with limited direct interconnection to core themes. The presence of autism as a research topic hints at AI's role in diversity hiring, showing that AI recruitment tools may also address inclusivity and accessibility in employment. This factorial map is instrumental in understanding how different research areas interconnect, helping scholars identify emerging trends, core discussions, and underexplored intersections. By analyzing this map, researchers can strategically align their work with dominant themes.

Fig 11. Factorial Analysis



Source: Authors own creation

PROPOSED RESEARCH DIRECTIONS

Taking cues from the thematic map and plethora of literature, future research should adopt multi-sectoral and cross-cultural approaches to AI-driven sustainable recruitment, ensuring broader applicability beyond limited HRM practices (Bedemariam, 2023). The motor themes (AI, decision-making, and HRM) suggest that AI is central to HR processes, but research must explore organizational culture, leadership support, and regulatory issues to enhance adoption and ethical implementation (Islam, 2024). Methodological advancements are needed, such as longitudinal studies to reduce biases from self-reported data and better track AI's impact over time (Elmohandes et al., 2024; Allal-Cherif et al., 2021). Ethical AI adoption remains underexplored, particularly in terms of fairness, transparency, and algorithmic bias, aligning with concerns raised in basic themes like personnel and employment (Bonomi Savignon et al., 2024; Yi PK, Ray et al., 2023). AI's role in shaping justice perceptions and efficiency in recruitment (found in central themes) should be examined across diverse demographic groups, fostering fairness and sustainability (Bonomi Savignon et al., 2024). Furthermore, the emerging themes, such as technological change, highlight the need for research into AI-human collaboration to ensure human-centric, inclusive hiring practices (Niehueser W et al., 2020; Wuisan DSS et al., 2023; Oberst U et al., 2021). Finally, addressing digital interactions in recruitment is crucial to mitigate the displacement of reality tests, ensuring AI enhances rather than replaces critical human judgment (Buranasing, A., 2020; Cardon, D., 2023; Cug, J., 2023; Fritts, M., 2021).

CONCLUSION

This research gives useful insights on how AI is used in human resource management practices specially in selection and recruitment to achieve sustainability. The bibliometric analysis using multiple bibliometric analysis tools, thematic mapping, keyword network visualization, and three-field analysis, uncovered key trends and research gaps. The findings reveal that AI-driven sustainable recruitment is gaining traction globally, but disparities exist in adoption across different regions. While AI enhances candidate screening and selection, concerns related to ethics, transparency, and human-AI collaboration persist which deviate from sustainability principles. The research underlines the criticality of reconciling AI-driven automation with human supervision to ensure fairness, inclusivity and sustainability. Future research should look into refinement of AI models, and exploring AI's sustainable influence on workforce diversity and organizational performance. By supplementing AI responsibly, organizations can optimize sustainable recruitment strategies while maintaining a human-centric approach to hiring.

7.1 Implications of the Study

Through a meticulous review of literature of 105 studies from prominent database Scopus, this bibliometric analysis offers valuable guidance uncovering novel perspectives on AI's practical applications in recruitment across diverse sectors. The potential benefits offered by AI into recruitment processes are also stated by (Kaushal, N., et. al (2021), Kaushal, N., et al., 2023) through their AIHRMI framework. Additionally, AI-powered recruitment tools can enhance efficiency, streamline candidate identification, and reduce time-to-hire for the employers. It can improve the candidate experience, bolstering employer branding and attracting top talent (Kot et al., 2021). Cost savings has been realized through task automation and reduced reliance on external recruitment agencies. However, ethical considerations are paramount. Establishing regulatory frameworks and adhering to ethical guidelines are epochal for maintaining trust, unity and sustainability in the recruitment process.

7.2 Limitations of the study

While this research offers priceless perceptivity into AI in sustainable recruitment, certain inhibitors should be addressed. First, there is a possibility of author bias, as the research relies on a single database that, while comprehensive, may not capture the full spectrum of relevant studies, leading to a limited dataset. Second, the study focuses exclusively on research articles; future research could spread the scope by integrating books, review papers, and book chapters for a more holistic perspective. Third, although bibliometric tools were utilized, integrating more advanced analytical techniques and empirical studies could yield deeper and more actionable insights. Lastly, adopting alternative methodological approaches, such as meta-analyses, could further enhance the study's rigor and provide a broader understanding of AI-driven sustainable recruitment trends.

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