Analysis of Research on Artificial Intelligence in Human Resources Management: A Bibliometric Analysis

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Abstract

This research aims to find contributors who have a major impact, observe the latest developments, and identify domains and supporting factors that can guide future research in the field artificial intelligence (AI) and human resource management integration. This research was conducted Within the framework of many activities and practices that are present in organisations. This study utilises a methodology that involves conducting bibliometric analysis and utilising the Biblioshiny app. The sample for analysis consists of 298 papers obtained from the Scopus database. The objective is to discover research that is still relevant to this theme. Three questions to be identified were drawn up that were performed on documents retrieved in the scopus database. It found that the main research focus in the field is still very little and despite the impact of artificial intelligence practices on human resources is enormous. Several studies have investigated stakeholder perspectives on the practice of applying artificial intelligence in the application of human resources. It is hoped that this research can provide guidelines and directions for the advancement of the use of AI in the field of HR for several organizations in the future.

Keywords: Artificial Intelligence, Bibliometric Analysis, Biblioshiny App, Human Resource Management.

Introduction

Artificial intelligence has been recognised as a creation in scientific literature since the 19th century. Currently, the awareness that the application of smart technologies dynamically changes the work environment is increasing among most professionals. The use of artificial intelligence has penetrated various industrial and professional sectors, including human resources management (1). In this era of globalization, traditional business practices are undergoing a paradigm shift. Today, not only local companies are competitors in competition, but organizations must also compete at the international level, given that lagging behind in technology can make a country's role less critical (2). Human resources are a factor that differentiates organizations because they are resources that competitors cannot see and imitate, thus providing the possibility of competitive advantage for any organization (3). Human resources management

Organisations choose a strategic orientation in response to shifts in the economic, political, social, and particularly technology domains (4, 5) However, not every department has fully embraced this novel function, and the implementation of strategies remains sluggish and frequently encounters challenges (6). In this case, the use of technology such as artificial intelligence requires the need to change in line with other aspects of society (7). Artificial intelligence plays a crucial role in organisations by enhancing the efficacy and efficiency of human resources management through the acceleration and accuracy of management procedures [8]. Artificial intelligence will activate the position and control of the data gathering process for human resources management, allowing this process to be integrated into the organization's economic plan and overall efficiency (9). The various areas that make up Human Resource Management in

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Artificial intelligence also plays a role in attracting high-potential individuals and evaluating them rapidly, investigating their eligibility according to job descriptions, designations, and estimates of additional value that can be provided to organizations (15). This is an integral part of the main task in the human resources management function (16). The integration of artificial intelligence and human resources management aims to provide benefits to managers in achieving better performance and improving intergenerational relationships (17).

Although the concept of artificial intelligence has been around for decades, attention to this concept began to emerge after the 1950s. In this period, the true prospects of artificial intelligence technology began to unfold. The philosophy of artificial intelligence and its technology implementation continues to evolve over time, with organizations experiencing improvements in their application (1). With the help of artificial intelligence, machines can learn through experience and handle tasks like humans (18). A multitude of domains have implemented artificial intelligence tools, including intelligent decision systems, fuzzy sets, and artificial neural networks (12). One of the areas where artificial intelligence is now being investigated is human resources management (19).

The implementation of artificial intelligence technology is a key trend in improving the productivity of human resources management in the future (20). However, in research related to human resources management, there are still shortcomings in an inclusive artificial intelligence execution framework, especially when combined with detailed analysis of The purpose of Human Resource Management is to analyse and evaluate the specific use of artificial intelligence (21). This research focuses on qualitative investigation with the aim to explain how artificial intelligence has been integrated in various human resources management functions and its impact on organizational focus and Human Resources. By reviewing various research articles, this study aims to identify major trends, patterns, and motifs that appear in the discipline of artificial intelligence in HRM. This essay will specifically address the following queries:

Q1: How much research on artificial intelligence in HRM has been developed in the last five years using the Scopus database?

Q2: How is the performance evaluation of various scientific entities in the fields of artificial intelligence and human resources management conducted, including sources, keywords, countries, affiliations, documents, and authors?

Q3: What possible avenues for artificial intelligence research in HRM might there be in the future?

The conceptual use of artificial intelligence in the field of human resources management is suggested in this article. The goal is to assist enterprises in adopting this technology and enhancing the effectiveness of human resources management. The

research will give a thorough overview of the field by evaluating the body of existing literature and applying bibliometric analysis. This will aid in developing future research agendas and policy initiatives that center on artificial intelligence and human resources management. The study's conclusions may serve as a source of motivation and direction for people, groups, and decision-makers as they adopt and advance green solutions for a more environmentally friendly world.

Methodology

Examine the search outcomes on Scopus

Conduct an examination using VOSviewer and Biblioshiny software, using the BibTeX file format

Draw analytical conclusions

- Retrieve papers from the Scopus database using the keyword "Artificial intelligence and human resources management".
- The number of publications that appear according to keywords is 1.394 .publications

- Filtering publications with restrictions in the form of year, Artikel, Final, and language
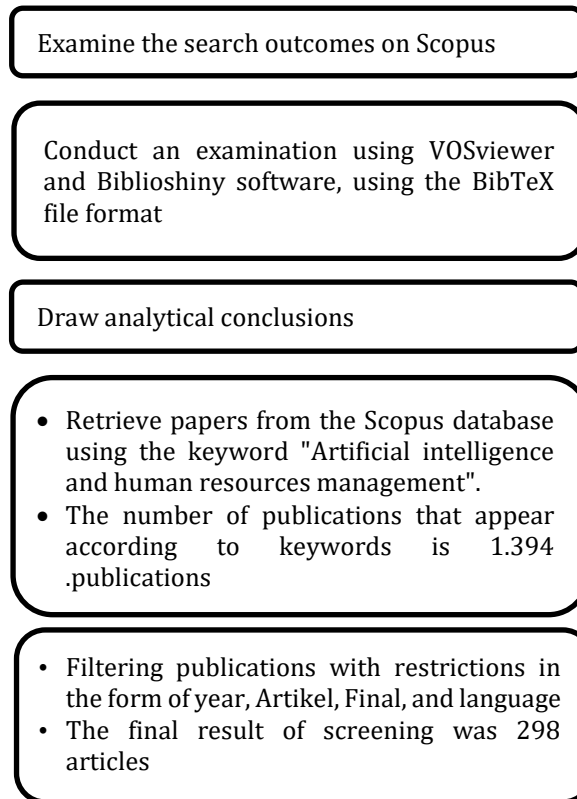- The final result of screening was 298 articles

Figure 1: Research Methods

This study employs bibliometric tools to analyse research on artificial intelligence in the field of human resources management. The research data comes from scientific articles published in Scopus within 5 years.

The articles are selected based on keywords relevant to the research topic. The Biblioshiny app and VOSviewer programme are used to analyse the filtering results after they are stored in CSV, RIS, and BibTex file formats. This study adheres to the methodical approach put forth by (22).

To filter search results more carefully, advanced search strategies are used. This approach exclusively takes into account English-language materials and concentrates on keywords, article titles, and abstracts. The analysis just looks at journals and papers. The combination of keywords to produce the desired search results is shown in Figure 1. A crucial component of any bibliometric analysis is data sources. The six steps of the literature review process are as follows. The procedures for carrying out a literature review are as follows:

Information search has been narrowed as a result of the subject of this literature review—artificial intelligence in human resources management, as illustrated in Figure 1. Abstracts, keywords, article titles, and other data are included in the search results, which are exported from Scopus in the BibTeX, CSV, and RIS file formats. To conduct more in-depth research analysis, the BibTeX file is loaded as a data source into the biblioshiny programme. VOSviewer is used to analyse networks, including co-author relationships and shared citations, in addition to biblioshiny. Among the 298 chosen articles, the

data source's oldest paper is from 2019, suggesting that study on artificial intelligence and HRM has been done since then.

Result and Discussion

Q1: How much research on artificial intelligence in HRM has been developed in the last five years using the Scopus database?

Citations Per Year

The use of citations is one method that can be used to evaluate the extent to which a scientific publication affects and is of high quality. Citation trends from 2019 to 2023 are shown in Figure 2. This graphic serves to highlight the variations in citations that take place inside that specific area. When evaluating the impact and influence of published scientific works in the subject, the information in this image can be helpful. This picture can also be useful in determining significant years or occasions that have an impact on the domain's citation count.

Figure 2 illustrates that the number of citations experienced a steady increase from 2019 and then experienced a sharp spike in 2022 and 2023. This increase could reflect significant developments and recognition in the field of artificial intelligence research in human resources management over the past few years, as published data becomes available.
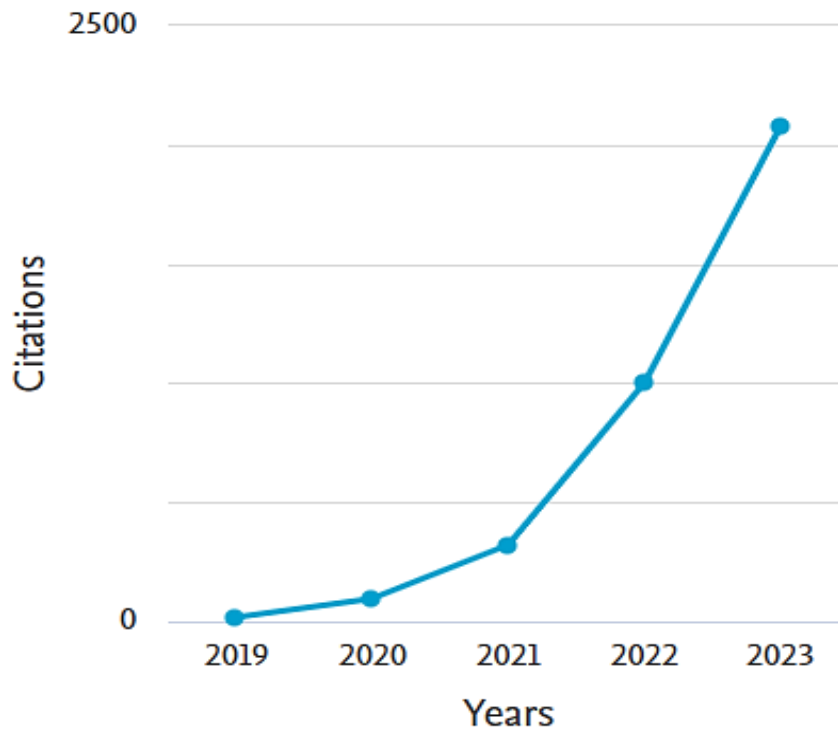

Figure 2: Evolution of the citations per year

Publication Per Year

This graph is a representation in the form of a line chart showing the number of documents published each year from 2019 to 2023. The source of the graph data comes from Scopus, a scientific database owned by Elsevier B.V. The chart pattern shows that the number of published documents continues to increase consistently year after year, peaking in 2023. These charts can be used as an analytical tool to understand trends and developments in scientific research in various fields during that time period.

Figure 3 illustrates the amazing trend in the evolution of articles about artificial intelligence in HRM over the past five years. A consistent increase from 2019 to 2023, with a peak in 2023, is shown in Figure 3. It's interesting to note that the number of publications did not decline from 2019 to 2021 throughout the COVID-19 pandemic, suggesting the study's endurance and ongoing interest.
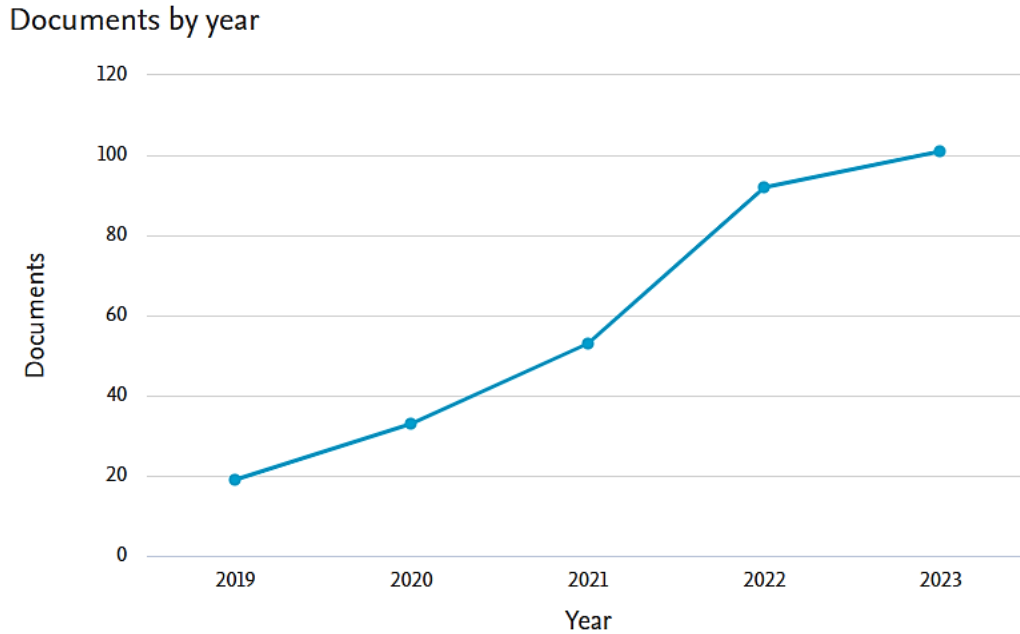
Documents by year

Figure 3: Number of Papers Published on Green Human Resource Management

Documents Per Year by Source

A line graph comparing the quantity of documents from ten distinct sources is shown in Figure 4. The graph shows many lines for each source, with the years 2019 through 2023 represented on the x-axis, and the quantity of papers is shown on the y-axis. These sources—which are distinguished by colour coding—include IEEE Access, Sensors, Asia Pacific Journal of Human Resources, International Journal of Human Resource Management, and Human Resource Management Review. The overall rise in documents for all sources over time is depicted in this graph. To comprehend publishing patterns in the area of artificial intelligence in human resources management, utilise Figure 4 as an analytical tool. Finding the most active and fruitful sources in the topic of research can be aided by the information in this figure.

Q2: How is the performance evaluation of various scientific entities in the fields of artificial intelligence and human resources management conducted, including sources, keywords, countries, affiliations, documents, and authors?

Q3: What are the potential future research directions in artificial intelligence in human resources management?

Most Relevant Affiliations

Affiliates for a certain period of time. This table provides data on the relative contribution of each affiliate to the production of documents. The importance of this table lies in its ability to provide an understanding of the role and contribution of each affiliate in producing a particular literature or document. This kind of analysis can help identify the most active or influential affiliations in a particular area of research or topic.

Table 1 data indicates that throughout the previous five years, the use of artificial intelligence in HRM has resulted in an increase in publications, with a total of 298 publications. Aston University and Clemson University have the same number of articles, namely 6 articles, then Arizona State University, Carnegie Mellon University, and Sungkyunkwan University have 5 articles each, Fudan University, Macquarie University, Neoma Business School, and University of Turin with 4 articles, and Aarhus University with 3 articles.
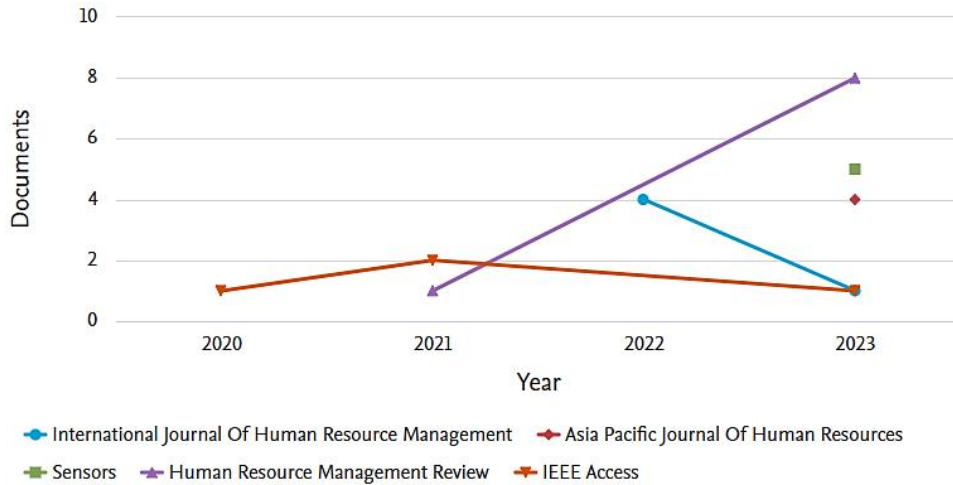
Figure 4: Top 10 Research Publication Sources

Table 1: Most Relevant Affiliations

Affiliation	Articles
Aston University	6
Clemson University	6
Arizona State University	5
Carnegie Mellon University	5
Sungkyunkwan University	5
Fudan University	4
Macquarie University	4
Neoma Business School	4
University Of Turin	4
Aarhus University	3

This reflects the affiliate's significant contribution to research related to artificial intelligence in human resources management during that time period.

Three-Field Plot

A research methodology known as "bibliometrics" uses quantitative techniques and statistical analysis to find underlying patterns in the body of work that is available in the literature. This method works well, especially when used to mapping science, where its insights can provide light on a wide-ranging, intricate, and sometimes contentious area of study (23). Biblioshiny, an online bibliometrix interface, is used to produce three-dimensional graphs that illustrate author productivity through the application of Lotka's Law. Furthermore, biblioshiny is used to construct a word cloud that is derived from the most used word keys.

The flow of information between authors (middle field), publication source (left field), and keywords (right field) can be shown using Biblioshiny's three-field plot approach. In this analysis, only a few entities from each of the fields are taken into consideration for more effective visualisation. This method offers a thorough summary of the relationships and organisation found in the scientific literature on a certain subject.

From Figure 5, it can be concluded that the majority of articles in this study are related to "related to artificial intelligence then deep learning data mining and Human resource management" and most of
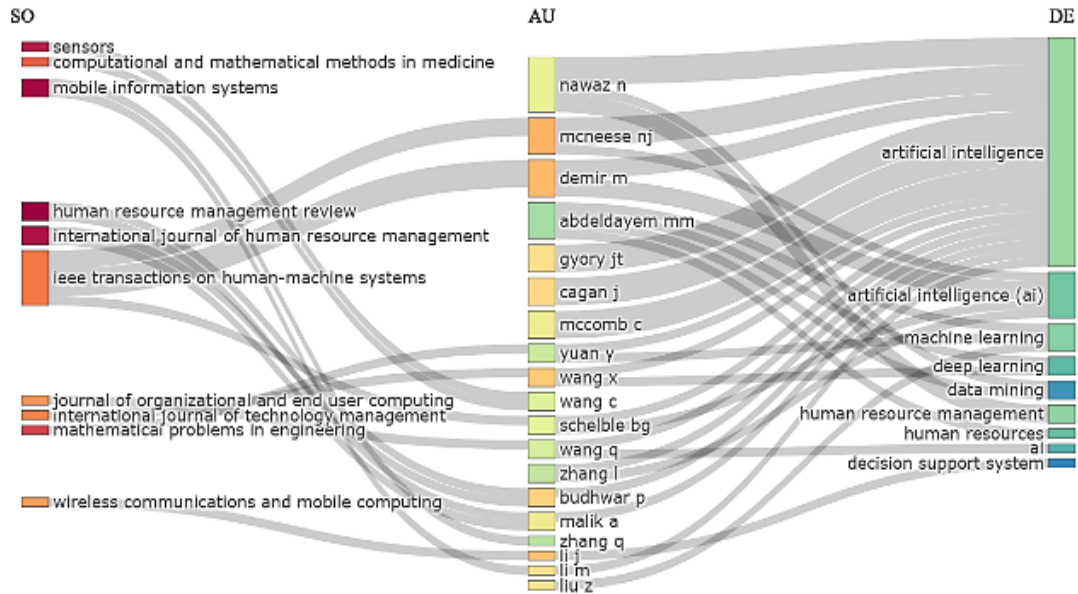
Figure 5: Three-field Plot (Left Field: Sources of Publication; Middle Field: Author; Last Field: Keywords) Using Biblioshiny App

These articles are published in "Lee Transactions on Human-Machine Systems, Human Resource Management Review, International Journal of Human Resource Management and Mobile Information Systems". The authors who have written the most articles in the fields of artificial intelligence and human resource management are Nawaz N, McNeill NJ, and Abduldayem MM.

Author Productivity Through Lotka's Law

The number of documents written by each author is displayed in the table below. The table consists of two columns, namely: Documents written, which is the number of documents written by the author.N. of Authors, which is the number of authors who wrote the document and Proportion of Authors, which is the proportion of the number of authors to the number of documents written.

Table 2 indicates that the vast majority of documents

(92.6%) are authored by a single individual. This shows that research in the field is generally done by individuals, not by teams. The number of documents written by two authors is relatively small (5.5%). This shows that research in this field is rarely carried out by small teams. The number of documents written by three or more authors is very small (1.9%). This shows that research in this field is rarely carried out by large teams.

Top Authors Production Over the Time

The following table shows the number of documents written by an author, as well as the productivity of that author. This table consists of 5 columns, Author, which is the name of the author. Year, which is the year of publication of the document. Freq, which is the number of documents written by the author in that year. TC, which is the total number of documents written by that author and TCpY, which is the number of citations received per document.

Table 2: Author Productivity through Lotka's Law

Documents written	N. of Authors	Proportion of Authors
1	898	0.926
2	53	0.055
3	15	0.015
4	3	0.003
5	1	0.001

Table 3: Top authors production over the time

Author	Year	Freq	TC	TCpY
Budhwar P	2022	1	49	24.5
Budhwar P	2023	2	43	43
Cagan J	2022	3	27	13.5
Demir M	2021	2	34	11.333
Demir M	2023	2	7	7
Gyory JT	2022	3	27	13.5
Li J	2021	1	28	9.333
Li J	2022	2	5	2.5
Li J	2023	1	10	10
Li M	2021	2	40	13.333

Table 3 shows that out of all the writers, Author Budhwar P. wrote the most documents (92 in total). Both Cagan J. and Demir M. are quite prolific authors; Cagan has written 27 papers while Demir has written 41. The output of other authors is modest; on average, they only write 12 documents.

Most Relevant Authors

Figure 6 is a dot graph showing the most relevant authors and the number of documents they wrote. A point graph is a type of graph that uses points to display the relationship between two variables. The x-axis represents the number of documents, and the y-axis represents the author. Axes are horizontal and vertical lines used to show the scale and categories of data. The blue dots represent data points. Data points are values resulting from measurements or observations of variables. Figure 6 shows the number of citations for each article by the author. The blue circle represents the most relevant citation, while the red circle represents the least relevant citation. Based on the graph, it can be concluded that the most prolific authors in artificial intelligence research in human resources management are McNeese, NJ, with 5 citations, then Demir MD, Li J, and Wang X, with 4 citations. These authors have published articles that are considered the most important works in artificial intelligence and human resources management research.

The paper has been widely cited by other researchers, who show that they have made significant contributions to the field. In addition, the graph also shows that research into artificial intelligence in human resources management has increased in recent years. This can be seen from the increase in the number of citations for articles published in recent years.

Most Relevant Sources

In Figure 7 This dot graph displays the quantity of documents for different sources. Each element of the image serves the following purposes: The number of is shown on the x-axis documents containing a particular source. The value of x ranges from 0 to 100. The greater the x value, the more documents that use that source. And the y-axis represents the names of different sources. These sources are scientific journals related to the fields of human resource management, information systems, technology, and social change. Eight labels make up the y-axis: ergonomics in manufacturing, human factors, international journal of human resource management, asia-pacific journal of human resources, mobile information systems, institutional journal of manpower, and human resource management review, technology forecasting and social change, strategic management journal. The blue dots represent data indicating the number of documents for each source. Each point has x and y coordinates corresponding to the number of documents and the source name.
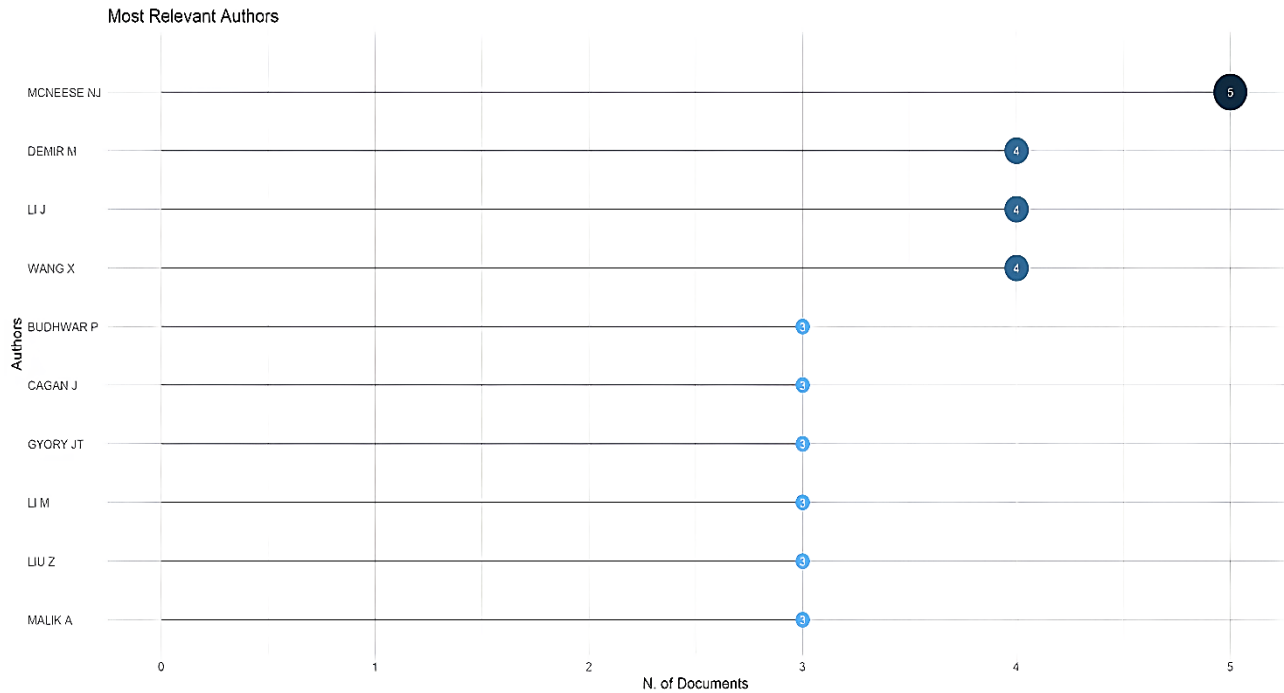
Most Relevant Authors

Figure 6: Most Relevant Author
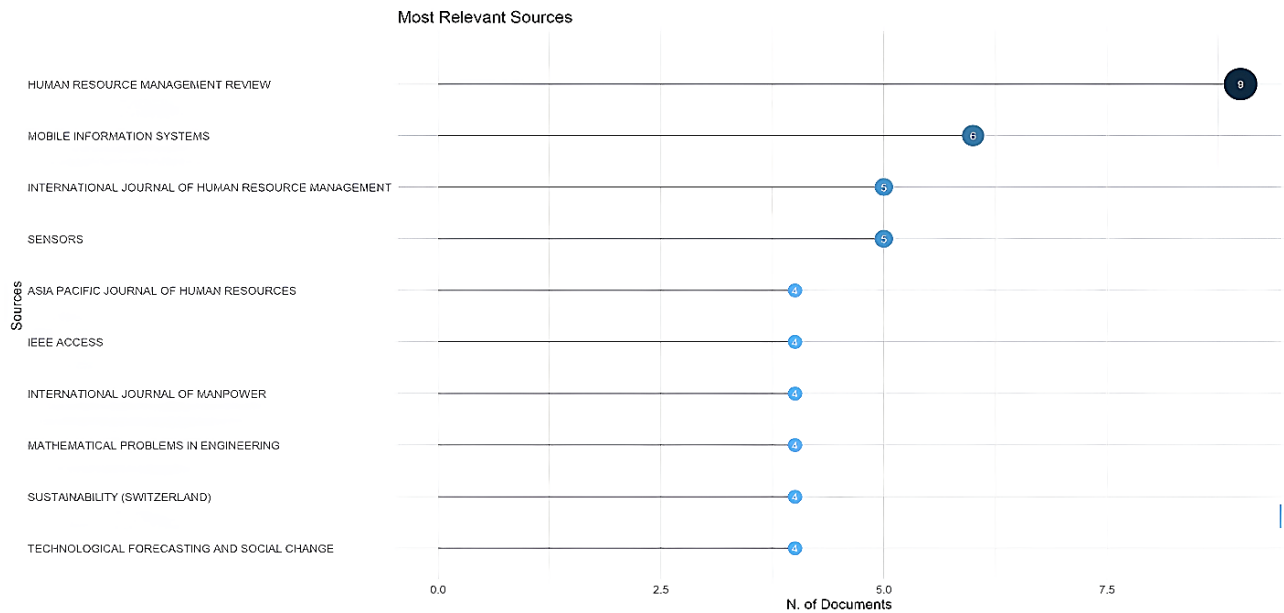
Most Relevant Sources

Figure 7: Most Relevant Sources

In Figure 7, the most relevant source is "Human Resource Management Review". This was followed by "Mobile Information Systems", "International Journal of Human Resource Management", "Sensors", "IEEE Access", "International Journal of Manpower", "Mathematical Problems in Engineering", "Sustainability (Switzerland)", and "Technological Forecasting and Social Change". Each of these sources has a different number of documents. The most widely used source is "Human Resource Management Review", with 7.5 documents. The least used source is "Technological Forecasting and Social Change", with 2.6 documents.

Word Cloud of Titles Using Biblioshiny App

This image is a word cloud that shows terms associated with artificial intelligence in HRM. A word cloud is a graphic aid that illustrates a text's word frequency or word importance. The magnitude of words reflects their frequency or importance, where larger words indicate a higher presence or importance than smaller words.

Figure 8: Word cloud

The visualization of the Biblioshiny Bibliometrix on Figure 8 package shows that keywords in the study of artificial intelligence in human resources still have a weak trend from 2019 to 2023. In visual representation using keywords, or Higher volume and density phrases are shown in a bolder, larger typeface. Therefore, through these keywords, we can obtain further visualized information related to the pattern and focus of keywords in research literature.

Country's Production on Research Articles

The following table 4 demonstrates the global production of research articles by nation. Based on how many research articles each nation produced in 2023, the table was created. The name of the nation is shown in the first column. The number of research publications published by the nation is displayed in the second column.

The third column shows each nation's share of the global production of scientific articles (SCPs). The contribution of each nation to the overall production of research publications in the field of science and technology (MCP) is displayed in the fourth column. The country's frequency of publishing research publications is displayed in the fifth column.

The sixth column shows the ratio of MCP's contribution to the total production of research articles by the country. Then Figure 9 is a global map that displays the output of science in various nations. This map's purpose is to display the scientific achievements of various nations. The quantity of scientific articles published in respectable journals by a nation's scholars is known as its scientific output. This map illustrates each nation's level of scientific productivity using varying shades of blue and blackness. The bluer it is, the higher the scientific production.

Table 4: Country's production

Country	Articles	SCP	MCP	Freq	MCP_Ratio
China	67	50	17	0.226	0.254
Usa	33	28	5	0.111	0.152
India	16	13	3	0.054	0.188
Australia	11	5	6	0.037	0.545
Italy	11	4	7	0.037	0.636
Germany	9	6	3	0.03	0.333
France	7	1	6	0.024	0.857
Korea	7	4	3	0.024	0.429
Malaysia	7	3	4	0.024	0.571

Table 4 shows that, with 67 research articles published worldwide in 2023, China is the nation producing the most research articles worldwide.

China also has the largest MCP contribution in the world, at 25.4%. The United States came in second with 33 articles, followed by India with 16. Indonesia is ranked 9th with 7 articles. Indonesia has an MCP contribution of 24%, which is the highest MCP ratio among countries in the top 10.

Co-occurrence of keyword

Co-occurrence of keywords in Vosviewer is a feature used to analyze relationships between keywords in a document. This feature can be used to identify keywords that often appear together, which can indicate the relationship between the topics covered in the document. Vosviewer's analysis of the figure shows a network of relationships between people and topics within the domain of administration of human resources. The network is depicted in the form of a map, with people represented by nodes and topics represented by links between nodes.
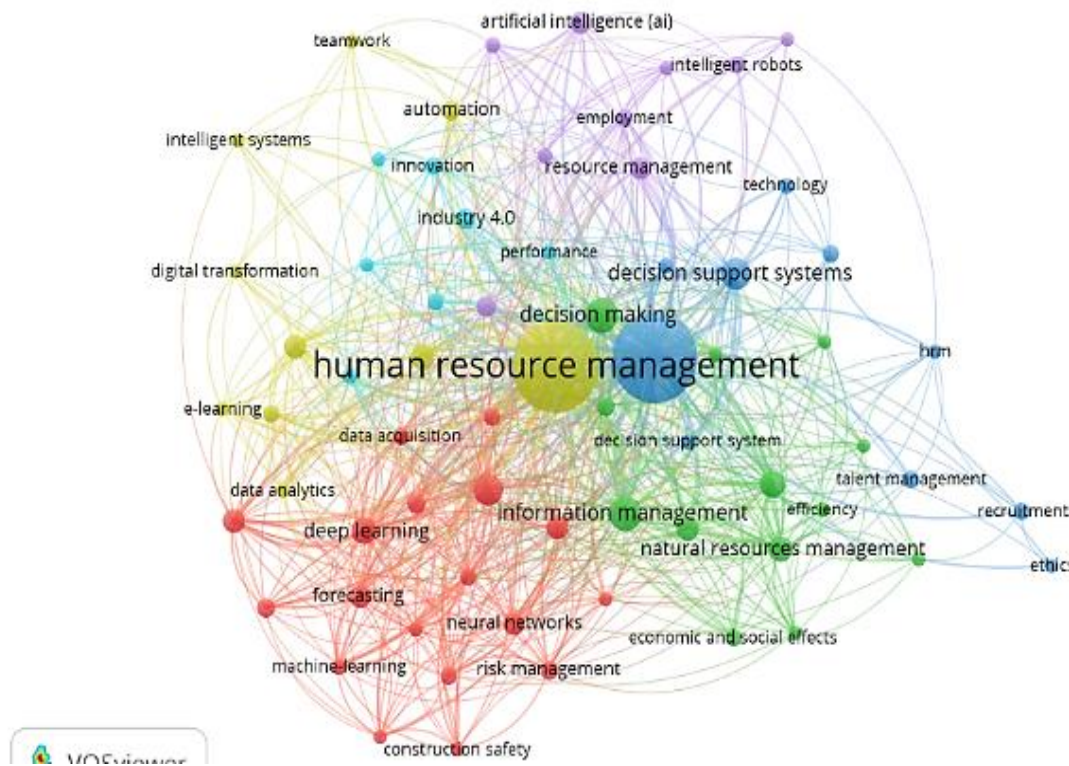

Figure 9: Co-occurrence of keyword

From the map, it can be seen that there are several topics that are the focus of human resources management research today. These topics are: Artificial intelligence has become one of the most in-demand technologies in human resources management. Artificial intelligence can be used for a variety of purposes, such as task automation, improving performance, and making better decisions. An intelligent system is a system that can learn and adapt. Smart systems can be used for a variety of purposes in human resources management, such as increasing efficiency, increasing productivity, and increasing employee satisfaction. Industry 4.0 is a digital transformation that is happening in the industry. Industry 4.0 has a significant impact on human resources management, as it demands changes in the way employees work and manage.

Overlay Visualization

Overlays are one of the three main visualization types in VOSviewer, in addition to network visualization and density visualization. Overlays serve to show traces of research history in a particular field or topic. These overlays are created using a technique called "co-citation analysis". Co-Citation analysis is a method for assessing how closely two things are related. documents based on

the frequency with which they are cited together in another document. Figure 10 analysis indicates a remarkable growth in research within the subject of human resource management in recent years. This can be seen from the many studies conducted using various keywords. Here are some trends in human resources management research that can be identified from the analysis, Technology development has become one of the main trends in human resources management research. This can be seen from the many studies that use keywords such as artificial intelligence, intelligent robots, automation, and intelligent systems. Digital transformation, digital transformation is also one of the main trends in human resources management research. This can be seen from the many studies that use keywords such as digital transformation industry 4.0, and data analytics. The role of human resources management in facing global challenges, Human resources management research is also increasingly focusing on the role of human resources management in facing global challenges, such as climate change, economics, and social. This can be seen from the many studies that use keywords such as sustainability, environmental management, and economic and social effects.

Discussion

Extensive studies have been conducted to track the evolution of artificial intelligence and human capital from 2019 to 2023. The literature on artificial intelligence and human resources is widely read, highlighting various obstacles and limitations in its effective application. This study aims to contribute to theoretical understanding by conducting a comprehensive literature review and analyzing papers published in this field during the aforementioned years.

The aim is to present a holistic view of the practice of artificial intelligence in human resources and analyze the accumulated knowledge from previous years. In this investigation, 298 papers related to artificial intelligence and human resources were carefully selected, thus forming a series of key features in the presentation of results. The impact of artificial intelligence practices on human resources is enormous. Several studies have investigated stakeholder perspectives on the practice of applying artificial intelligence in the application of human resources.
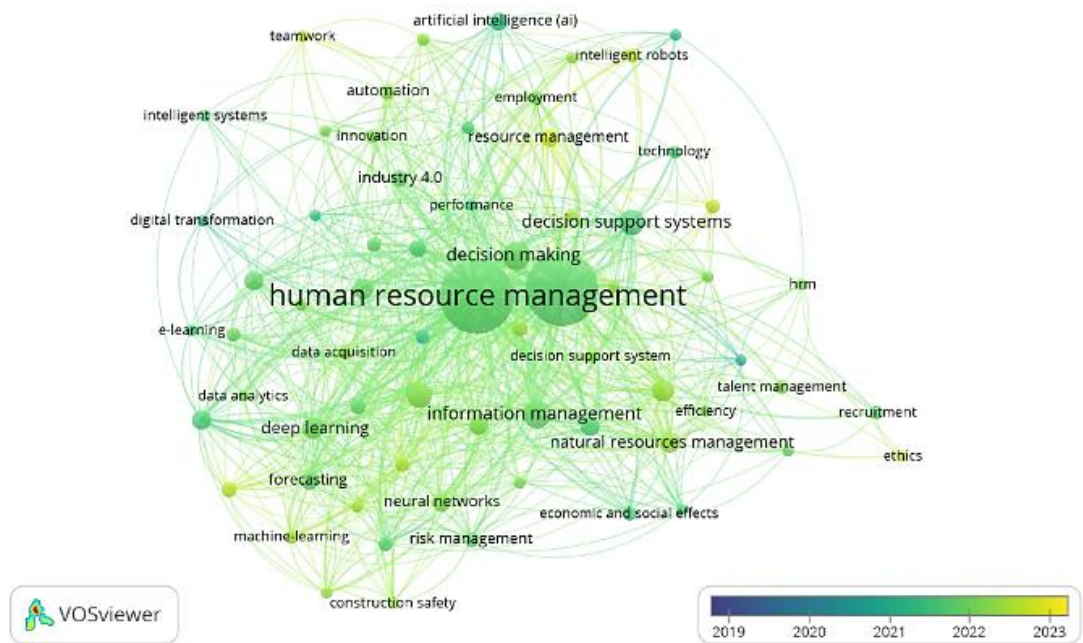

Figure 10: Overlay

Conclusion

The aim of this research is to shed light on the ways in which artificial intelligence is incorporated into different HRM tasks. The objective of this model is to offer suggestions and directives for growing the use of artificial intelligence in HRM to various types of implementers in organizations. There are two implications of this study.

The AI and HRM functions produced in this study provide significant insights to practitioners, helping them gain a better understanding of how AI technology might enhance the effectiveness of several HRM functions. Furthermore, it enables individuals to comprehend the significance of AI technology when combined with HRM practices in order to attain a lasting competitive edge.

Furthermore, this article has provided a comprehensive analysis of the interconnections between human resource management (HRM) and AI. This knowledge can assist professionals in developing and formulating more effective strategic visions regarding the implementation of AI/machine learning's effects on the labour market, an area that has historically received little attention in developing nations.

Limitations

This study uses bibliometrics to analyze artificial intelligence and human resources management as a basis, by determining and covering search terms relevant to the topic and obtaining 298 selected papers from the Scopus database in the 5-year period 2019–2023. The results may be different if the researcher uses different keywords. Reviewing existing knowledge is an important step in this method. Although the study consisted of 298 articles taken Although the Scopus database had shortcomings, it was nevertheless utilised. In the future, a more comprehensive investigation could be conducted, incorporating databases such as WoS. Furthermore, the study employed solely two software programmes, namely Biblioshiny and VOSviewer. The literature has been categorised into five research groups using the Biblioshiny programme, as determined by researchers.

The study's inability to comprehend the various theories applied in the primary research topic is another significant shortcoming. Nonetheless, this study employs the relevant and essential theory.

Additional investigation into this field may reveal other novel facets. This work is an early attempt to give a comprehensive assessment of the research undertaken on artificial intelligence and human resources management functions, despite the constraints previously indicated. It presents an entire stream of topical knowledge and indicates paths for future academics to pursue when they want to look into new subjects. This will support the growth and advancement of this topic's research.

Abbreviation

Nil

Acknowledgment

Nil

Author Contributions

The authors take complete responsibility for the following: 1) Edi Fajar Alidarma Wijaya: contributed to the study by overseeing the conception and design, collecting data, analysing and interpreting the results, and preparing the manuscript. 2) Ika Nurul Qamari: Responsible for the conception, analysis, and interpretation of results, as well as editing and final proofing.

Conflict of Interest

The article's content is guaranteed and the authors bear responsibility for it. Each author works in collaboration without any conflict of interest.

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Not applicable

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