A BIBLIOMETRIC ANALYSIS OF ELECTRONIC HUMAN RESOURCE MANAGEMENT E-HRM IN SCOPUS DATABASE

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Purpose: This study aims to Analyze the articles published in SCOPUS database relevant to EHRM. Toward future expanding and exploration to the EHRM area and shows the critical details about the relevant literature.

Design/Methodology/Approach: A bibliometric analysis for the articles published in SCOPUS database, contains the countries of the publications, authors, author's nationality, number of articles been published according to authors and authors nationality, keywords, most repeated words and furthermore.

Findings: The outcomes of the analysis asserted that there is a lack of publications in general, the researchers of the publications were students and from educational institutions. Malaysian an Jordanian universities were amongst the highest papers published in EHRM. The importance of EHRM was clarified as well according to the previous literature. EHRM could simplify the HRM functions, cut costs, improve performance, generate a systematic HR function, and utilizing or integrating the information technology and HRM.

Research, practical & social implications: the implications of EHRM are beneficial for the fields and organizations which they use it, it's the modern method to practice the HR functions which it might make the accessibility of the HR functions from the organizations and customers, suppliers and stakeholders.

Originality/Value: The paper contributes to the body of knowledge and guide the researchers toward valuable future research and filling up the several gaps in the area of the study.

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UMA ANÁLISE BIBLIOMÉTRICA DA GESTÃO ELETRÔNICA DE RECURSOS HUMANOS NA BASE DE DADOS SCOPUS

RESUMO

Objetivo: Este estudo visa analisar os artigos publicados na base de dados SCOPUS relevantes para a EHRM. Rumo à futura expansão e exploração da área do EHRM e mostra os detalhes críticos sobre a literatura relevante.

Design/Metodologia/Abordagem: Uma análise bibliométrica para os artigos publicados na base de dados SCOPUS, contém os países das publicações, autores, nacionalidade do autor, número de artigos publicados de acordo com a nacionalidade dos autores e autores, palavras-chave, a maioria das palavras repetidas e, além disso.

Constatações: Os resultados da análise afirmaram que há falta de publicações em geral, os pesquisadores das publicações eram estudantes e de instituições educacionais. Universidades malaias e jordanianas estavam entre os

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mais altos artigos publicados na EHRM. A importância da EHRM também foi esclarecida de acordo com a literatura anterior. A EHRM poderia simplificar as funções da HRM, reduzir custos, melhorar o desempenho, gerar uma função sistemática de RH e utilizar ou integrar a tecnologia da informação e a HRM.

Investigação, implicações práticas e sociais: as implicações da EHRM são benéficas para os campos e organizações que eles usam, é o método moderno para praticar as funções de RH que pode tornar a acessibilidade das funções de RH das organizações e clientes, fornecedores e partes interessadas.

Originalidade/Valor: O artigo contribui para o corpo do conhecimento e orienta os pesquisadores para pesquisas futuras valiosas e preencher as várias lacunas na área do estudo.

Palavras-chave: E-HRM, Gestão Eletrônica dos Recursos Humanos, Bibliométrica.

UN ANÁLISIS BIBLIOMÉTRICO DE LA GESTIÓN ELECTRÓNICA DE RECURSOS HUMANOS E-HRM EN LA BASE DE DATOS SCOPUS

RESUMEN
Objetivo: Analizar los artículos publicados en la base de datos SCOPUS relevantes para la EHRM. Hacia la futura expansión y exploración hacia el área de la EHRM y muestra los detalles críticos sobre la literatura relevante.

Diseño/Metodología/Enfoque: Un análisis bibliométrico de los artículos publicados en la base de datos SCOPUS, contiene los países de las publicaciones, autores, nacionalidad del autor, número de artículos publicados según autores y nacionalidad de los autores, palabras clave, palabras más repetidas y además.

Hallazgos: Los resultados del análisis afirmaron que existe una falta de publicaciones en general, los investigadores de las publicaciones fueron estudiantes y de instituciones educativas. Las universidades malasias y jordanas estuvieron entre las más altas publicadas en EHRM. También se aclaró la importancia de la EHRM de acuerdo con la literatura previa. La gestión de recursos humanos podría simplificar las funciones de gestión de recursos humanos, reducir costos, mejorar el rendimiento, generar una función sistemática de recursos humanos y utilizar o integrar la tecnología de la información y la gestión de recursos humanos.

Implicaciones de investigación, prácticas y sociales: las implicaciones de la EHRM son beneficiosas para los campos y organizaciones que la utilizan, es el método moderno para practicar las funciones de RRHH lo que podría hacer la accesibilidad de las funciones de RRHH de las organizaciones y clientes, proveedores y partes interesadas.

Originalidad/Valor: El trabajo contribuye al cuerpo del conocimiento y guía a los investigadores hacia una valiosa investigación futura y llenando las varias lagunas en el área del estudio.

Palabras clave: E-HRM, Gestión Electrónica de Recursos Humanos, Bibliométrico.

INTRODUCTION

The human capital is the most vital and affective source of development and consistency in the firms. The more tendency to improve the human capital in the firms is targeting higher productivity, effectiveness, and efficiency which could achieve the competitive advantage in the market. Throughout the current use of internet the things and using the technology in all of our daily life led the specialist and experts in human resource management to think about the role of technology in the field. Therefore, the researcher explored the databases published articles in electronic human resource management, not that much of articles been published which encouraged the authors to do Bibliometric review for the topic. The practical contribution of this research is highlighting the significancy of turning the function of human resource management to electronic which ensure the higher activation for the human resource department and that would be reflected on higher performance, employee retention, employee

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satisfaction, financial and non-financial profits, satisfaction of both employees and customers, organizational goals achievement. On the other hand, the theoretical contribution is guiding the future research to the area and industries to be observed and explored, the enrichment of the literature related to this area and that will contribute in building up a base for the future research discussions and arguments.

Background

With the rapid development to all of the fields, human resource management amongst the social science fields been affected by the recent technology. The integration of human resource activities and computer shows the importance of technology to facilitate and ease the human resource management activities (Zhou, et al., 2022). Thus, the diversity and changes in the mentality of the human resource management departments causing the necessity of adapting the recent human resource implications (Syarief, et al., 2023). Basically, human resource management and development is the vision for most of the countries having strategic plans contain talented, skilled, experts, efficient, effective and productive employees (Ibrahim, et al., 2023A; Ibrahim & Ali, 2021; Ibrahim, et al., 2022). The quality and high performance in the human resource management functions such as recruitment, selection, rewards and compensations and performance appraisal identifying the future of the organizational performance (Kiran, et al., 2022; Akhtar, et al., 2023). Therefore, the organizations adapting the TOP model (Technology, Organization, People) in the firms to improve the total organizational performance through the human capital as the main source of creativity and innovation. According to Al-Alwan, et al., (2022) Ibrahim, et al., (2023B) the suggested model of using E-HRM outcomes were as there is additional positive impact on the employees and employment flexibility in term cooperation, coordination and usability of the employees and the recruitment. As well as, in the same paper positive effects were as access to organizational assets, flexible use of sources and self-employees efficiency etc.

Furthermore, this study to enrich EHRM literature to encourage the future researches to suggest applicable models in the different industries. the Implications of EHRM is not yet used and popular amongst the countries and industries all over the world. This review would identify the situation of the countries and industries to concentrate on the field as well as the researchers in the different countries to provide more research on their countries and industries to get along with the recent development in human resource management.

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MATERIAL AND METHODS

Methodology

The bibliometric analysis method embodied in the application of quantitative techniques (i.e., bibliometric analysis) on bibliometric data (e.g., units of publication and citation) (Broadus, 1987). Using the keywords Electronic human resource in SCOPUS data base to be applied on the abstract and keywords of the publications.

Data Selection

Table below shows the main information of the article data, which represents the period of the data, which is 2004:2023, the total sources, which amounted to 67, the number of documents that reached 80 articles, in addition to the number of local and international contributing authors, which amounted to 202 and the percentage of their citations for all years and during the year. This, in turn, provides an opportunity to describe the data collected for this article.

Table 1: Data Main Information

MAIN INFORMATION ABOUT DATA	
Timespan	2004:2023
Sources (Journals)	67
Documents	80
Annual Growth Rate %	7.57
Document Average Age	5.52
Average citations per doc	8.1
References	3125
DOCUMENT CONTENTS	
Keywords Plus (ID)	158
Author's Keywords (DE)	232
AUTHORS	
Authors	202
Authors of single-authored docs	13
AUTHORS COLLABORATION	
Single-authored docs	13
Co-Authors per Doc	2.89
International co-authorships %	21.25
DOCUMENT TYPES	
	1
Oliver	1
Article	53
Book Chapter	3
Conference Paper	14
Conference Review	1

Source: Prepared by the author 2023

RESULTS AND DISCUSSION

Additionally, the first figure below illustrates the distribution of 80 publications on the topic of E-HRM indexed in Scopus from 2004 to 2023. The analysis of the annual variations in the total number of publications indicates a consistent growth rate of approximately 15%. There has been a substantial increase in scientific production in recent years (2018 to present), with more than 80% of the selected articles published during this period. The research on this subject began slowly, with production extending only until 2017, accounting for approximately 18% of the total production. Despite some minor fluctuations, there is an overall trend of growth in scientific production, with the highest number of works being published in 2021 (about 19% of the total records). The significant number of indexed articles in 2022 suggests that the topic continues to be prominent in international E-HRM literature.

Figure 1: Annual Scientific Production
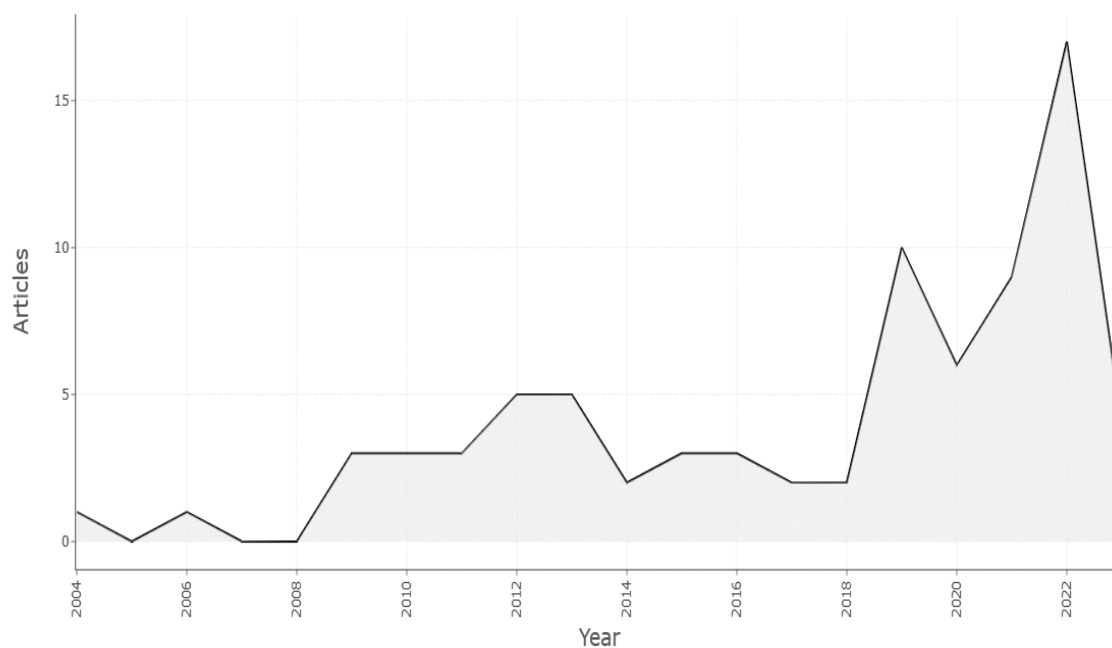
Source: Prepared by the author 2023

Moreover, the following figure illustrates the impact of published articles on the topic from 2004 to 2023, measured in terms of average citations per year. The analysis shows that the highest average number of citations occurred during the years 2008 and 2010. In 2009, the average number of citations per year was even higher due to the inclusion of one highly cited article by Stone & Lukaszewski (2009). Similarly, the peak in 2009 was the result of another highly cited article by Bondarouk & Ruël (2009), which received the highest number of citations in this dataset. Additionally, an article by Stone & Dulebohn (2013) has been one of

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the most frequently cited documents, contributing to the increasing trend of average citations per year. Notably, these three documents are the top three most cited articles in this research.

Figure 2 Average Citation Per Year
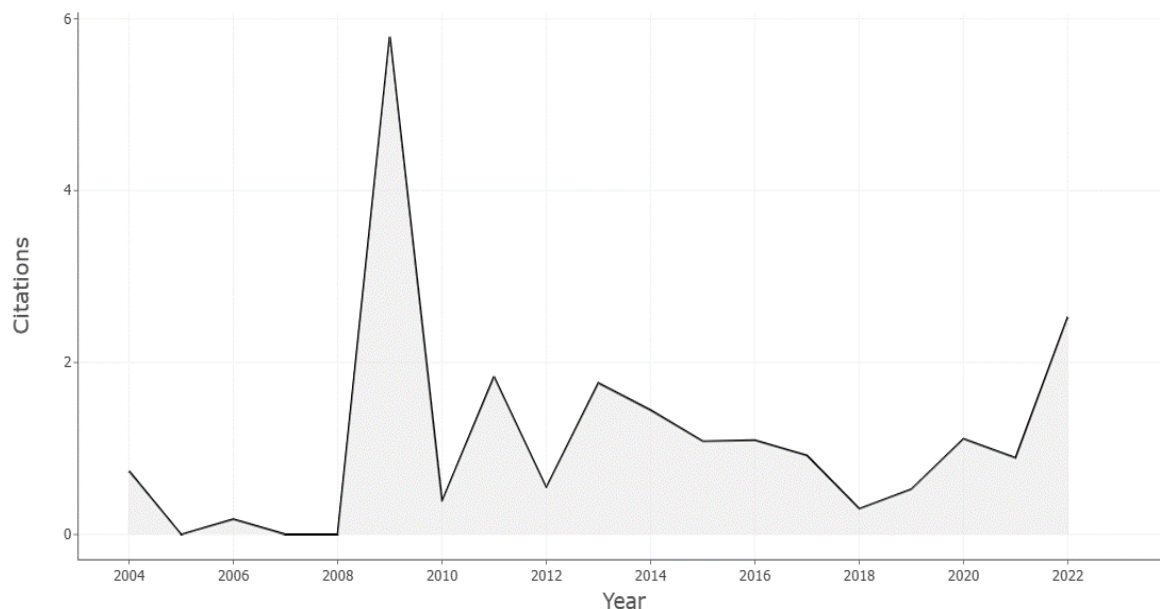
Source: Prepared by the author 2023

The figure below illustrates a Sankey diagram with three fields that displays the countries, keywords, and years of publication of the cited references. This diagram offers a visual depiction of the distribution of research topics and the recency of the papers cited for each country. Most of the research papers discussing E-HRM were published by Costa Rica (CR), Australia (AU), and Germany (DE), although the USA and South Africa are the primary contributors, despite the limited number of research papers on E-HRM. Furthermore, the diagram highlights that "Information Technology" and "Employee performance" are the most frequently used keywords, which are primarily associated with the most cited reference in the study.

Figure 3 Three-Field Plot
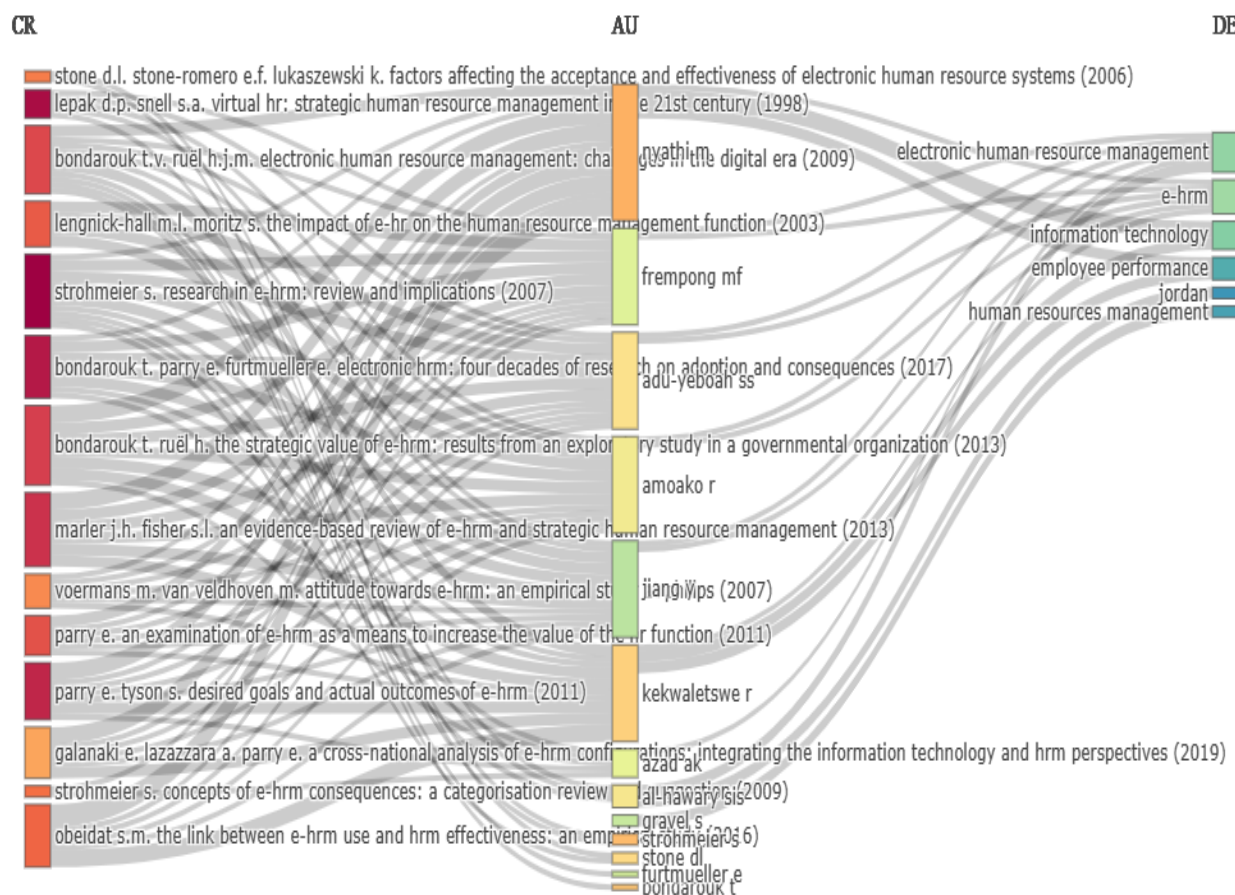
Source: Prepared by the author 2023

The Figure below displays a graphic representation of the trends in authors most frequently used journals. These journals started to emerge in research around 2004 and have since continued to grow. Some journals, including "Studies in Computational Intelligence" and "Asian Social Science," experienced a significant increase in popularity after 2011. This suggests that the adoption of E-HRM is growing among authors in this field.

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Figure 4 Source Dynamics
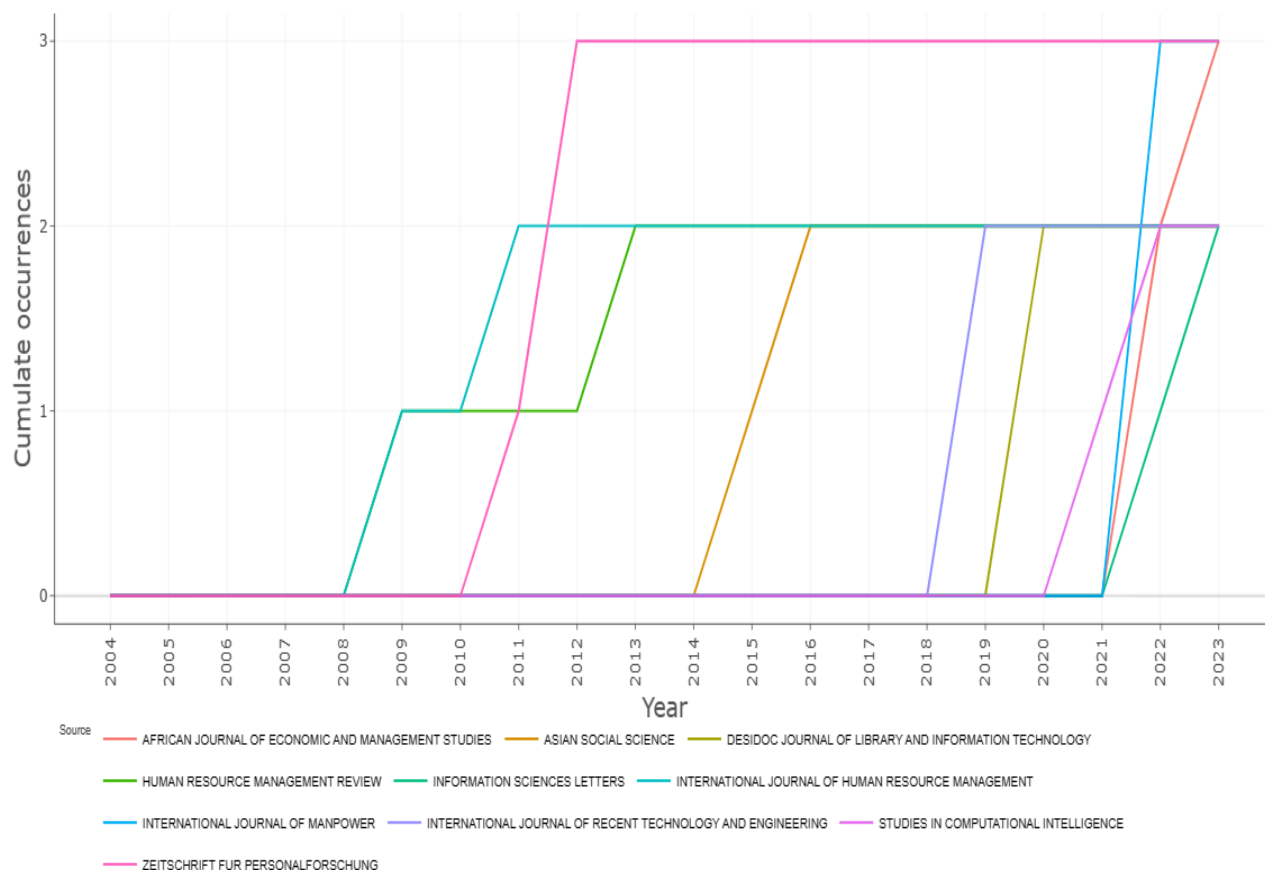
Source: Prepared by the author 2023

Most Relevant Authors

This section presents the results of an analysis of authors who have conducted research on E-HRM, focusing on the most relevant ones. Figure below illustrates the number of publications by the top ten authors who have published the highest number of articles on E-HRM. The figure reveals that Nyathi M and Strohmeier S had four publications. Other highly relevant authors include Bondarouk T, Kekwaletswe R, and Stone DL, with three articles each. It is worth noting that even though some authors have not published many articles, their contributions to the field have been valuable.

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Figure 5 Most Relevant Authors
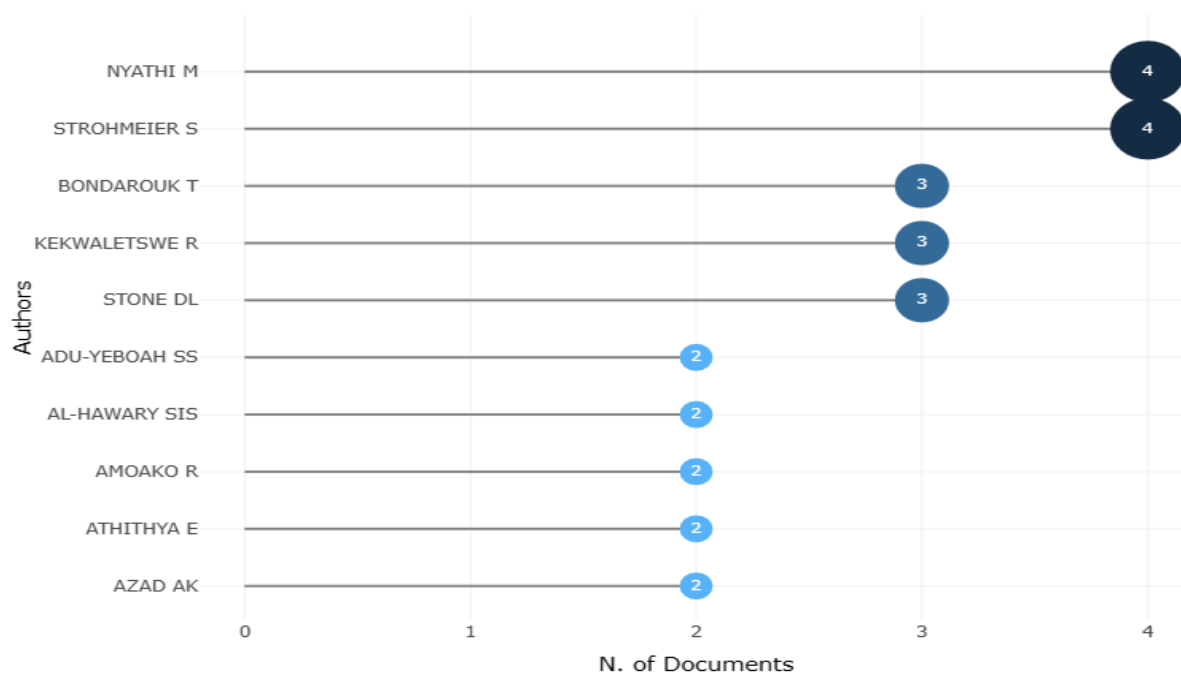
Source: Prepared by the author 2023

Most Relevant Affiliation

The following table shows the authors of E-HRM related papers mainly from the Universiti Malaysia Terengganu (Number of articles = 9), Amman Arab University, DRDO-Combat Vehicles Research and Development Establishment, Hefei University of Technology, and University of Twente (N = 6 articles for each university), Al Al-Bayt University (N = 5), Saarland University and University of South Africa (N = 4 for each university), and Al Zaytoonah University of Jordan and Applied Science University (N = 3 for each university).

Table 2 Most Relevant Affiliations

Affiliation	Articles
UNIVERSITI MALAYSIA TERENGGANU	9
AMMAN ARAB UNIVERSITY	6
DRDO-COMBAT VEHICLES RESEARCH AND DEVELOPMENT ESTABLISHMENT	6
HEFEI UNIVERSITY OF TECHNOLOGY	6
UNIVERSITY OF TWENTE	6
AL AL-BAYT UNIVERSITY	5
SAARLAND UNIVERSITY	4
UNIVERSITY OF SOUTH AFRICA	4
AL ZAYTOONAH UNIVERSITY OF JORDAN	3
APPLIED SCIENCE UNIVERSITY (ASU)	3

Source: Prepared by the author 2023

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Most Relevant Countries

This section examines the scientific production of different countries and the corresponding author's country based on bibliometric analysis. Table three displays the Country Scientific Production related to the research criteria, and the countries with the highest frequency are India (Freq = 27), Jordan (Freq = 25), Malaysia (Freq = 22), and China (Freq = 19). Additionally, figure six illustrates the Corresponding Author's Country, with the red bars representing multiple country publications (MCP) and the turquoise bars indicating single country publications (SCP).

Table 3 Country Scientific Production

Region	Freq
INDIA	27
JORDAN	25
MALAYSIA	22
CHINA	19
IRAN	16
GERMANY	12
IRAQ	12
SOUTH AFRICA	11
USA	9
BANGLADESH	8

Source: Prepared by the author 2023

Figure 6 Corresponding Author's Country

Source: Prepared by the author 2023

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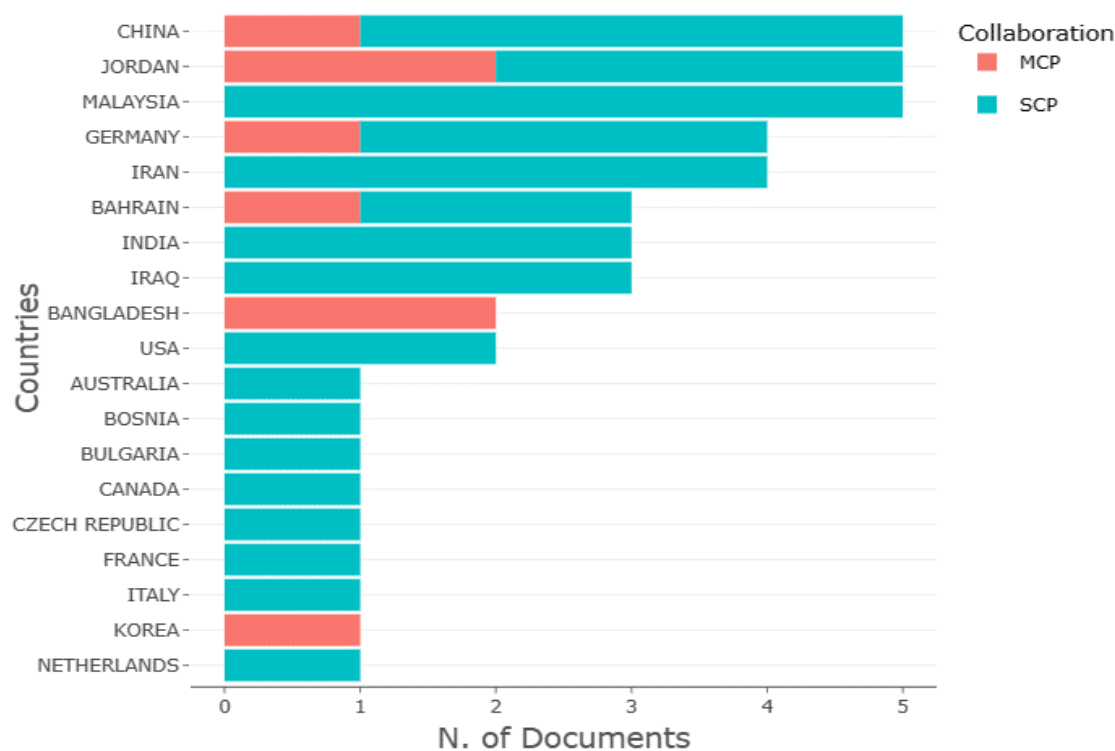
Additionally, the following figure illustrates the publication growth patterns of the top five most productive nations from 2004 until 2023. China experienced a steeper increase in the number of publications after 2010 compared to the other four countries. In contrast, Malaysia's publication growth rate has been sluggish since 2014. On the other hand, India has observed a rising trend in publication numbers since 2018. The growth rates of Iraq and Jordan have remained relatively low over the past decade.

Figure 7 Countries' Production over Time
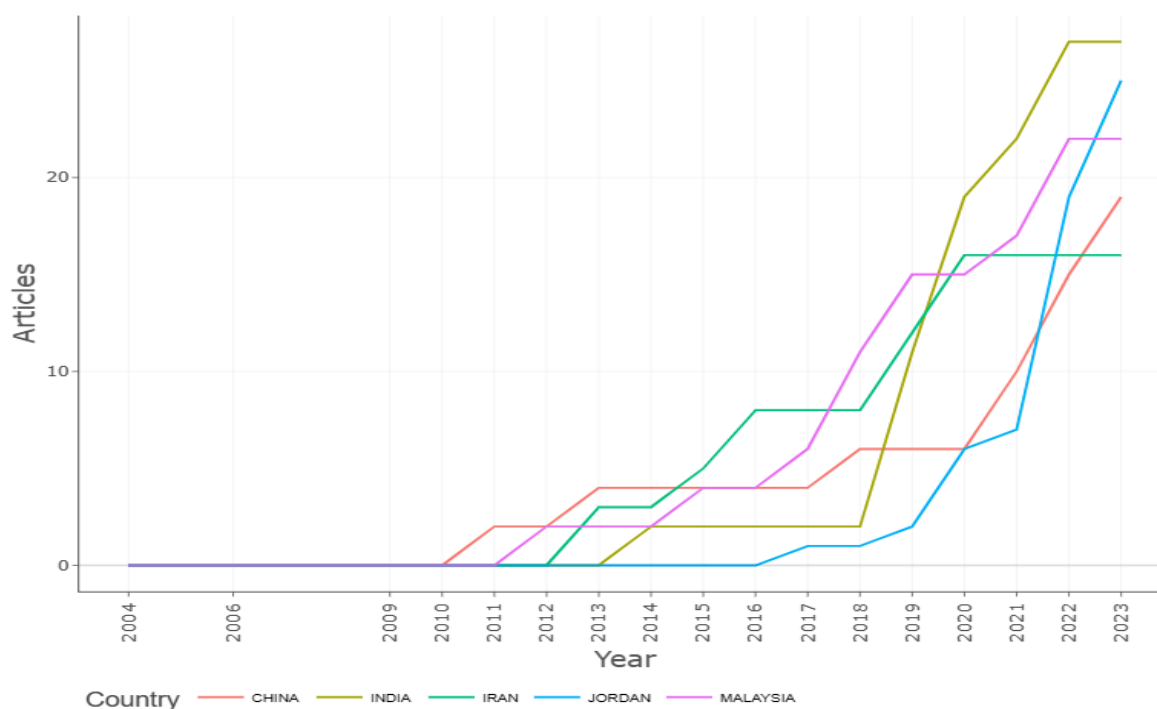
Source: Prepared by the author 2023

Most Cited Countries

Article citations refer to the number of times that a particular scientific article has been cited by other researchers in their own works. It is often used as a measure of the impact or influence of a particular publication or author. From the following table, we can see that the Netherlands has the highest number of publications with a total of 180, and each article has an average of 180 citations. This means that the research produced in the Netherlands is highly influential and impactful, with each article being cited on average 180 times.

The USA is second in terms of the total number of publications with 137, but the average number of citations per article is much lower at 68.5. China has the third-highest number of publications with 66, but the average number of citations per article is only 13.2. It is worth noting that the number of publications does not necessarily indicate the quality of research, and

there could be many other factors at play, such as funding, collaboration, and the quality of the research itself, that could influence the number of citations an article receives. Therefore, this table provides some insights into the productivity and impact of scientific research across different countries.

Table 4 Most Cited Countries

Country	TC	Average Article Citations
NETHERLANDS	180	180
USA	137	68.5
CHINA	66	13.2
JORDAN	44	8.8
KOREA	25	25
GERMANY	18	4.5
AUSTRALIA	14	14
CZECH REPUBLIC	10	10
BANGLADESH	9	4.5
FRANCE	8	8

Notes: TC (Total citations)
Source: Prepared by the author 2023

In this regard, Table five presents a list of ten academic papers (Most Global Cited Documents) along with their DOIs, total citations, TC per year, and normalized TC. The total citations indicate the number of times that a particular paper has been cited by other academic works. TC per year is the average number of citations that the paper received per year, while the normalized TC represents the number of citations per year, normalized by the average number of citations per paper in the same journal and year. From the table, we can see that the most highly cited paper is the one authored by Bondarouk TV in 2009, with a total of 180 citations and a TC per year of 12. The paper with the highest normalized TC is the one by Alhamad A in 2022, with a normalized TC of 9.88. It is worth noting that there is a variation in the publication dates of the papers listed in the table, ranging from 2004 to 2022. This difference in publication dates can impact the total citations and TC per year of the papers, as older papers generally have more time to accumulate citations.

Table 5 Most Global Cited Documents

Paper	DOI	Total Citations	TC per Year	Normalized TC
Bondarouk Tv, 2009, Int J Hum Resour Manage	10.1080/09585190802707235	180	12	2.22
Stone Dl, 2013, Hum Resour Manage Rev	10.1016/j.hrmr.2012.06.001	82	7.45	4.66
Lin L-H, 2011, Int J Hum Resour Manage	10.1080/09585192.2011.540149	66	5.08	3
Stone Dl, 2009, Hum Resour Manage Rev	10.1016/j.hrmr.2008.11.003	55	3.67	0.68

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Manafi M, 2015, Asian Soc Sci	10.5539/ass.v11n10p358	26	2.89	3
Alhamad A, 2022, Int J Data Netw Sci	10.5267/j.ijdns.2021.12.011	25	12.5	9.88
Wahyudi E, 2014, Public Pers Manage	10.1177/0091026013517555	25	2.5	1.92
Arjomandy D, 2016, Can J Adm Sci	10.1002/cjas.1380	15	1.88	1.96
Power D, 2004, Inf Technol People	10.1108/09593840410570302	14	0.7	1
Al-Hawary Sis, 2020, Int J Learn Intellect Cap	10.1504/IJLIC.2020.109927	13	3.25	3.9

Source: Prepared by the author 2023

Moreover, the figure below provides a summary of the spectrogram of the References Spectroscopy, which displays the E-HRM values in a bar chart format. The chart also includes a red line indicating the ten-year median deviation. The article discusses a subset of the cited references that are responsible for the peaks observed in the spectrogram. The complete list of 3125 cited references is available in the supplementary materials for interested readers.

Figure 8 References Spectroscopy
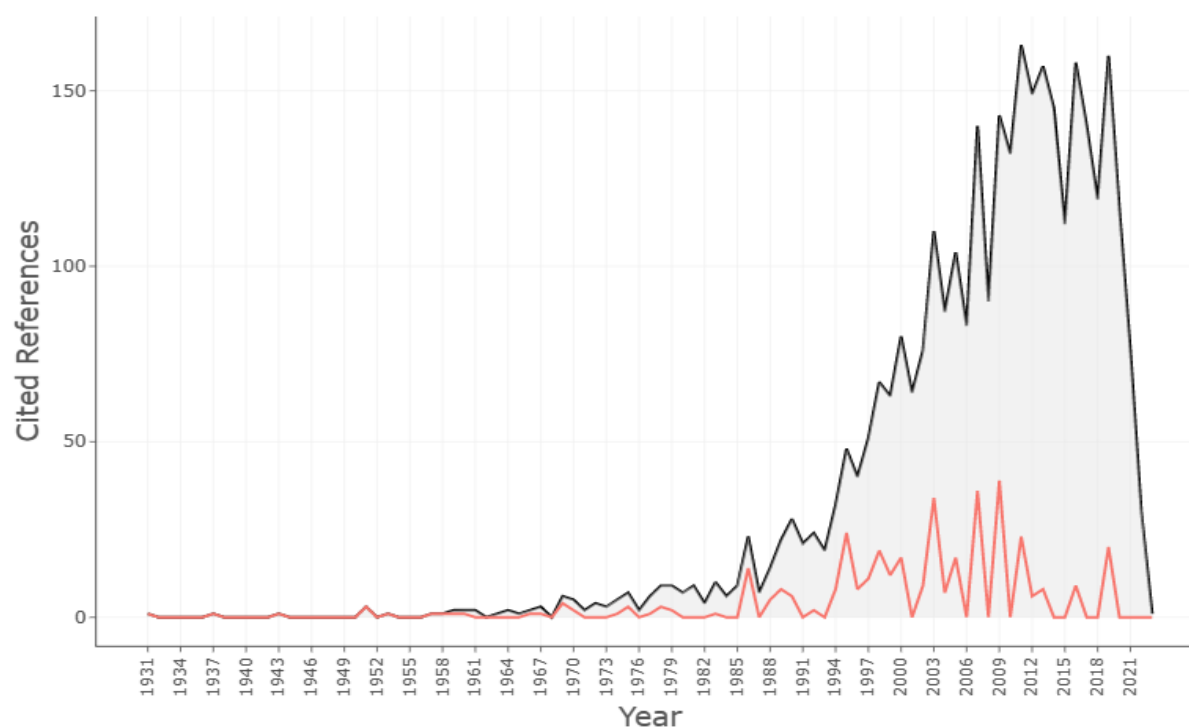
Source: Prepared by the author 2023

Most Frequent Words

Table below provides a useful snapshot of the most frequently occurring words within a corpus of documents. By analyzing the frequency of these words, researchers can gain insights into the major themes and topics within the corpus, which can help guide further research and

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analysis. For example, HRM is the most frequently occurring phrase, with 16 occurrences. This suggests that this phrase is a major theme or topic within the corpus of documents. E-HRM and natural resources management follow closely behind with 14 and 13 occurrences respectively. These phrases may represent sub-themes within the broader field of human resource management. Besides, resource allocation also has 13 occurrences, indicating that this may be another important topic within the corpus. Also, information management appears 7 times, which suggests that it may be a less prominent theme than the others listed above.

Table 6 Most Frequent Words

Words	Occurrences
Human Resource Management	16
Electronic Human Resource Managements	14
Natural Resources Management	13
Resource Allocation	13
Information Management	7
Electronic Commerce	5
Employment	4
Human Resources Management	3
Conceptual Design	2
Decision Making	2

Source: Prepared by the author 2023

Moreover, the following figure illustrates a visual representation of the frequently associated words and phrases related to Electronic Human Resource Management (E-HRM), which involves the utilization of digital technology and tools to carry out human resources functions like employee engagement, performance management, and recruitment. The word cloud for E-HRM comprises essential terms such as "resource allocation," "natural resources management," and "information management," which are all fundamental components of E-HRM. Additionally, the word cloud includes more specific words like "innovation," "strategy formulation," and "transformational leadership," which represent how technology is transforming the HR industry. Overall, an E-HRM word cloud captures the present digital transformation taking place in HR and how technology is being harnessed to enhance HR processes and outcomes.
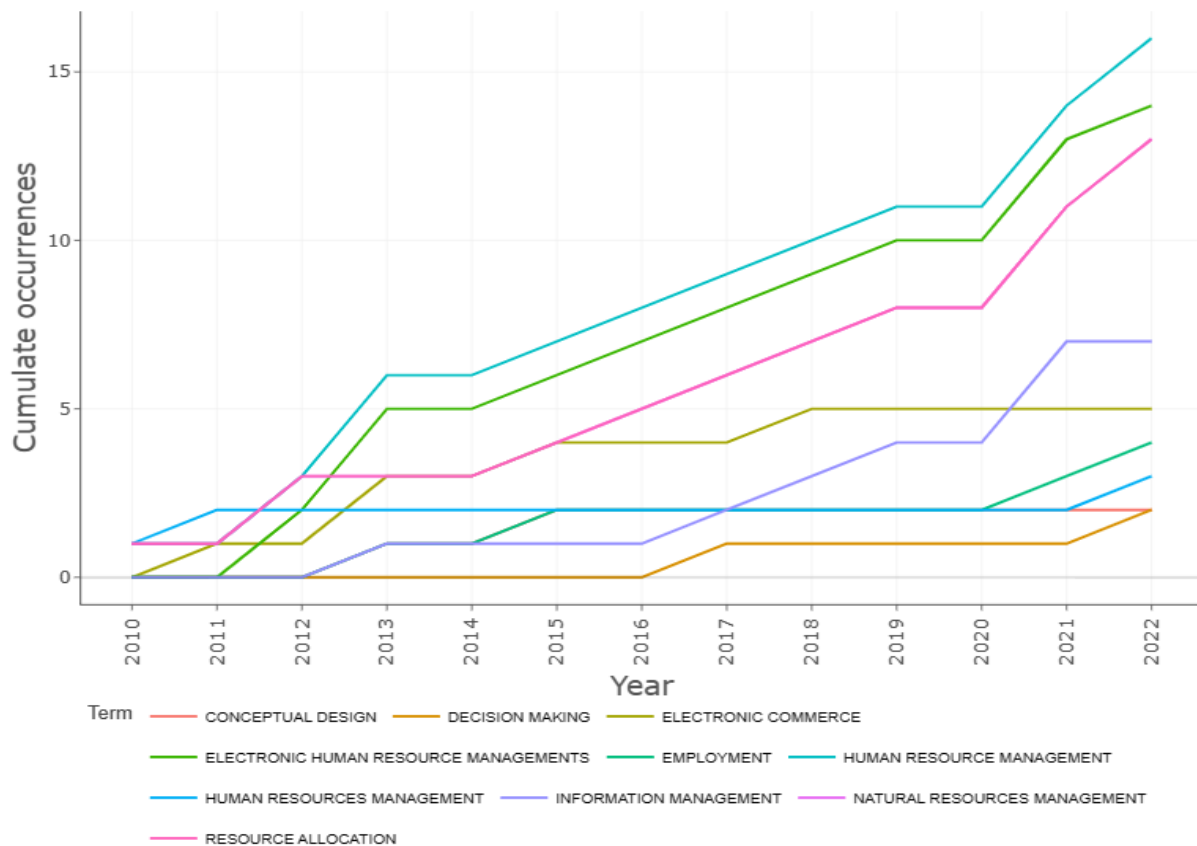
Figure 9: WordCloud

Source: Prepared by the author 2023

In this regard, the R studio software was used to analyze keywords from 80 articles in the Scopus database in order to strengthen evidence about E-HRM research trends. The unit of analysis was a document with a focus on word dynamics, as depicted in Figure below.
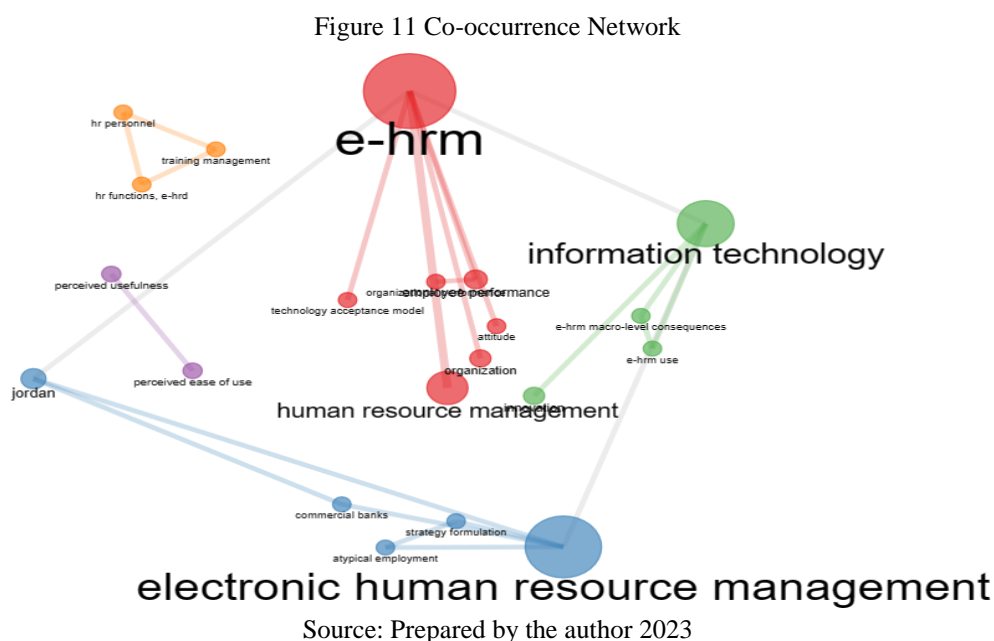
Figure 10 Word Dynamics

Source: Prepared by the author 2023

Figure above indicates that "electronic human resource management" has been the most frequently used keyword in articles since 2010, followed by "employment" which has grown steadily since its appearance in 2011. Other trends that have emerged include "natural resources management", "resource allocation", "information management", "electronic commerce", "human resources management", "conceptual design", and "decision making". To summarize, "electronic human resource management" is currently the most popular keyword in this field.
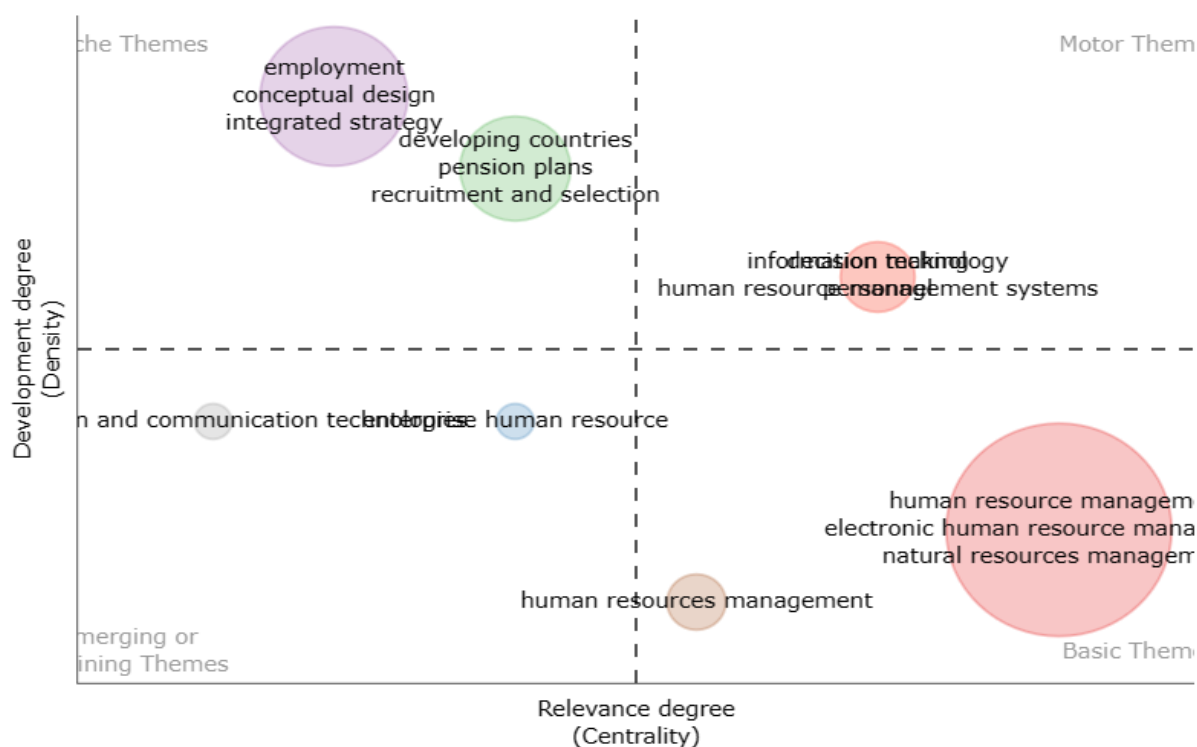
Co-occurrence Network

The co-occurrence network analysis examines the frequency of words appearing together in a text, specifically a collection of articles or documents related to E-HRM. The most common terms that appear in the same context are extracted and used to create a network, with nodes representing the most frequent terms and edges connecting nodes that appear together. The nodes in the network are divided into three groups (A-C) represented by red, blue, and green colors respectively. The size of the node corresponds to its frequency of occurrence in the review documents, while the proximity or line width indicates the frequency of co-occurrence between two keywords. The color of the nodes is based on the cluster analysis of keywords according to their co-occurrence patterns in the review documents. Additionally, the network highlights the top six keywords linked to "E-HRM," which are indicated by the strength of their links. Therefore, this article utilized the co-occurrence network analysis to interpret the references and provided a legend for readers to understand the colors as shown in Figure below.

Figure 11 Co-occurrence Network

Source: Prepared by the author 2023

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In this regard, the figure below shows the research themes identified through bibliometric analysis of the conceptual structure of the included documents. The clusters in the graph indicate the research themes, with the size of the clusters proportional to the number of keywords. The quadrants on the map represent different types of themes, such as motor themes in the upper-right quadrant with high centrality and density, niche themes in the upper-left quadrant with low centrality and high density, basic themes in the lower-right quadrant, and emerging themes in the lower-left quadrant with low centrality and density. One popular topic in this study is the decline in recruitment, selection, and communication technologies in human resources. Additionally, a niche trend in human resource management studies is natural resources management, which is strongly related to the E-HRM process. Consequently, the focusing on E-HRM can assist organizations in streamlining HR operations, reducing costs, and improving decision-making, leading to a more engaged and productive workforce.

Figure 12 Thematic Map

Source: Prepared by the author 2023

The co-word analysis displayed in the following figure aims to illustrate the conceptual structure of a framework by analyzing the frequency of word co-occurrences within a bibliographic collection. The analysis utilizes Multiple Correspondence Analysis (MCA) as a technique to reduce the dimensionality of the extensive data with multiple variables, resulting

in a simplified two-dimensional graph that reflects the similarity between the keywords based on plane distance. The conceptual structure includes natural language processing (NLP) routines to extract terms from titles and abstracts. Keywords that are represented closer to the center point of the graph have received more attention over time. The distribution of the points is used to interpret the results, with closer proximity indicating more similarity in distribution. The red cluster is the most significant, containing 34 keywords related to "human," "resources," "management," and "employment" in the documents analysed.

Figure 13 Conceptual Structure Map - method: MCA

Source: Prepared by the author 2023
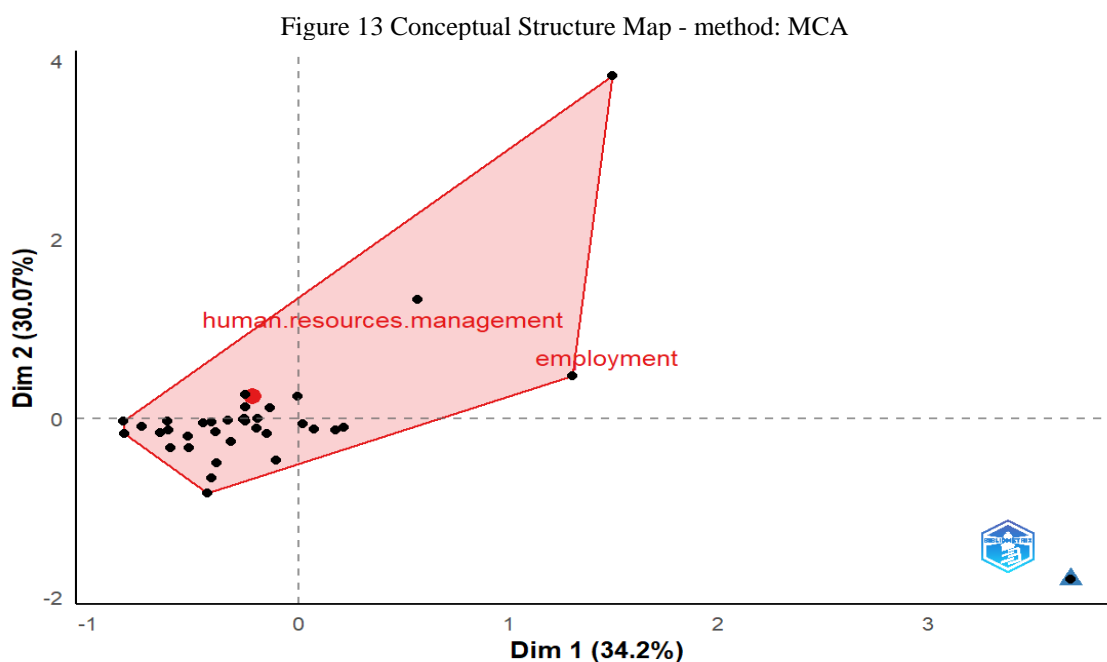
FUTURE RESEARCH

This bibliometric study conducted to analyse the and figure out the possible gaps and guide the future research to be more effective and beneficiary for the industry of the studies. The importance and compulsory ability and adaption for changes in the current business world specifically identify the success and booming of the firms (Moosa, Moosa, & Faheem, 2023; Sukhawatthanakun, Roopsing, & Silpcharu, 2023; Khaowisade, Sanrach, & Silpcharu, 2023; Ibrahim et al., 2021; Mohammed, et al., 2022). Thus, this review shows the main and essential elements in the organizations to be developed and adapting the new technology which is the human resource management. As stated the human resource management must follow the new digital function to ensure the goodness of the employees in the firms (Semenets-Orlova, et al., 2023; Al-Hindawy, 2022; Ibrahim, 2021). A gap such as lack of applicable models and practices for EHRM is not existed in the studies reviewed, and lack of studies in countries expected to

be the pioneer in such field. The countries categorized as third world country and developing countries less likely studying the EHRM in this database as well. The implications of EHRM needy for more technology to be used, the studies mentioned that some of HRM functions such as selection and recruitment are more to be turned into higher quality employees and fresh good blood imported to the firms. E-training and E-overseeing shall be activated in the firms via using the information technology. Finally the gap of using the word HRM still more than E-HRM, that is indicating the absence of awareness toward more EHRM in the organizational environment. The integration of EHRM with the Green EHRM is also recommended area to be explored and studied.

CONCLUSION

This study concentrate on all the articles going through the EHRM concept in scopus database, the review identified the countries studying more EHRM which Netherlands asserted as the top and highest publications, followed by first world countries such as USA and China. The frequencies of the publications in EHRM is very poor and needed to be further explored. Finally, the significance of EHRM to the HRM practices and implications is very vital to make it more effective and efficient, and enrich the employees databases of the organizations and nations which will contribute in developing a vary excellent system helps the HRM department in practicing the E-functions.

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