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Review Article

A Review on the 4.0 Industrial Revolution and its Impact on Human Resource Management Trends

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ABSTRACT

The concept of industrial revaluation 4.0 has become a widely accepted idea. Good Human Resource Management (HRM) is necessary for an organization to be successful. Determining the road map for improving the human resource management in industrial sector requires gaining an initial awareness of the body of knowledge regarding HRM in the context of Sector 4.0. Our objective was accomplished through a methodological examination of the literature. It also involves a plan and an approach that is consistent for the process of effectively managing personnel in the industry. Through a scientometric study, we attempted to conduct an effective examination of A review on the 4.0 Industrial Revolution and Its Impact on Human Resource Management Trends. The entire study makes use of Scopus as its database, and the years 2012 to 2023 are considered to be the era under examination. According to the findings of the publication study, the number of publications in Scopus is growing at a rate of 53.44% each year. This research was a collaborative effort between 2800 different researchers who published 916 documents, out of which 32.86% were written by authors from multiple countries. here were 30.39 citations on average per document. As a result of this analysis, we concluded that research in this field may be maintained to better understand the industrial revolution and its impact on human resource management, both of which are effective means by which organizations can be controlled.

Keywords: Human resource management, 4.0 Industrial revolution, Bibliometric analysis, Human capital, HRM and innovation.

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INTRODUCTION

The German government initiated the industrial revolution in 2011. Where it has gained more importance from scholars.[1] Rather Industrial 4.0 the term 4.0 industrial revolution used. It is more similar, Often in many countries and industries.[2] The main objective of the industrial revolution is the technology installation of the automotive.[3] Every sector's business model is being upended and altered because of the availability and widespread adoption of cutting-edge technologies such as augmented reality nanotechnology Artificial Intelligence (AI), and Internet of Things (IoT), which have drastically replaced technological advancements since the 1960s.[4] The term "4th Industrial Revolution," "Industry 4.0," or "I4.0"[5] refers to this change in production paradigms, which has had a significant impact on employees' work routines and habits.[6] This has also made scholars aware of the significance of Human Resource Management (HRM) in the shift towards the new technological paradigm.[7] Industry 4.0 is changing how people work, learn, lead, manage, recruit, and interact with each other.[8] It is serving as a new strategic instrument for competitiveness and offering the right mix of technologies to overcome the productivity challenge.[9] Decentralization, individual empowerment, less formal regulations, horizontal communication, and cooperation are acknowledged as important characteristics of the industry 4.0 scenario. The COVID-19 pandemic[10] and global wars[11] are only two of the new and unprecedented difficulties that make the implementation of the industry 4.0 paradigm more imperative. Lockdowns, a shortage of raw materials, interrupted services, and declining supply prices are just a few of the severe consequences of these crises that businesses may overcome with the use of technological and organizational advances and effective HRM practices.[12] The advent of the digital revolution has had a profound impact on society as a whole, with industry being significantly affected. This influence has been so pervasive that the notion of Industry 4.0 has now gained universal recognition and has become firmly established. Nevertheless, it is important to acknowledge the potential drawback of placing too much focus on technology, as it may result in a diminished recognition of the

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fundamental importance of human resources Nevertheless, it is important to acknowledge the potential drawback of placing too much focus on technology, as it may result in a diminished recognition of the fundamental importance of human resources.[13]

The European Commission has called for increased focus from the research and industrial sectors on the human dimension, among other areas of concern. HRM technology solutions are being quickly used by organizations across all industries. The driving force behind this phenomenon is the imperative to engage in competition for business prospects on both local and worldwide scales. Additionally, organizations face the difficulty of attracting and retaining employees in a labor market that is fiercely competitive,[14] marked by increasing differences in skill levels.

Address Based on the results of the HR Federation survey, the aggregate worth of venture capital investments in the global HR technology sector surpassed USD 3.1 billion in 2018, indicating a substantial rise of nearly threefold compared to the previous year's investment volume.[15] In order to optimize the benefits derived from investments in HRM technologies, it is imperative for firms to ensure that digital transformation is aligned with their overarching corporate strategy. In order to align employee behaviors with the organization's goal, it is imperative to establish human resources procedures. According to the alignment of HR practices with organizational strategy facilitates the attainment of optimal digital transformation, ultimately leading to superior performance.[16] The existing literature reveals a multitude of intricate hypotheses that establish connections between human resource activities. In conducted research. In their research and their study provided a comprehensive examination[17] of the research in relation to these theories, demonstrating that they offer a disparate portrayal. Firstly, it is important to note that there exist conceptual distinctions that underlie the many studies being discussed. Secondly, it is worth mentioning that the results obtained from these studies exhibit variations.

The process of planning, organizing, and supervising the work of an organization's current staff in order to successfully carry out the purpose, vision, and objectives of the organization is known as human resource management, or HRM. The processes of hiring, choosing, training, paying, keeping, and motivating employees are all included in the above listed operations. The team in charge of Human Resource Management (HRM) is in charge of creating and executing policies and procedures that support and uphold worker safety. The HRM team is in charge of monitoring adherence to national and local regulations that protect employees' private information and advance their physical, mental, and emotional health.[18]

Organizations of all sizes and in a variety of industries rely on Human Resource Management (HRM) to make sure their business operations run smoothly and successfully Knowledge. In order to optimize the benefits derived from investments in HRM technologies, it is imperative for firms to ensure that digital transformation is aligned with their overarching corporate strategy. In order to align employee behaviors with the organization's goal, it is imperative to establish human resources procedures. The alignment of HR practices with organizational strategy facilitates the attainment of optimal digital transformation, ultimately leading to outstanding results.[16] A business standpoint, the significant emergence of HRM 4.0 signifies that organizations recognize the advantages of incorporating technology. However, in terms of research, there remains a lack of comprehensive examination regarding the extent of transformations resulting from the implementation of the HRM 4.0 paradigm and its implications for employees, the company, and society as a whole[17] as well as emphasized the necessity for additional exploration into the correlation between Human Resource Management (HRM) and technology.[19] An investigation was conducted to examine the present condition of HR analytics and its prospective ramifications.[20]

Technology from an industry 4.0 viewpoint for HRM and innovation

Researchers who work on this subject often use an "inward-looking" viewpoint.[21] They have examined the functions that digital technology performs throughout the HRM lifecycle. to enhance process efficiency and worker and operator well-being. These studies usually center on digital technology, with HRM serving as the application area. The use of tools, models, processes, and infrastructures in the workplace, as well as the management and organizational fallout, have all been explored by academics. There are many difficulties. First, a more thorough assessment of the revolutionary effects of the modern technologies-such as Artificial Intelligence (AI), robots, augmented and virtual reality, etc., -on operators and work environments is required, even over an extended period of time[22] Second, the virtualization of work has had a significant influence on workplaces and work routines as a secondary consequence of the current crisis; the amount of this impact at the organizational and individual levels is still up for debate. We propose that a more thorough comprehension of the following subtopics is necessary:

Collaboration between humans and machines

As technology and robots are increasingly widely used in the workplace, people will need to work together more and more. Future studies in this field need to look at the optimal methods for collaborating between humans and machines.[23] Including how to create and carry out procedures that optimize the positive effects and reduce the negative ones.

Data governance and security

With the growing volume of data generated by Industry 4.0 technologies, HR departments must make sure that data is

collected, handled, and safely kept. Additionally, they have to ensure that the company's responsibilities for ethical and legal compliance are met by the data governance policies.[24] The consequences of industry 4.0 on employee privacy and data security should be studied in research, along with the best ways to safeguard employee data in an automated workplace.

Novel approaches to employee engagement and representation

Industry 4.0 and the advancement of digital technology may open up new channels for employee representation and participation in decision-making, such as employee-driven innovation portals, virtual works councils, and digital employee representation platforms.[25] There is a research potential in this area to look at how these innovative forms of employee participation and involvement affect companies, employees, and labor relations.

HRM 4.0: Enhancing Performance with Industry: A Management and Organization Perspective Technologies 4.0

Scholars are intrigued by the ways in which Industry 4.0 technologies impact the performance of organizations. Of the HRM process as well as the organizational. Elements of HRM more broadly. Academics may expand their knowledge of the success- and failure-related facets of Human-Machine Interaction (HMI) throughout many stages of workers' lives, such as education, employment, job profile, qualifications, competency mapping, and capacity upgrading. The safety and security components of regular activities should get special attention. The primary cause of the difficulties is the need to comprehend how to innovate HRM theory and practice in order to keep up with the quick speed of technological advancement.

HRM 5.0, Industry 4.0 critiques and industry 5.0 talks taking sustainability issues into account

Innovation Academics that study this subject often use an "outward-looking" viewpoint.[21] Adopting Industry 4.0 technology no longer has performance optimization as its primary goal. Conversely, researchers are looking for ways to help organizations, businesses, and society as a whole promote resilience and sustainability. In general, people see the organization as a component of a larger framework. In these early phases of the industry 5.0 paradigm, there are opportunities for researchers to examine models and techniques to direct the adoption of technology, both theoretically and practically. To understand how digital technologies may become engines for accomplishing socially conscious aims, additional study is necessary. The novelty of the topic presents challenges since research methodologies are still being solidified and long-term evaluation of scientific achievements is required.

Additional theoretical exploration is required to better understand the function of individuals within an increasingly digitalized industry. Gaining a comprehensive understanding of the existing body of knowledge in the academic literature pertaining to the management of human resources within the industry 4.0 paradigm is evolving to become "Industry 5.0" or "I5.0".[26] This is a more resilient, sustainable, and human-centered approach. Improving large-scale manufacturing processes' efficiency is the main goal of Industry 4.0. As opposed to this, Industry 5.0 priorities sustainability and resilience.[27] Within the framework of the industrial revolution, placing a larger emphasis on people and society.[28] Sector 5.0 framework of Industry 4.0 is a crucial initial undertaking in order to establish a strategic plan for augmenting the role of human capital within a digital industrial setting. The industry 4.0 paradigm as it exists today is undergoing a shift towards a more human-cantered, sustainable, and resilient approach, commonly referred to as "Industry 5.0" or "I5.0"[26] Improving large-scale manufacturing processes' efficiency is the main goal of Industry 4.0. As opposed to this, Industry 5.0 priorities sustainability and resilience within the framework of the industrial revolution, placing a larger emphasis on people and society.[28] Sector 5.0 has garnered the interest of researchers who may not have previously been inclined towards the technological aspects of Industry 4.0.[27] Assert that Industry 5.0 encompasses two primary aspects. Firstly, it emphasizes the importance of people' competencies, expertise, and capacity to collaborate effectively with machines and robots. Secondly, it highlights the significance of adaptability in production processes and the mitigation of environmental consequences. This is crucial for the development of efficient HRM strategies that can effectively tackle the obstacles and capitalize on the opportunities presented by this emerging paradigm. They encourage further research to evaluate Industry 4.0's effects in order to create HRM methods that are suitable for addressing the challenges and opportunities presented by this new paradigm. On various stakeholders in their evaluation and research for the HRM 4.0 future agenda. It appears that the literature underrepresents the corpus of knowledge on HRM 4.0 at this point. The current study intends to apply bibliometrics to analyses the following themes through a scientometric approach:

Q1. How is the literature on HRM evolving and being organized in relation to Industry 4.0?

Q2. Which writers, nations, and organizations in HRM 4.0 throughout the Industrial Revolution are the most productive?

Q3. In what manner is the literature on Human Resource Management (HRM) evolving and being organized with respect to the concept of Industry 4.0?

Q4. What are the primary subjects explored in previous scholarly investigations?

Q5. What are the potential areas of research in the field of Human Resource Management that hold promise for researchers in the future?

The aim of this research is to perform a thorough examination of the current body of literature concerning Human Resource Management (HRM) and its connection to the industrial revolution. Additionally, this research seeks to elucidate the internal framework and progression of HRM research. In this part, we identify a trustworthy approach for data collection and relevant bibliometric approaches.

This document offers a comprehensive and organized overview of the primary areas of study within this particular discipline. Additionally, it outlines potential avenues for future research by highlighting unresolved inquiries and insufficiency in the current body of literature, thereby facilitating the advancement of the field by upcoming academics. In order to address these inquiries, a comprehensive examination of scholarly literature was undertaken.[29] This involved the collection and analysis of scientific papers sourced from the Scopus. The primary outcome of this study involves the identification and subsequent discussion of three key topics that characterize the research domain under investigation. The following subjects are: The technological aspect of Industry 4.0 (I4.0) encompasses research on the ways in which I4.0 technologies facilitate Human Resource Management (HRM). The human-centric viewpoint entails investigations into the effects of I4.0 on Human Resources (HR) and the optimal design and implementation of technologies to promote societal benefits and enhance human welfare. The present analysis focuses on the organizational viewpoint, specifically examining scholarly articles that discuss the advantages of adopting Industry 4.0 technology in conjunction with Human Resources (HR) operations. Based on the aforementioned analyses, we propose a comprehensive agenda for further study.

METHODOLOGY

We hosted an SLR with the goal of summarizing the academic research on the relationship between HRM and Industry 4.0. In accordance with Transfield,[30] SLR criteria, the three primary elements of the research procedure that we implemented are the selection and placement of papers, screening, and findings presentation/included. We have analyzed 503 publications using bibliometrics between 2011 and 2023.gathered from Scopus using the features and methodologies of study from other scholarly bibliometric studies that have been published.[31] It is a type of Systematic Literature Review (SLR) Method. Stages of the methods shows in Figure 1. This stage provides extensive collection of research data, encompassing patents, grants, publications, citations, and clinical trials. The bibliometric approach has gained traction as a means of analyzing literature and locating research by employing keywords.[32]

Additionally, bibliographic mappings and keyword co-occurrences were analyzed for this study using the Visuals of Similarities (Vos) viewer software. Indonesia's[33] Based on historical data, our study displays network analysis and visual graphs. individual research output and is intended to show the volume and scope of interest in a publication.[34] Furthermore, the research processes pertaining to the approach have been designed. The study's methodological approach is depicted in Figure 2.

Search Query

The following search term was typed into the Scopus data search area.

Title-Abs-Key

Industrial and revolution, or its effects on human resources, management, and human behavior, and pub years >2010 and <2024.

Table 1: The average number of citations received annually.

Year	Mean TC per Art	N	Mean TC per Year	Citable Years
2011	29	7	2.23	13
2012	35.36	11	2.95	12
2013	22.27	11	2.02	11
2014	12.38	13	1.24	10
2015	100	16	11.11	9
2016	8.83	12	1.1	8
2017	6.3	20	0.9	7
2018	39.34	29	6.56	6
2019	12.36	59	2.47	5
2020	21.48	91	5.37	4
2021	10.23	88	3.41	3
2022	4.39	93	2.19	2

RESULTS AND DISCUSSION

This study conducted a scientific assessment of publications on HRM and INDUSTRIAL REVOLUTION that have been published over the last two decades, with the aim of summarizing the present state of research in this field and identifying potential future research directions.[35] In order to investigate the annual count of publications, research institutions, nations and regions, subject directions, highly cited references, and highly cited journals, the current study used visual analysis. The keyword analysis's findings were summarized through scientometric analysis through Biblioshiny a shiny R package used widely by the researchers. This work targets to provide a systematic analysis of what research work is being undertaken, who did that work, what are the future directions.[36]

Scientometric Investigations

The academic community has used to extensively as a source of Scientometric data to review the Scientometric data on industrial revolution. Level of keywords applied for Scopus database focusing on the period of 2011 to 2023 and the keywords are taken industrial revolution and HRM. The dataset presented spans from 2011 to 2023 and is sourced from a comprehensive collection of 379 distinct references, comprising academic journals, literary works, and several other document kinds. The dataset being analyzed consists of 503 documents, demonstrating a significant annual growth rate of 18.38%. The collection primarily consists of recent research, as indicated by the relatively low average age of the papers, which is 2.6 years. The dataset exhibits an average citation count of approximately 15.92 per document, suggesting a noteworthy level of influence and impact associated with the publications encompassed within the dataset. Furthermore, it is worth noting that these documents, when considered as a whole, contain a substantial number of citations, totaling 22697. After rigorous analysis, the documents contain 2874 Keywords Plus (ID) and 1593 Author's Keywords (DE). This shows that the dataset covers several topics and research interests.

These publications include 1595 authors, 96 of whom are solely responsible for their works. An average of 3.37 co-authors per document shows collaboration is common. A significant number of 18.69% of these links are global, indicating significant global research collaboration in the dataset. Most documents in the collection are articles (227), followed by conference papers (150), books (17) book chapters (72), reviews (29), editorials (3), and short surveys (2). The multiple document categories suggest a wide range of research outputs, including original research, literature reviews, and conference contributions. This provides a comprehensive view of scholarly work across the era and from many sources. Overall, the dataset shows a dynamic and diverse collection of scholarly publications.

Its rapid growth, international cooperation, and wide range of study subjects and document formats make it stand out. Therefore, it is useful for bibliometric analysis and research evaluation. In Table 1 we can see mean total citation per. The x-axis and Y-axis be used to create a graph that shows which years citation an increase and reduction in the average number of articles. 2012's annual average citation per document n=11 and in the year 2012 mean TC per year 2.95 mean Total Citation (TC) 35.36. Annual average citation in the year 2015 row 5 to shows that n=16, mean

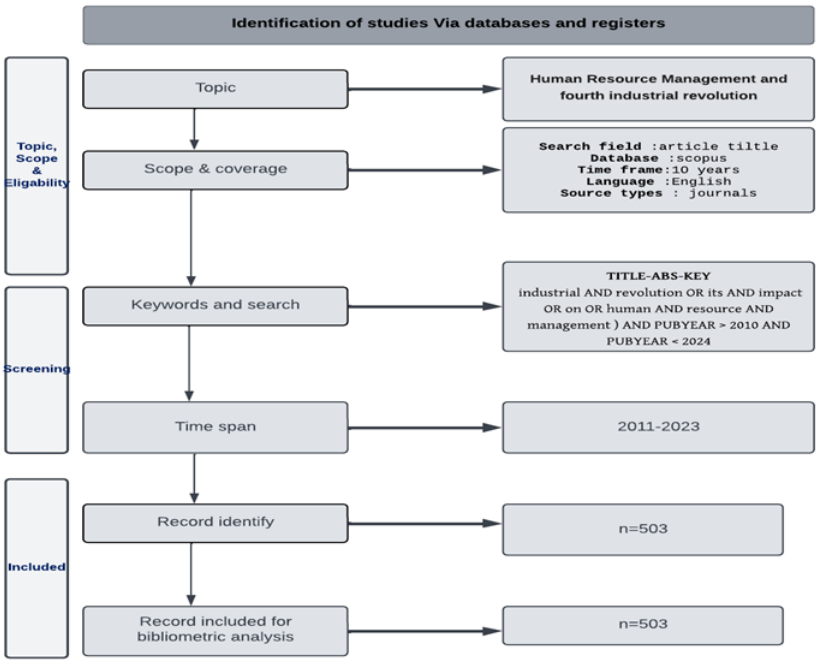

Figure 1: Method adopted in this study. Source: Authors created.

total citation per year 11.11 as well shown in the Figure 3 mean per document 100 at row 5, annual citation in the year 2022 row 12 shown below at the Table 2 total citation is 2 and mean total citation per year 4.39 mean total citation per year 2.19, N is given 93 which is shown below Figure 4.

Annual scientific production presented table and figure below where yearly wise analysis selected data from scopus in the year 2011-2023, industrial revoluation 4.0 continous growing in the year 2011 its 7 articles table repersented below 2023 its 53 articles but in the year 2022 it was 93 scientificaly growth german governamanet goal was competitive, flexible, digitalized production.[37] The average citation per year increase upto2020 then again, its decrease compares to previous year in the year 2021 it 88.

Most Relevant Authors Corresponding Author's Countries and Country Scientific Production The author who has had the biggest influence on the topic of the fourth industrial revolution will be highlighted in Table 5. The authors of this research were connected to the Department of Social and Behavioral Sciences. Fractionalized 0.645 and Pane article 6. Zou c Table 2 below displays the fractionalized 0.64518815 and article 5 papers total from stacho z represented fractionalized 1.28333. countries scientific production. The frequency of China is 180, India is 140, Indonesia is 119, and South Africa is 87. The top author and

Table 2: The tope contributed authors on human resource management and industrial revolution and top author and articles.

Authors	Articles	Articles Fractionalized	Region	Freq
PAN S	6	0.64518815	CHINA	180
ZOU C	6	0.64518815	INDIA	140
STACHO Z	5	1.28333333	INDONESIA	119
STACHOVÁ K	5	1.28333333	SOUTH AFRICA	87
WANG Y	5	0.53566434	USA	87
XIONG B	5	0.502331	UK	82
LIN M	4	0.33566434	GERMANY	68
MA F	4	0.33566434	ITALY	65
ZHANG G	4	0.33566434	SPAIN	58
ZHAO sQ	4	0.46336996	BRAZIL	51

Table 3: The group of articles that received the most citations.

Authors	Year	Title	Journal	Total Citations	TC per year	Local Citations	LC/ GC Ratio
Longo, F., Nicoletti, L., and Padovano, A.[38]	2017	Smart operators in industry 4.0: A human-centered approach to enhance operators' capabilities and competencies within the new smart factory context.	Computers and industrial engineering.	285	47.50	21	7.37
Benešová, A., and Tupa, J.[40]	2017	Requirements for education and qualification of people in Industry 4.0.	Procedia manufacturing.	259	43.17	14	5.41
Tambe, P.[41]	2014	Big data investment, skills, and firm value.	Management science.	185	20.56	1	0.54
Dave, B., Kubler, S., Främling, K., and Koskela, L.[42]	2016	Opportunities for enhanced lean construction management using Internet of Things standards.	Automation in construction.	146	20.86	0	0.00
Akhavian, R., and Behzadan, A. H.[43]	2016	Smartphone-based construction workers' activity recognition and classification.	Automation in construction	145	20.71	6	4.14
Fantini, P., Pinzone, M., and Taisch, M.[44]	2020	Placing the operator at the center of Industry 4.0 design: Modelling and assessing human activities within cyber-physical systems.	Computers and Industrial Engineering.	123	41.00	3	2.44

Authors	Year	Title	Journal	Total Citations	TC per year	Local Citations	LC/ GC Ratio
Kaasinen, E., Schmalfuß, F., Özturk, C., Aromaa, S., Boubekeur, M., Heilala, J. and Walter, T.[45]	2020	Empowering and engaging industrial workers with Operator 4.0 solutions.	Computers and Industrial Engineering.	94	31.33	8	8.51
Bag, S., Yadav, G., Dhamija, P., and Kataria, K. K.[46]	2021	Key resources for industry 4.0 adoption and its effect on sustainable production and circular economy: An empirical study.	Journal of Cleaner Production	92	46.00	8	8.70
Pejic-Bach, M., Bertoncel, T., Meško, M., and Krstić, Ž.[47]	2020	Text mining of industry 4.0 job advertisements.	International journal of information management.	85	28.33	5	5.88
Xu, X., Lu, Y., Vogel-Heuser, B., and Wang, L.[48]	2021	Industry 4.0 and Industry 5.0-Inception, conception and perception.	Journal of Manufacturing Systems.	81	40.50	17	20.99
Longo, F., Padovano, A., and Umbrello, S.[39]	2020	Value-oriented and ethical technology engineering in industry 5.0: A human-centric perspective for the design of the factory of the future.	Applied Sciences.	79	26.33	21	2658
Whysall, Z., Owtram, M., and Brittain, S.[49]	2019	The new talent management challenges of Industry 4.0.	Journal of management development.	78	19.50	12	15.38
Fareri, S., Fantoni, G., Chiarello, F., Coli, E., and Binda, A.[6]	2020	Estimating Industry 4.0 impact on job profiles and skills using text mining.	Computers in industry.	76	25.33	5	6.58
Calzavara, M., Battini, D., Bogataj, D., Sgarbossa, F., and Zennaro, I.[50]	2020	Aging workforce management in manufacturing systems: state of the art and future research agenda.	International Journal of Production Research.	71	23.67	2	2.82
Kazancoglu, Y., and Ozkan-Ozen, Y. D.[51]	2018	Analyzing Workforce 4.0 in the Fourth Industrial Revolution and proposing a road map from operations management perspective with fuzzy DEMATEL.	Journal of enterprise information management	71	14.20	11	15.49
Ryu, J., Seo, J., Jebelli, H., and Lee, S.[52]	2019	Automated action recognition using an accelerometer-embedded wristband-type activity tracker.	Journal of construction engineering and management.	68	17.00	1	1.47
Stachová, K., Papula, J., Stacho, Z., and Kohnová, L.[53]	2019	External partnerships in employee education and development as the key to facing industry 4.0 challenges.	Sustainability.	67	16.75	5	7.46
Bednar, P. M., and Welch, C[54]	2020	Socio-technical perspectives on smart working: Creating meaningful and sustainable systems.	Information Systems Frontiers.	61	20.33	7	11.48

Authors	Year	Title	Journal	Total Citations	TC per year	Local Citations	LC/ GC Ratio
Cimini, C., Boffelli, A., Lagorio, A., Kalchschmidt, M., and Pinto, R.[55]	2020	How do Industry 4.0 technologies influence organisational change? An empirical analysis of Italian SMEs.	Journal of Manufacturing Technology Management.	55	27.50	0	0.00
Javaid, M., Haleem, A., Singh, R. P., Haq, M. I. U., Raina, A., and Suman, R.[56]	2020	Industry 5.0: Potential applications in COVID-19.	Journal of Industrial Integration and Management.	54	18.00	5	9.26
Hannola, L., Richter, A., Richter, S., and Stocker, A.[57]	2018	Empowering production workers with digitally facilitated knowledge processes-a conceptual framework	International Journal of Production Research.	53	10.60	0	0.00
Li, D., Fast-Berglund, Å., and Paulin, D.[58]	2019	Current and future Industry 4.0 capabilities for information and knowledge sharing.	The International Journal of Advanced Manufacturing Technology.	52	13.00	2	3.85
Cubric, M.[59]	2020	Drivers, barriers and social considerations for AI adoption in business and management: A tertiary study.	Technology in Society.	50	16.67	0	0.00
Choudhury, P., Foroughi, C., and Larson, B.[60]	2021	Work-from-anywhere: The productivity effects of geographic flexibility.	Strategic Management Journal.	48	24.00	0	0.00
Kipper, L. M., Iepsen, S., Dal Forno, A. J., Frozza, R., Furstenau, L., Agnes, J., and Cossul, D.[61]	2021	Scientific mapping to identify competencies required by industry 4.0.	Technology in Society.	48	24.00	1	2.08

Table 4: Most citated country and Trend topics (author created by using Scopus data base).

Country	TC	Average Article Citations	Trend topic	freq	year_q1	year_q3
Germany	704	58.7	Industrial revolution	9	2017	2020
United Kingdom	668	44.5	Knowledge management	7	2018	2022
China	604	15.9	Internet of Things (Iot)	5	2018	2020
Brazil	554	69.2	Industry 4.0	98	2019	2022
India	292	12.7	Artificial intelligence	20	2020	2021
Saudi Arabia	277	92.3	Sustainability	16	2020	2022
Korea	243	17.4	Human resource management	20	2020	2022
Italy	188	17.1	Human resources	15	2020	2022
USA	180	18	Management	11	2018	2022
			Fourth industrial revolution	26	2021	2022

top nations are displayed in the Table 2 below as well Figure 5 presented in graphically by using original pro.

Most citated countries Trend topics

The Table 3 below appears that, the top ten countries with the highest number of citations. GERMANY most cited country ranks first with an average article citation of 704 and a total citation count of 6211. With the year 2011-2023 in the area of industrial revolution 4.0 total citation received with used of bibliometric analysis. The publication outlets of the most cited papers are shown in Table 3, where the journal with the most citations on the topic under investigation is Computers and Industrial Engineering (n=4), with over 30 citations. The graph also illustrates the citation data for United Kingdom, which has a total citation count of 668 and an average citation count of 44.5. The Table 4 below displays the total number of citations for India, which is 292, and the average citation per article, which is 12.7. Similarly, Saudi Arabia has a total citation count of 277 and an average article citation of 92.3. I have selected the top ten nations for analysis and visualized the data in a graph using Excel and bibliophagy. This approach allows us the condition of countries with the elevated citation counts.

The topics that will be discussed the most frequently in 2017 will all be associated with indutrial revolution and will have a frequency of 9. These topics will be the most popular and will be trendy. The following graphs illustrate topics that are now trending according to the authors' use of the key phrase "digitalization" in the year 2022 or the frequency. The term "suatinable developmenet " has a term frequency of 14 in the year 2022, whereas the term "industry 4.0" has a term frequency of 686 in the year 2022.

Thematic mapping

The Figure 6 demonstrates how thematic mapping allows for the representation of four separate typologies related to different

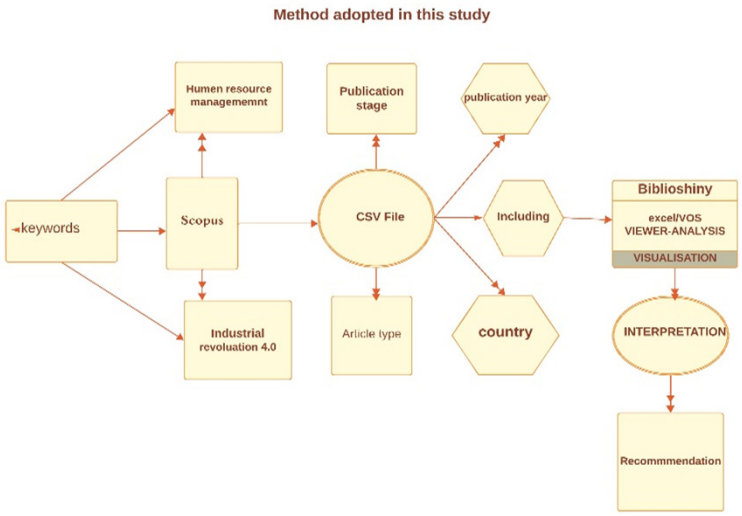

Figure 2: Flow diagram of the strategy. Source: Authors construction based on Scopus database.

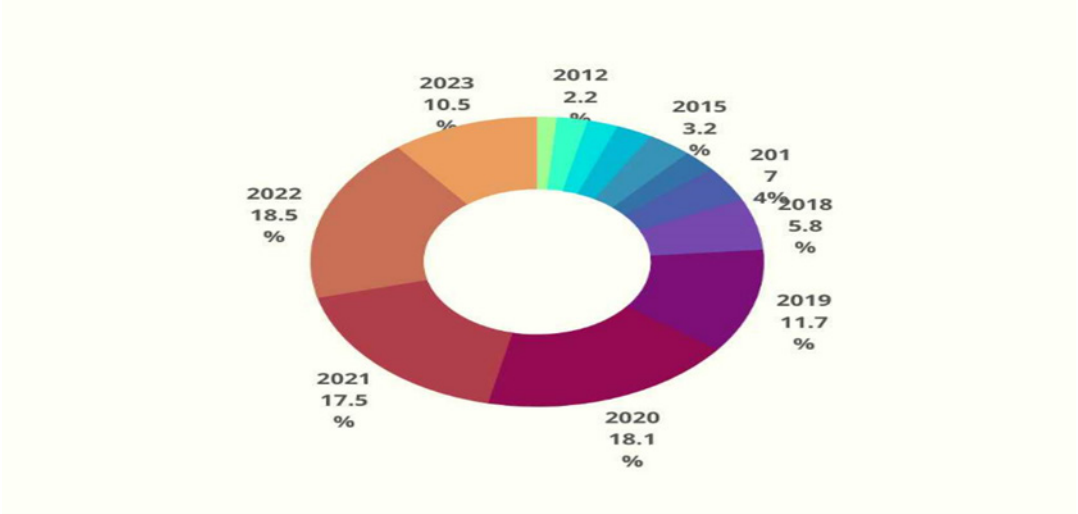

Figure 3: Annual scientific production. (Source: author created by using origin pro).

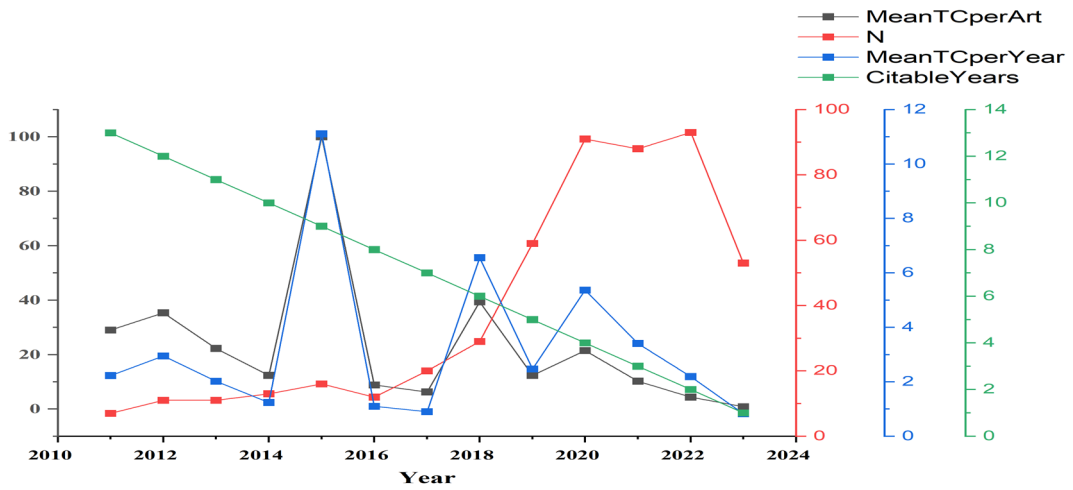

Figure 4: The average citation annually in the area of industry 4.0 revolution. (Source: Authors construction based on Scopus database).

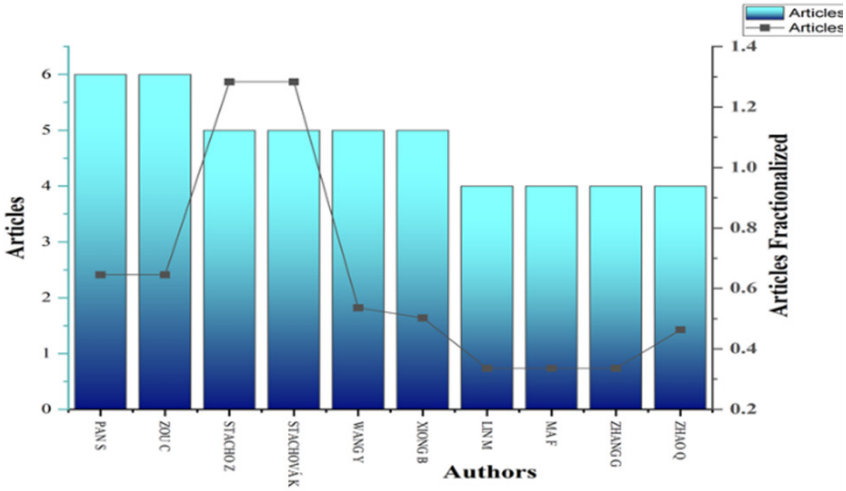

Figure 5: Most relevant authors. Source: author creation by using the Scopus Database (2011-2022).

topics. The thematic mapping utilizes the keywords field. Themes are classified into two dominance graphs based on their density and centrality. The concept of centrality serves as a metric or indicator. The significance of a topic is demonstrated by its representation on the X-axis, while the density on the Y-axis indicates the level of development. Additionally, the centrality relevance degree is also taken into consideration. The themes are categorized into four quadrants, which will be discussed in the following sections. The upper right Quadrant (Q1) contains motor themes. These are high density and high centrality themes, indicating their significance. Below graphs shows high density key words where (Q1-Q4) digital literacy founded. Anther themes are in the upper-left Quadrant (Q2) Niche Themes. Graph represented key words, energy independence new energy, development strategy globalization, cooperatives eutrophication, the fourth industrial revolution south korea. As we can see lower-left Quadrant (Q3) Emerging or Declining Themes. But below graph shows (Q3-Q4) Manufacturing supply chain management. Lower right (Q4) Basic themes in this industry 4.0 human resources, human resource management digitalization, fourth industrial revolution artificial intelligence.

Table 4 shows that Computers and Industrial Engineering (n=4) has the most publications on the issue under investigation, with over 30 citations. The other journals that come after this are Technology in Society (n=2) International Journal of Production Research, Journal of Cleaner Production, Automation in Construction, Computers in Industry, Information Systems Frontiers, and Sustainability. The most referenced articles' publishing channels are also included in Table 4. Below shows that Computers and Industrial Engineering (n=4) has the most publications on the issue under investigation, with over 30 citations. The other journals that come after this are Technology in Society (n=2), International Journal of Production Research, Journal of Cleaner Production, Automation in Construction, Computers in Industry, Information Systems Frontiers, and Sustainability. Interestingly[38] foundational paper "Smart operators in industry 4.0: A human-cantered approach to

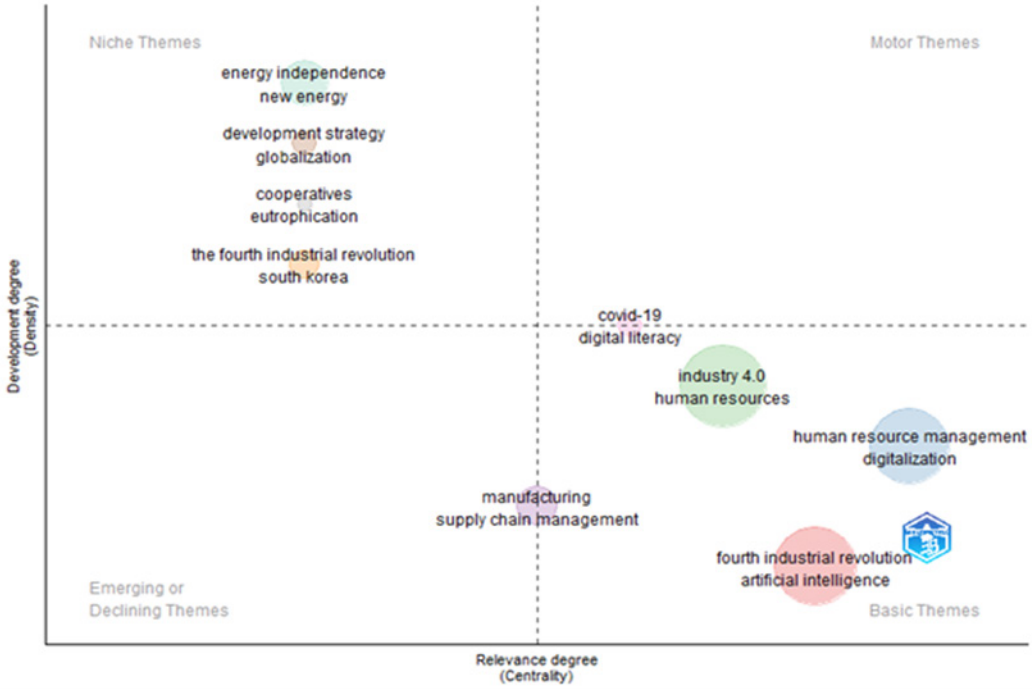

Figure 6: Thematic mapping.

Table 5: Corresponding author's countries (SCP-Singal citation publication; MCP-Multiple citation publication).

Country		China	India	Indonesia	South Africa	United Kingdom	Korea	Germany	Italy	Poland	USA
Articles	206	38	23	20	19	15	14	12	11	11	10
SCP	176	33	18	19	18	11	11	8	8	10	8
MCP	30	5	5	1	1	4	3	4	3	1	2
Freq	0.4095427	0.075547	0.0457256	0.039761431	0.03777336	0.029821074	0.027833	0.023856859	0.02187	0.0218688	0.0198807
MCP_ Ratio	0.1456311	0.131579	0.2173913	0.05	0.052631579	0.26666667	0.21428571	0.33333333	0.27273	0.0909091	0.2

enhance operators' capabilities and competencies within the new smart factory context" has received the highest citations (n=285 citations) worldwide. The two articles that obtained the most local citations (i.e., citations from publications included in the analysed collection) were the same one and another by[39] (21 citations each). The primary focus of these works is on methods for improving the skills of smart operators.

The most referenced articles' publishing channels are also included. Industry 4.0's effects on HRM are a complicated, multidimensional topic. Because the three study areas are related to one another and even complement one another, it is critical that academics adopt an integrated, multidisciplinary strategy that takes into account the many organisational, social, and technical aspects of HRM's progress within the framework of Industry 4.0. We present a research agenda based on the findings of our Systematic Literature Review (SLR)[33] which highlights potential directions for the three study themes and identifies possibilities and problems for each. We also recommend some areas of current under research that need further investigation HRM 5.0, Industry 4.0 criticisms, and Industry 5.0 discussions that consider sustainability issues, Cooperation between machines under people technology from a certain sector A 4.0 perspective on innovation and HRM.

Bibliographic Coupling(Countries,authors, source)

The graph shows which nation has the most credible scientific sources. The VOS app used to develop the keywords associated with each source as well as how they link to one another. Below Figure 7 show that minimum number of document is 5 and minimum number of citation is 5. The figure shows item is 31 and culters 4 and link is 255, total link strength is 12541. Figure 9 shown below minimum number of document of auther 2 and minimum number of citation authour 4, maximum number of author per document 10 items 84, cluster 14 links 212, total link strenght 361. Bibliographic coupling source minimum number of doument source 5 and minimum number of citationsource is 5 items 3 and clusters 1 k;links with source. Most relevant sources according to this diagram is lecture notes in mechanical engineering number of documents are 18. Another source is

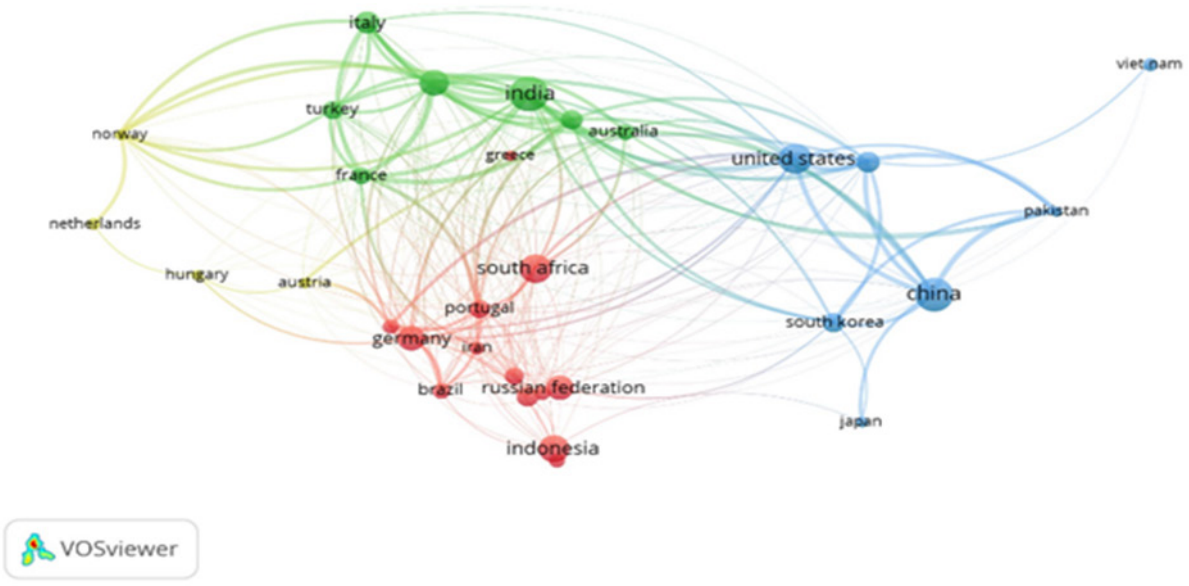

Figure 7: Coupling with countries.

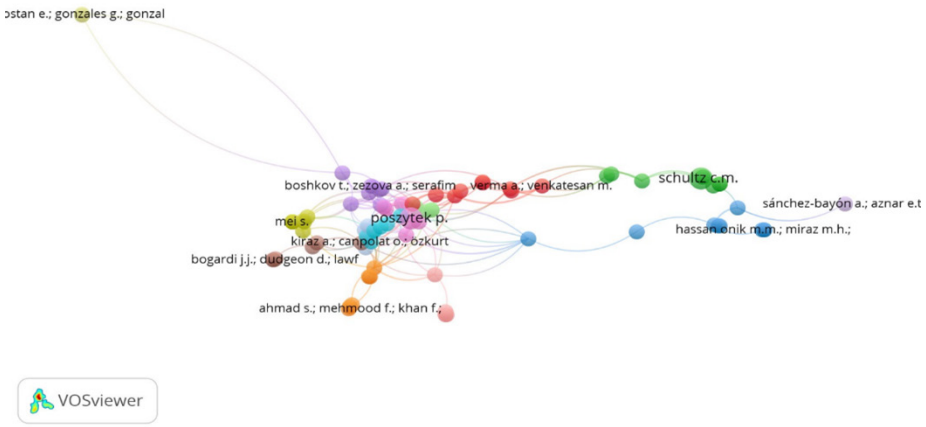

Figure 8: Coupling authors.

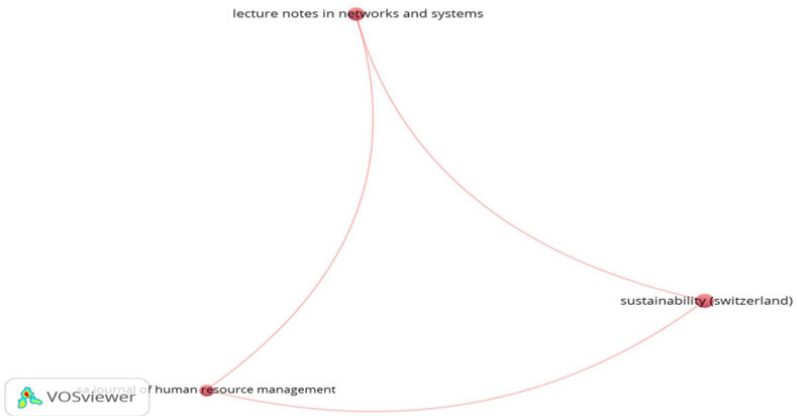

Figure 9: Bibliographic coupling source.

Proceeding of the summer school Francesco Turco is 15. Below Figure 7 shows source Procedia is per no. of document is 13 like that another source is Procedia computer science, Procedia manufacturing, sustainability (Switzerland) and technological forecasting and social change document sources is 13.we can see the countries collaboration in between them Figure 7 exhibited below cluttering countries. Figure 7 shows which countries have the most papers published. Here, China has the most single-country publications (33), as well multiple citated publication 5 second India is single cited publication 18 and multiple citation publication is 5. Below shows that Indonesia is article are 20 and single cited publication 19 and multiple citated publication is 1.

CONCLUSION

The industrial sector has undergone a significant transition as a result of Industry 4.0's new technology[62] In addition to having a significant effect on businesses' financial and operational performance, these technologies are also gradually altering the conception and management of human resources in manufacturing facilities[63] The goal of the current study was to comprehend the primary research subjects and the structure of the body of literature that A review on the 4.0 Industrial Revolution and Its Impact on Human Resource Management Trends. This study has inspected a performance. At present, at the nascent stage of the 4.0 Industrial Revolution, envisioning the various tendencies associated with it proves to be a challenging task. The impact of Fourth Industrial Revolution technologies on enterprises across different sectors and economies varies significantly. Even the German authors leading aspect this concept of industrial 4.0 German government has equations of other parts. The profound and dynamic transformations in the global economic environment brought about by the Fourth Industrial Revolution give rise to inquiries that warrant additional investigation pertaining to prominent multinational corporations' energy independence new energy, development strategy globalization, cooperatives eutrophication, the fourth industrial revolution south Korea. A significant area of inquiry for potential future research pertains to the re-evaluation of the state's function. The examination and comprehension of emerging forms of enterprises and novel business frameworks resulting from the digital revolution elicit significant scholarly curiosity. The advent of the Fourth Industrial revolt results in the redistribution and surplus of wealth from established Transnational Corporations (TNCs) in wealthy nations to their rival counterparts. The analysis of challenges encountered by major Transnational Corporations (TNCs) in the realm of digital marketing and management transformation is crucial. The contemporary advancements in technology associated with the Fourth Industrial Revolution have established the network-based structure of modern enterprises and the modular characteristics of commodities, services, and processes. One significant area of inquiry pertains to the influence of digitalization on competitiveness and rivalry within the global market.

LIMITATIONS

The primary contextual constraints of the study stem from the way the research technique was implemented. First, Considering the managerial strategy that was applied, we limited the search to publications indexed in the databases' (Scopus) business and management topic areas. Even if they collectively represent the most extensive scientific sources and have the greatest documentation, they could not include all the studies that are relevant to our problem. Second, only articles that were published in English in scholarly publications were taken into account. As a result, additional research that could have been pertinent was eliminated, including book chapters, theses, doctorate dissertations, and conference proceedings. Third, the specification of the first set of keywords and the chosen search algorithm has an impact on the results.[64] In an attempt to get around this restriction, we developed a recursive strategy that enabled us to expand the keyword sets by taking into account the terms used in the publications that we located via our evaluation.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

HRM: Human resource management; **IOT:** Internet of Things; **SLR:** Systematic Literature Review; **ID:** Keywords Plus; **DE:** Author's Keywords; **TC:** Total Citations; **SCP:** Single Country Publications; **MCP:** Multiple Country Publications; **TNCs:** Transnational Corporations.

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