Journal of Economic Cooperation and Development, **45**, 4 (2024), 271-300

Bibliometric Insights into Human Resource Analytics: Analyzing the Growth and Impact of Research

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ABSTRACT

Literature on human resource analytics (HRA) reveals that the application of HRA varies based on the business environment, country perspective, and overall management style of a business. The literature also signifies that HRA application in modern business has been increasing not only in the number of companies but also in the scope of use. To summarize the HRA literature, this study reviews the existing HRA literature using citation-based novel bibliometric methods. A total of 227 published articles from the Scopus database are examined. This study examines the performance in the growth of publications, authors, countries, institutions, and sources, along with co-occurrence keywords and co-authorship citation networks. Content analysis revealed five research streams: HRA and organizational performance, HRA adoption, tools and technologies, risks, and challenges, and HRA and well-being. Despite HRA's growth, the findings of this study suggest that challenges persist in several areas such as HR competencies, leadership, data quality, ethical consideration, and technology integration. Future research directions are also given.

ملخص

تظهر الأدبيات المتعلقة بشأن تحليلات الموارد البشرية أن تطبيقها يختلف بناء على بيئة العمل والمنظور الوطني والأسلوب الإداري العام للأعمال. وتفيد أيضا بأن تطبيق تحليلات الموارد البشرية في الأعمال الحديثة يتزايد ليس فقط من حيث عدد الشركات، ولكن أيضا من حيث نطاق الاستخدام. لتلخيص الأدبيات الخاصة بتحليلات الموارد البشرية، تستعرض هذه الدراسة الأدبيات الحالية

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باستخدام أساليب ببليومترية مبتكرة قائمة على الاقتباسات. وتم فحص إجمالي 227 مقالا منشورا في قاعدة بيانات سكوبس (Scopus). وتبحث هذه الدراسة الأداء في نمو المنشورات والمؤلفين والدول والمؤسسات والمصادر، إلى جانب الكلمات المفتاحية المشتركة وشبكات الاستشهاد للتأليف المشترك. كشفت التحليلات عن خمس تيارات بحثية، وهي: تحليلات الموارد البشرية والأداء التنظيمي، وتبني تحليلات الموارد البشرية، وأدوات وتقنيات تحليلات الموارد البشرية، والمخاطر والتحديات المتعلقة بتحليلات الموارد البشرية، وتحليلات الموارد البشرية والرفاه. وبالرغم من نمو تحليلات الموارد البشرية، تشير نتائج الدراسة إلى أن التحديات لا تزال قائمة في عدة مجالات، مثل كفاءات وقيادة الموارد البشرية وجودة البيانات والاعتبارات الأخلاقية المتعلقة بالمجال ودمج التكنولوجيا فيه. وكما تقدم الدراسة توجيهات للبحوث المستقبلية.

RÉSUMÉ

La littérature sur l'analyse des ressources humaines (ARH) révèle que l'application de l'ARH varie en fonction de l'environnement de l'entreprise, de la perspective du pays et du style de gestion global de l'entreprise. La littérature indique également que l'application de l'ERH dans les entreprises modernes a augmenté non seulement en termes de nombre d'entreprises, mais aussi en termes de portée de l'utilisation. Pour résumer la littérature sur l'ERS, cette étude passe en revue la littérature existante sur l'ERS en utilisant des méthodes bibliométriques novatrices basées sur les citations. Au total, 227 articles publiés dans la base de données Scopus ont été examinés. Cette étude examine les performances en matière de croissance des publications, des auteurs, des pays, des institutions et des sources, ainsi que les mots-clés de cooccurrence et les réseaux de citations de coauteurs. L'analyse du contenu a révélé cinq axes de recherche : ERS et performance organisationnelle, adoption de l'ERS, outils et technologies, risques et défis, et ERS et bien-être. Malgré la croissance de l'ERS, les résultats de cette étude suggèrent que des défis persistent dans plusieurs domaines tels que les compétences en RH, le leadership, la qualité des données, les considérations éthiques et l'intégration de la technologie. Les orientations futures de la recherche sont également données.

Keywords: Human resource analytics (HRA); bibliometric analysis; content analysis.

JEL Classification: C23, R41

1. Introduction

Human Resource Analytics (HRA) has witnessed considerable growth, particularly due to the progression of technology (McCartney and Fu, 2022). At the dawn of the digital age, HRA has emerged to harness the power of data (Kiu et al., 2023). It leverages the power of data to facilitate evidence-based decision-making. The human resource (HR) function possesses the capacity to integrate and implement analytics in decision-making processes, thereby positioning itself as a crucial strategic partner in establishing a sustainable competitive advantage (Ulrich and Dulebohn, 2015; Arora et al., 2023).

HRA has gained significant acceptance among human resource management (HRM) practitioners and academics, with this trend exhibiting rapid acceleration, reflecting a burgeoning global market (Marler and Boudreau, 2017). The HRA market valuation reached $3.3 billion in 2022, and it is projected to experience a compounded annual growth rate (CAGR) of 13.1% between 2023 and 2032, highlighting a significant global explosion (Credence, 2019).

In academic literature, HRA appeared between 2003 and 2004 (Marler and Boudreau, 2017). Several HRA terms, such as "Workforce analytics," Talent analytics, "People analytics", "Human Capital analytics", "Human Resource analytics", and "HR analytics", are interchangeable to some extent (Davenport et al., 2010; McCartney et al., 2021a). However, HRA is the most used term, which refers to a novel system for collecting, analyzing, and visualizing a complex set of HR data to generate actionable insights and identify hidden patterns for future predictions (Hamilton & Sodeman, 2020a). HRA focuses on analyzing HR activities such as candidate selection, recruitment, training, performance appraisal, compensation, and evaluation with the identification of employee mood, sentiment, and attrition prediction to provide managers with insights for productive decision-making and enhancing organizational performance (OP) (McCartney & Fu, 2021). Organizations exposed that they could improve performance through HRA in terms of cost reduction, efficiency, low turnover rate, improved low-performing employees, and time savings in performance assessment (Madhani, 2023).

Organizations are adopting HRA to reap these benefits, as evidenced by several studies (Wirges & Neyer, 2022; Arora et al., 2023). Despite the

advantages, the literature has identified challenges such as a lack of analytical skills, poor data quality, security, and privacy with technology integration for HRA adoption (McCartney and Fu, 2022; Wirges & Neyer, 2022). Although it faces various challenges HRA is in the embryonic stage (McCartney and Fu, 2022; Study, 2023). As it is a new concept, there are many opportunities for substantial growth in the practice of HRA (Dahlbom et al., 2020). Researchers are encouraged to conduct future research in the HRA domain; however, there remains ambiguity regarding its adoption. HRA adoption continues to be an unresolved question and a persistent concern (Qamar and Samad, 2021; Arora et al., 2022).

In the last decade, numerous review papers extracted research topics, trends, evolution, and future research directions for HRA (Marler & Boudreau, 2017; Margherita, 2021; Bahuguna et al., 2023). Margherita (2021), carried out a systematic literature review (SLR) to define HRA and pinpoint key topics in enablers, applications, and value of HRA. Bahuguna et al., (2023) also employed SLR to analyze 480 articles from 2003 to March 2022 of the Web of Science (WoS) database to elucidate HRA's evolution and advancement. Similarly, Qamar & Samad, (2022) studied HRA evolution through bibliometric and content analysis of 125 articles from the Scopus database between 2008 and 2019 to identify research clusters with future agendas to make it a more inclusive study.

Earlier researchers conducted a review study based on 28 articles from WoS databases spanning the years 2012 to 2021 to revisit HRA adoption (Ramachandran et al., 2023). Conversely, a study analyzed the practice of HRA through an "HRA-as-practice" approach, examining 100 publications from WoS and Scopus databases (Espegren & Hugosson, 2023). Thakral et al., (2023) employed a structural topic modeling approach to investigate the trends of HRA, drawing from 503 articles of Scopus to identify significant future research themes. Recently, Arora et al., (2023) conducted a bibliometric analysis of HRA from Scopus databases, highlighting future research trends from 2013 to January 2022.

However previous reviews have focused on specific aspects of HRA with restricted date ranges, spanning nine to 20 years and not extending to February 2024 (Arora et al., 2023; Study, 2023; Arora et al., 2022a). This study aims to cover literature from 2008 to February 2024 to analyze research growth and insights into HRA comprehensively. Although qualitative reviews exist, a comprehensive quantitative outlook over time

is scarce. The breadth of HRA and its applications by researchers, data scientists, and industry experts require thorough investigation (Study, 2023). Arora et al., (2023) emphasized the necessity of quantitative content analysis of HRA in the future. Therefore, a bibliometric analysis with a content analysis from the initial period to the present is required.

This study offers an inclusive understanding of HRA with past, present, and future by employing a hybrid research technique that combines bibliometrics with content analysis, utilizing a Scopus-indexed database of 227 published documents from 2008 to February 2024 (February). This research aims to attain the stated objectives.

- To evaluate publication trends and influential authors, institutions, countries, and sources of HRA literature from 2008 to 2024.
- To examine key research in terms of most frequent keywords, co-citation network analysis, co-occurrence keywords network, and co-citation of the authors who have been cited.
- To identify potential research areas for future research directions.

This study adopted a hybrid research approach to intensively review past, present, and future literature on HRA. It provides an outline of publication trends including authors, countries, institutions, and sources. The keyword co-occurrence network delineates the HRA research area with prominent clusters based on the author's keywords and keywords network analysis. The bibliographic coupling documents mirror the co-citation network among authors with highly cited contributed works. Co-citation cited authors reveal the strength of co-citation links among cited authors. Finally, content analysis explored HRA and organizational performance, HRA adoption, tools and technologies, risks and challenges, and HRA and well-being research streams leading to future directions, based on 50 selected documents (published in journal impact factor 3 or above).

2. Data and Methodology

The bibliometric review technique is a recognized method in management to analyze a body of literature to identify eminent authors, institutions, sources, keywords, and relationships among these authors, and countries (Akther et al., 2022; Jarin et al., 2021). It uses quantitative tools to evaluate existing literature based on bibliometric data of publications, citation information, research trends, and co-authorship (Ikra et al., 2021;

Johara et al., 2023). Numerous studies have employed bibliometric analysis to analyze institutions, countries, leading journals, and pertinent keywords (Wu et al., 2021; Qamar and Samad, 2021). Despite various literature review methods (Akther et al., 2022; Tahmid et al., 2021), a bibliometric method is the most objective owing to its reliance on a review protocol and quantitative techniques, unlike other methods that lack a review protocol (e.g., critical) or rely on subjective interpretations (e.g., thematic) (Donthu et al., 2021a).

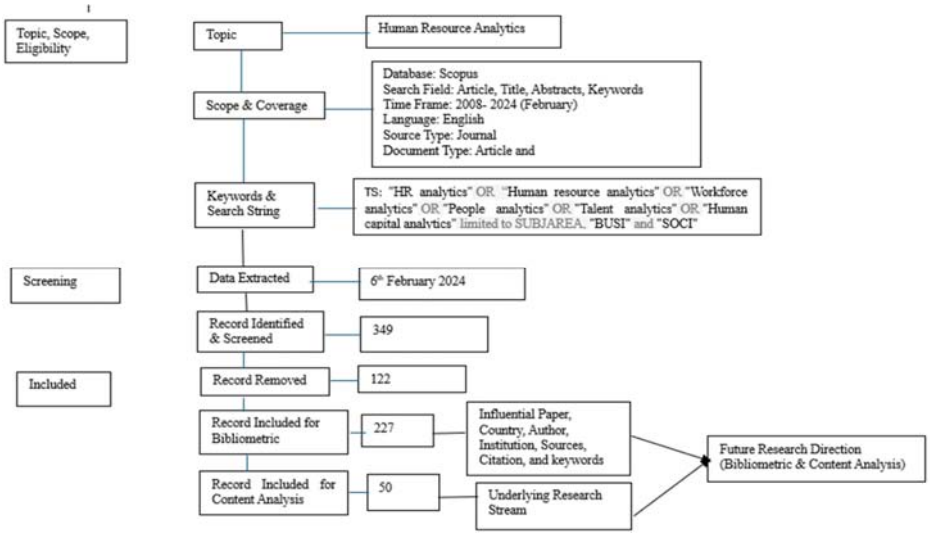
This study used a hybrid approach of mixed bibliometric and content analysis to attain the objectives. Performance analysis was conducted by using bibliometric measures, such as publication count, citations, citation score, h-index, keyword co-occurrence analysis, and bibliographic coupling to unpack the major topics and themes, subsequently guided the authors' full-text reading for content analysis (Akther et al., 2022).

Data collection commenced on 6th February 2024 focusing on Human Resource Analytics and social science disciplines from 2008 to 2024. Previous reviews were limited between 2008 to 2022 (Arora et al., 2023; Study, 2023; Arora et al., 2022a) not extending to 2024 (February). Consequently, this study utilizes a Scopus database of 227 documents from 2008 to February 2024. The Scopus database was selected because of its extensive coverage, containing 95% of scholarly peer-reviewed publications (covering more than 20,000) in science, medicine, social science, humanities, and arts (Fahimnia et al., 2015). This database also allows access to tens of millions of articles (peer-reviewed journals). Compared to the Wos databases, Scopus offers better coverage and comprehensiveness (Qamar & Samad, 2022). However, the Wos database is restricted to ISI-indexed journals. Moreover, researchers prefer Scopus databases because of their comprehensiveness (Rosado-Serrano, Paul, & Dikova, 2018).

Data collection followed three stages: topic, scope and eligibility, screening, and inclusion (Fig.1). At first, articles were searched on "HR analytics" OR “Human resource analytics" OR "Workforce analytics" OR "People analytics" OR "Talent analytics" OR "Human capital analytics" restricted to SUBJAREA, "BUSI" and "SOCI" by filtering English language, yielding 349 articles. The search was limited to articles and review papers, which resulted in a final dataset of 227 documents. This study used the bibliometric packages of R software (Warnes et al., 2015)

and VOS viewer (Van Eck & Waltman, 2010) to graphically represent bibliometric results. Then fifty publications were prioritized for in-depth content analysis to identify trending research areas in HRA literature. These articles were selected by following two criteria; journals with an impact factor of three or higher, and articles published after 2021. These 50 articles were thoroughly examined to identify the significant research streams.

Figure 1. Data collection procedure.



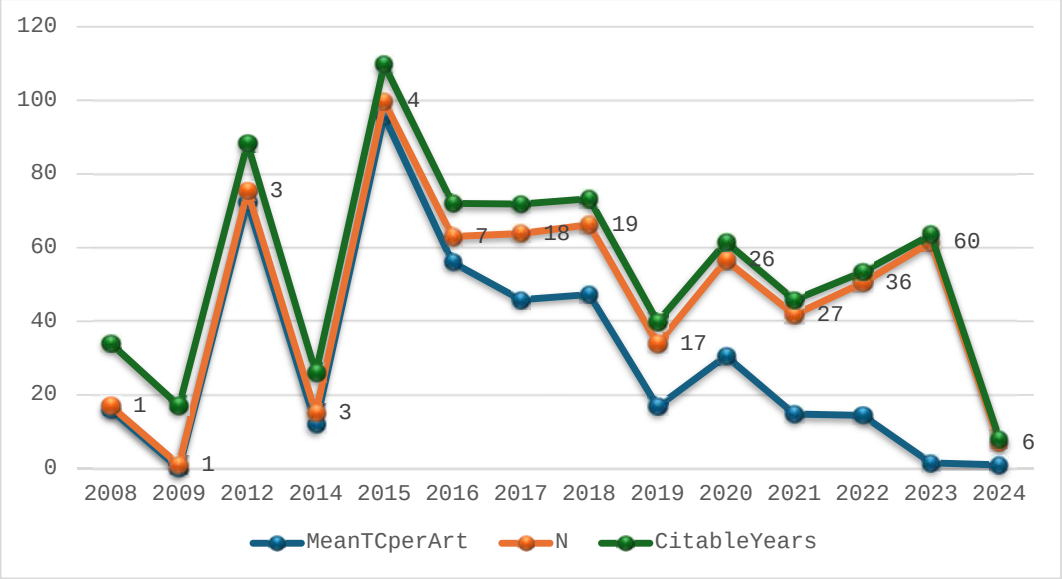
3. Performance Analysis

3.1 Publication and Citation Trends

The figure depicts an analysis of 227 articles collected from 2008 to 2024, encompassing 511 authors and 127 sources (journals and review proceedings). This graph shows the limited research in the HRA domain until 2007. However, an article on "Emerging Human Capital Analytics for Investment Processes" appeared for the first time in 2008 and was cited for 11 years. The HRA field demonstrated a yearly growth rate of 1.8 %, with an outstanding expansion between 2017 and 2019. In 2018, 19 publications were published referring to the five times production of

2015 (only 4 articles) and secured the second position. Subsequently, this subject has experienced substantial growth in publications (Figure 1). Since 2020, HRA has become an indispensable tool for transforming the HR department (Fink and Sturman, 2017; Marler and Boudreau, 2017). Notably, there was a remarkable increase in 2023 with 60 publications, while MeanTCP peaked in 2015 (95.75). There is a dearth of research on HRA and its adoption (Marler and Boudreau, 2017). However, HRA adoption and its utilization among HR professionals remains a subject of matter (Watson, 2018; Vargas et al., 2018). Overall, the graph illustrates the progression of HRA over this period, offering valuable insights into the growing interest in the HRA domain.

Figure 2. Publication and citation trends



3.2 Most Prominent Authors, Countries, Affiliations, Documents and Sources

This table represents the top 20 countries, authors, institutions, documents, affiliations, and sources in HRA literature. As one of the leading initiators, India ranked first in HRA literature with 37 articles, while the USA had the highest TC (1369) with 35 articles. The Netherlands (10 articles, 407 citations), the UK (8 articles, 403 citations), Australia (11 articles, 240 citations), and Denmark (3 articles, 178

citations) were followed. Conversely, Italy and Israel received high average citations (181, 160) respectively with only four articles each demonstrating high-quality publications.

An examination of single-country publications (SCP) and multiple-country publications (MCP) revealed that most countries published independently. India produced 37 articles, with only two international collaborations. Similarly, the USA also collaboratively published 5 out of the 30 articles. In general, the prevalence of SCP is higher than MCP, highlighting the preference for domestic collaboration. The US has collaborated mostly with China and Australia, presumably due to their advanced technological capabilities. It is noted that the most productive author in terms of publications did not garner many citations. Ulrich D. received the highest number of citations (347) by publishing only three papers. Authors Baum and Kim were top contributors to TC with 311 and 174 respectively. Caray followed closely with 137 citations. Other prominent authors Charlwood, Pillai R, and Sivathanu B, received 291, 225, and 225 citations respectively, followed by Chalutz Ben-Gah H (155 citations). McCartney S published five papers from 2008 to 2024 (February), received 96 citations, and had an h-index of 4, indicating a strong influence on HRA literature. Except for a few authors, this review study revealed that most productive authors had a low h-index. The H index is a reliable and valid tool for assessing scientific contributions and achievements. Among the top 20 authors, only McCartney had an h-index of 4. 34% of the authors had an h-index of 3, and 60% had an h-index of 2. Leo Egghe proposed the g-index by organizing all publications in descending order of citations they received and multiplying the top g articles by their citations. In this case, McCartney S received 5 g citations, followed by Fu N (4), and Chalutz Ben-Gah H (3), while the remaining authors received 2 g citations.

The top 20 universities produced 106 documents, suggesting that HRA is thriving and expanding. RMIT is the topper with 14 publications. Interestingly, six universities are from Europe: Tilburg University (7 papers), Vrije Universities Brussel (7 papers), Rennes School of Business (5 papers), Bar-Ilan University (4 papers), Copenhagen Business School (4 papers), Democritus University of Thrace (4 papers), and Maynooth University (4 papers). Among them, Tilburg University and Vrije Universities Brussels occupied the second position. The findings indicate that European institutions contributed the most while USA universities

published 22% of total papers. Nevertheless, Indian Universities (Amity, IIT, K.R. Mangalam, and Chitkara University) published 19% paper of the total and ranked third.

Of the 227 documents, the top 20 journals published 98 documents. The Journal of Organizational Effectiveness was at the top of the list (12 documents & 444 citations), followed by the Journal of Human Resource Management (398 citations) and secured second position. This indicates the dominant impact of the Journal of Organizational Effectiveness on HRA literature. Moreover, the h-index was 9 meaning that nine publications in HRA received at least nine citations each.

Table 1. Most Eminent Authors, Countries, Documents, Sources and Affiliations

Country	Article	MCP	Authors	H	TC	Affiliation	NP	Sources	h_index	g_index	TC	NP
India	37	2	Singh S	2	10	RMIT University	14	Journal of Organizational Effectiveness	9	12	444	12
USA	35	5	Mccartney S	4	96	Tilburg University	7	Human Resource Management	8	11	398	11
Australia	11	3	Chalutz Ben-Gal H	3	155	Vrije Universiteit Brussel	7	Personnel Review	7	11	214	11
Netherlands	10	4	Fu N	3	65	School of Business	6	Human Resource Management Journal	6	9	372	9
United Kingdom	8	1	Guerry M-A	3	64	University of Southern California	6	Human Resource Management International Digest	4	9	234	9
Germany	7	1	Arora M	2	10	Amity University	5	International Journal of Human Resource Management	4	4	350	4
Ireland	7	1	Avrahami D	2	90	Indian Institute of Management Rohtak	5	International Journal of Manpower	3	5	67	5
Spain	6	2	Boudreau J	2	82	K.R. Mangalam University	5	International Journal on Emerging Technologies	3	3	24	3
China	5	5	Cascio W	2	82	Nova Southern University	5	Sustainability (Switzerland)	3	3	27	3

Belgium	4	2	Charl Wood A	2	291	Purdue University	5	Asia Pacific Journal of Human Resources	2	3	14	3
France	4	2	Di Lauro S	2	153	Rennes School of Business	5	Asia Pacific Journal of Information Systems	2	2	7	2
Israel	4	0	Edwards MR	2	25	An-Najah National University	4	Baltic Journal of Management	2	2	48	2
Italy	4	2	Fecheyr-Lippens B	2	27	Bar- Ilan University	4	Business Horizons	2	2	170	2
Denmark	3	0	Jain P	2	12	Chitkara University	4	Decision Support Systems	2	2	93	2
Saudi Arabia	3	1	Levenson A	2	117	Copenhagen Business School	4	Evidence-Based HRM	2	2	8	3
Bangladesh	2	1	Ulrich D	2	347	Democritus University of Thrace	4	FIIB Business Review	2	2	14	2
Canada	2	1	Pagliari C	2	153	Loughborough University	4	Human Resource Development	2	5	57	5
Korea	2	0	Tursunbayeva A	2	153	Maynooth University	4	Human Resource Management Review	2	4	256	4
New Zealand	2	1	Pillai R	2	225	Renmin University of China	4	International Journal of Information Management	2	2	186	2
Pakistan	2	1	Sivathanu B	2	225	Symbiosis Centre for Management and Human Resource Development	4	International Journal of Organizational Analysis	2	4	40	4

Source: Authors Own Work

3.3 Co-occurrence network analysis of Keyword

The figure co-occurrence network of keywords portrays the development of HRA from 2008 to 2024. The clusters were identified by five distinct colors: purple, red, green, yellow, and orange. Each color represents a cluster's keywords with line thickness indicating relationship strength between keywords. Of the 23 keywords, HR analytics has 85 occurrences (Table 2), with a link strength of 135 in the purple cluster including HRIS, technology adoption, strategy, and HR competencies. Penpokai et al., (2023) studied the relationship among technology adoption, HR competencies, and HRA; and revealed technology adoption and HR competencies are two organizational constructs. HR competence demands HRA applications because it is an organizational construct in competence management. Researchers concentrated on HR competencies as competencies and skills are required for HRA adoption. HR competence influences decision-making (8 occurrences) through HRA which can contribute to strategic HRM (9). As part of strategic HRM, HR managers, and business partners engage in evidence-based decisions by implementing HRA (Thakral et al., 2023). HRA has emerged as a current business trend and challenge, emphasizing the strategic importance of HRM in senior management.

The second largest node is people analytics (PA), occurring 53 times in the yellow cluster. Rasmussen et al., (2024) highlighted the capabilities of PA teams and professionals. PA and machine learning algorithms can be pivotal in terms of job and employee sentiment analysis and monitoring for generative AI-driven HR and sustainable organizational development (Ljungholm & Popescu, 2023). AI-driven HR and PA can lead to organizational sustainability.

The green cluster combined human capital, change management, humans, organizations, social networks, and employee engagement. Managerial decision-making determines strategic Human Capital Analytics (HCA), which improves organizational and market performance as part of strategic performance measurement and management systems (Samson & Bhanugopan, 2022). For performance management, generative AI algorithms can be applied to manage talent, job displacement & creation, employee productivity, and well-being (Ljungholm & Popescu, 2023).

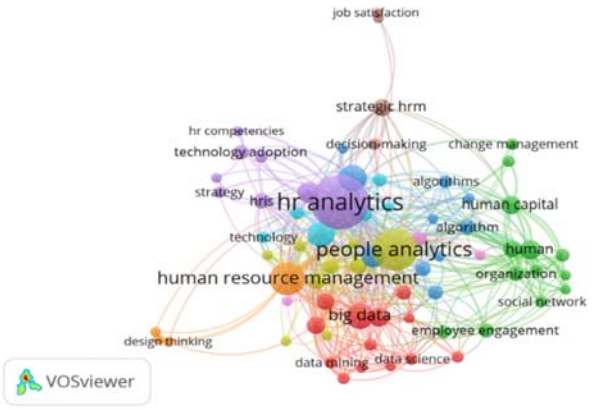
The red cluster comprises big data, data mining, and data science, where big data has the highest frequency (20). Digitalization and advancement

of big data and predictive analytics compel new HRM concepts for talent management. Technologies like AI, robotic automation, blockchain, machine learning, augmented reality, relational analytics, and virtual reality can be integrated with HRA (Kiu & Chan, 2023). Additionally, HR can incorporate blockchain, AI, and metaverse into HR functions such as retention, talent management, and employee turnover, showcasing HRA's potential to enhance HR practices. Future researchers can also address blockchain applications to enhance workplace ethics (Thakral et al., 2023).

Table 2: Most Frequent Keywords

Keyword	Occurrences	Total link strength
hr analytics	85	135
people analytics	53	131
human resource management	32	81
human resource analytics	21	39
big data	20	46
artificial intelligence	14	54
organizational performance	12	29
talent analytics	11	40
Human	11	53
human capital	10	27
strategic hrm	9	23
decision making	8	33
Algorithm	7	32
data analytics	8	40
hr analytics	85	135
people analytics	53	131
human resource analytics	21	39

Figure 3. keyword co-occurrence



3.4 Co-citation network

The bibliographic coupling of documents resembles network analysis in terms of the titles of the papers and the authors with citations. This figure shows the strength of co-authorship including twenty-three authors excluding many authors. The prominent author, Angrave et al., (2016) explained why HR failed the big data challenge considering HRA and received a TC of 279 in the green cluster. The authors clarified that HRA is essential to ensure HR's future strategic management function by transforming OP. In the future, companies can apply neural networks and predictive analytics with HRA (Lismont et al., 2017). Frederiksen, (2017) discussed the movement from a descriptive to a predictive approach using firm-level data and the benefits of data-entered decision-making that received 28 TC. In this network, Khan & Tang, (2016) addressed employees perceived predictive analytics and their impact on HRA practice and received 31 TC. However, most companies demonstrate that predictive analytics need to improve the efficiency and effectiveness of HR activities, whereas prescriptive analytics seem to be in their infancy (Cayrat & Boxall, 2022). Conversely, Todolí-Signes (2021) discussed the algorithms to explain occupational risks and emphasized programmed algorithms to weigh this risk through AI, referring to workplace safety.

In a yellow cluster, Pessach et al., (2020) focused on employee recruitment through prescriptive analytics via machine learning and mathematical programming, linked to Ekawati (2019), who discussed employee turnover with prescriptive analytics and received a TC of 28. Predictive analytics support HR recruiters in improving hiring and placement decisions. Machine learning, predictive analytics, logistic regression, and decision tree approaches are suitable for hiring and analyzing turnover (Rombaut & Guerry, 2018). According to, Safarishahrbijari, (2018) WFA can predict the future workforce to assist any industry with a prognostic effect that has no link to other authors. King, (2016) received 53 TC, along with Ekawati (2019), which connects Khan's (2016) green cluster. HR professionals objectively evaluate their readiness for HRA to overcome organizational challenges and HRA application.

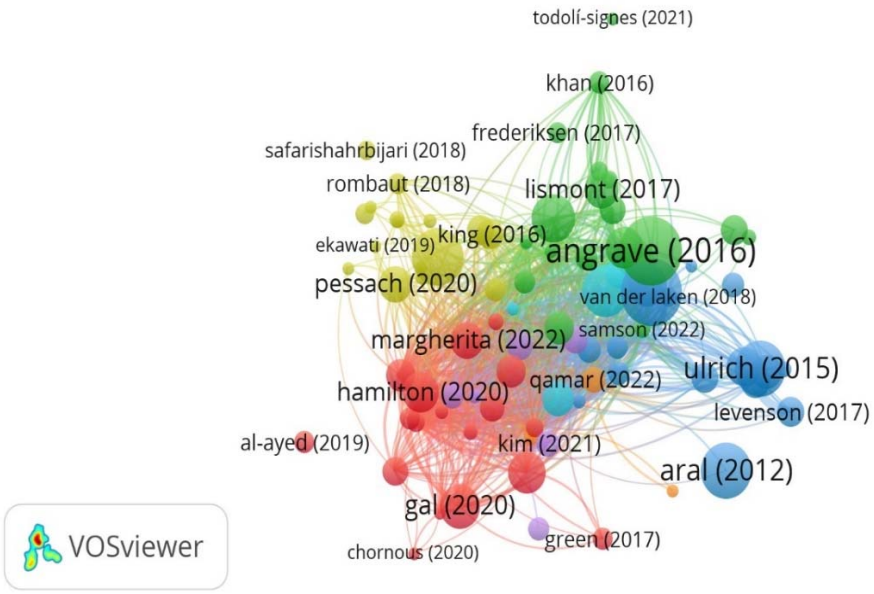
Ulrich and Dulebohn, (2015) captured the largest space in the blue umbrella and received 188 TC. This study strongly connected with Van den Heuvel & Bondarouk, (2017) noted the fluctuations of HRA's future

application, value, structure, and system support while Ulrich & Dulebohn, (2015) discussed the HR work and areas of HR investments. HR investment leads to HRA's capability to facilitate business, and HR leaders to make operational and strategic decision-making. Previously, Aral et al., (2012) explained the adoption of Human Capital Management (HCM) software regarding performance pay, HRA, and IT examining the combined effect on productivity with 187 TC. Regarding this, Qamar & Samad, (2022) identified current and future HRA research trends emphasizing hiring quality, employee retention, and turnover predictions.

Today, the global workforce significantly affects HR, with business analytics becoming a relevant area of strategic organizational capability. Ulrich and Dulebohn, (2015) and Levenson, (2018) emphasize that WFA can improve strategy execution. This link is related to Kim et al., (2021) of the red node who explored the relationship between the technology and HRM with a TC of 40. In the same cluster, Hamilton & Sodeman, (2020a) stressed the opportunities and challenges of big data analytics to manage human capital resources and examined its potential to assess the real-time performance of knowledge talent. This study is consistent with Margherita (2020), who contributed to firm performance and received 97 TC. Another researcher Chornous & Gura, (2020) dealt with issues of HCM optimization based on predictive workforce analytics and business intelligence, similar to Gal et al., (2020).

The use of PA has increased, to manage people in organizations. PA allows decision-makers to make evidence-based, bias-free decisions; and expands workers' personal and professional growth (Gal et al., 2020). Green (2017) highlighted the best practices of HR positions and employees in unveiling hidden PA secrets. Both Green, (2017) and Gal et al., (2020) focused on PA, whereas Gal et al., (2020) and Kim et al., (2021) illustrated technology and HRM relationships upon receiving a TC of 40.

Figure 4. Co-citation network



3.5 Co-citation Cited Authors

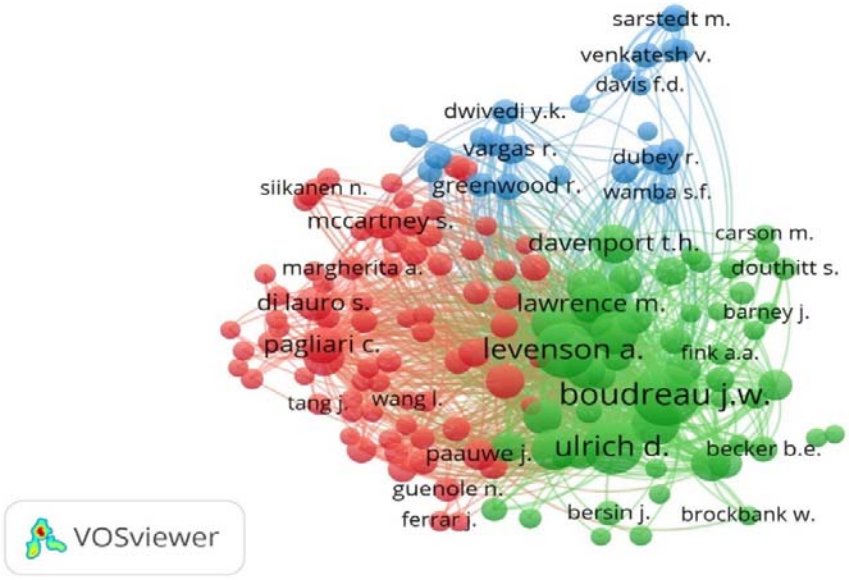
In Figure 5 of co-citation cited authors, authors received at least 20 citations, where 158 authors met the threshold point in this study. The total strength of co-citation links to other authors. The graph shows three clusters: green, blue, and red. The green cluster is composed of 12 authors, where Levenson (2018) received the highest (144) citations, with a total link strength of 6837, focusing on analytics to develop a strategy for the workforce. Boudreau & Cascio, (2017) epitomized the largest node explaining push and pull factors behind the limited use of HCA representing fertile ground for future research. These authors received 177 citations with a total link strength of 6714. Ulrich and Dulebohn (2015) received 139 citations and secured third position, raising the question of whether the HR journey will continue, and what will be next.

The red cluster combines ten authors with Mccartney having a total strength of 2814 and 54 citations of links. McCartney & Fu, (2021) raised the impact of HRA on OP. However, Pagliari received more citations (56) and linked strengths with other authors 2586. Di Lauro s. received 51

citations with a link of strength 2236. In 2020, a framework of an "exponential view of HRA" was facilitated by AI and cognitive technologies for advancing HRA.

The blue cluster includes eight authors, and Vargas et al., (2018) studied the early adoption of HRA with a high link strength was 2002 and received 42 citations. Simultaneously, Dwivedi's co-citation link strength was 1885, with 34 citations.

Figure 5. Co-citation Cited Authors



4. Influential Papers Content Analysis

This section analyzes the contents of 50 influential papers published in recognized journals with an impact factor of three or higher, out of 227 documents. A rigorous comprehensive reading identified HRA and organizational performance, HRA adoption, tools and technologies, risks and challenges, and HRA and well-being research areas (Table 3).

Table 3. Different Streams of HRA Literature

Core stream	Sub stream
HRA & Organizational Performance	Problem analytics game changer, Bridging gap & OP, Personalized HRM via HRA, employee performance & productivity, ROI-based review of HRA, performance management, problem-solving capabilities, HRA & attrition, Talent analytics.
HRA & Adoption	Determinants of HRA, HRA adoption via organizational analytics maturity (OAM), Acceptance of HRA, process orientation, HRA & SHRM, Strategy formulation, and Public Personnel Management.
HRA Risks & Challenges	Challenges of workforce big data, End-user modifiability & HCA in hiring decisions, Challenges for practitioners, praxis & practices, Ethics & Dark sides of PA, Accountability of HRA
HRA & Wellbeing	Mental well-being, mitigating incidents, employee resilience, Rostering practices, evidenced-based HRM
HRA Tools & Technologies	Generative AI Algorithms, Microsoft 365, PA & SARI sustainability, PA & SHRM, PA & HRD, Analytics & AI, Data mining, PA framework, Relational analytics.

HRA and Organizational Performance

HRA is welcomed as it is gaining prominence in business organizations to ensure OP (Qamar & Samad, 2022). A novel business model was developed utilizing statistical methods to connect HR and OP practices. Many prominent companies such as Convergys, Maersk Drilling, Sysco, McDonald's, Google, Bank of America, Coca-Cola, Unilever, and Inditex, are successful in HRA deployment (Madhani, 2023). But McCartney & Fu, (2021) addressed why, how, and when HRA leads to increased OP.

Thakur et al., (2023) evaluated the mediating role of creative problem-solving capability (CPSC) and the moderating role of data quality with HRA personnel expertise to ensure OP. With the strategic application of analytics, HRA systematically solves business problems to examine OP (McCartney and Fu, 2022a). Researchers have examined the capabilities of teams and individual analytic competencies in influencing OP (Rasmussen et al., 2024). The findings suggest that theoretical and

conceptual studies on HRA tend to provide a better return on investment (ROI) than technical and case-based research. It is noted that workforce planning, recruitment, and selection are HR tasks that yield the highest ROI (Chalutz Ben-Gal, 2019). Moreover, future researchers should provide important insights to HR technology marketers, talent managers, and technology developers to ensure OP.

HRA and Adoption

The emergence of HRA has been fueled by an abundance of data and compelling organizations to appreciate its value. HRA is regarded as a crucial tool within the HR department, leading to transformative digital disruptions (Marler and Boudreau, 2017). Organizations are moving towards HRA adoption to cope with digital transformation.

To adopt HRA, Shet et al., (2022) developed a framework incorporating technology, organization, environment, data governance, and individual factors based on the Technology–Organization–Environment (TOE) theory. Similarly, Ioakeimidou et al., (2023) tested the HRA adoption framework using the TOE theory. Technological and organizational aspects are crucial for HRA adoption and enhancing Organizational Analytical Maturity (OAM). Additionally, IT infrastructure and HR capabilities are vital for boosting OAM. Although the environmental context received less attention, relative advantage and top management support significantly influenced HRA adoption. Wang et al., (2024) extend this research by proposing a dynamic framework of HRA using adaptive structuration theory (AST). Wirges & Neyer, (2022) also evaluated the process-oriented understanding of HRA. Scholars mentioned the role must be defined in the HRA implementation process.

Nevertheless, HRA adoption remains a concern. There is a paucity of research exploring the determinants of HRA adoption (Arora et al., 2023). Skilled professionals and management assistance can significantly affect HRA adoption enabling professionals to utilize analytics effectively. HRA adoption can assist HR professionals in managing procedures and making SHRM decisions more effectively. In this regard, the interaction among the specialist department, HR business partner, and the HRA function should be increased.

HRA and Well-Being

The mental well-being of employees is a global concern. According to Lathabhavan (2023), HRA is a valuable source of mental health that can facilitate the development of evidence-based management (EBM) strategies to promote mental well-being. However, medical scientists have shortcomings, such as workload issues related to unpredictable rostering practices. Rostering and management decisions are handled manually through enterprise agreements (EA) which do not meet the requirements and negatively affect medical scientists' well-being in pathology services across the health sector (Cavanagh et al., 2024). In Australia, 16,000 medical scientists perform pathological services daily (AIHW, 2019). Consequently, work experience and rostering practices were severely affected. Moreover, mitigating absenteeism and turnover has become challenging.

In aged care, there is a need for HRA to manage and mitigate incidents of violence against nurses and personal care assistants (Pariona-Cabrera et al., 2023). Many innovative opportunities can enhance human capital through HRA. This study investigated the indirect effect between AI-enabled HRA and employee resilience with job crafting whereas the HRM system functioned as a moderator among hotel employees in China. AI-enabled HRA can enhance resilience from the employee perspective.

Tools and Technologies

Organizations are increasingly adopting technological advancements with the integration of HRM and data science to remain relevant in intense competition. A set of technologies, such as AI, Generative AI, data mining, robotics, data analytics, machine learning, Internet of Things (IoT), big data analytics, and HRA vigorously reinvented HRM (Arora et al., 2023).

Bahuguna et al., (2023) explored integrating AI with traditional HRM which is pivotal for HRA. Ljungholm and Popescu (2023) analyzed generative AI's impact on talent and performance management, job displacement and creation, employee productivity, and well-being. Predictive analytics and machine learning are essential for AI-driven HR and sustainable organizational development, particularly in job and employee sentiment analysis.

Brau et al., (2023) highlighted the importance of analytics and AI in judgment, decision-making, and understanding human factors in the digitalized retail supply chain. This study illustrates the changes in human factors within HR development (HRD) decision-making considering managerial roles. Despite predictive analytics' importance in HRD, comprehensive understanding remains limited (Lee & Lee, 2023). This study also mentioned the importance of knowledge, building blocks, ethical issues, and PA application in the HRD field.

Risks and Challenges

HRM is inundated with technologies, and embraced by opportunities, risks, and challenges. Cayrat & Boxall, (2022) explored the challenges, risks, and implications of HRA for practitioners, praxis, and practices while Arora et al., (2022) noted the slow acceptance rate of HRA in engineering and construction industries. Glennie et al., (2023) highlighted the opportunities and challenges of big datasets. Microsoft 365 digital activity records emphasize that big data inadequately represents organizational behavior complexity, and employee privacy and consent pose challenges. To utilize workforce big data; privacy, and consent processes may require revisions. Cayrat & Boxall, (2022) stressed ethical concerns in utilizing employee data amidst significant data quality and integration challenges. Another major challenge is to convince managers to make decisions using an analytical model in employee selection. Existing literature suggests increasing analytical recommendations and their influence on lower-level hiring decisions (Downes et al., 2023). Practitioners are working to build a balanced set of analytical, business, and HR capabilities in their HRA teams (Cayrat and Boxall, 2022). Additionally, Giermindl et al., (2022) mentioned PA can marginalize human reasoning and erode managerial competence, revealing potential dangers. Previous research has identified ongoing challenges with data quality and integration with HR specialists' analytical competence. Authors have emphasized relational analytics which uses workplace relationship data, complements traditional PA, and aligns scholars and practitioners with modern workplace realities (Soltis et al., 2023). Public awareness surged and was triggered by reports on AI misconduct (Chang & Ke, 2023). Consequently, this situation calls for sustainable and responsible use of AI (SRAI). Scholars are now concentrating on SRAI to develop a framework for sustainable PA.

5. Future Research Directions

HRA & Organizational Performance

Several successful business cases have demonstrated that HRA enhances OP. Future research should expand the knowledge of these cases to maximize OP (McCartney & Fu, 2021). This knowledge assists in innovation learning and improves employee performance to increase company sales (Study, 2023). Very few studies have examined the financial outcome of HRA, and future researchers should investigate the evaluation of financial results along with the economic effect of HRA (Thakral et al., 2023). Arora et al., (2023) highlighted that organizational size or age needs to be included to show the impact of OP in the future.

Researchers suggested that managers need to understand the strategic role of data analytics capabilities in performance management leading to improved business intelligence and fostering a data-driven culture (Kiu & Chan, 2023). According to Kiran et al., (2023), attrition can be managed by utilizing HRA and empowering data-driven interventions. HRA and attrition trigger data mining decision systems, forecasting firm performance, and employee satisfaction. Although HRA offers valuable insights, it requires a comprehensive plan to tackle employee attrition by incorporating employee engagement initiatives, and retention strategies. Moreover, managers can formulate HRA to enhance employee performance ensuring the entire OP.

HRA Adoption

Researchers identified that technological and organizational contexts are important for the HRA adoption context (Ioakeimidou et al., 2023). Future research should explore the environmental context's impact on HRA adoption. Arora et al., (2022) noted gaps in understanding the roles of employee characteristics, workplace culture, organizational strategy, HRIS, IT, and HR managers' skills on HRA effectiveness, suggesting future research. Ethical issues, privacy, and acceptance levels should be integrated into the adoption process with technological discussions (Margherita, 2020). Future researchers can determine the impact of these factors on HRA design. Additionally, organizations should optimize succession planning by mapping employees' skills with HRA (Thakral et al., 2023), prompting future research on HR professionals' necessary skills and competencies.

Furthermore, organizations should align HRA technology with rewards, and promotions to boost HR employees' intrinsic motivation (Arora et al., 2022). Interestingly, the literature missed line managers' involvement in adopting the HRA system, so researchers suggest involving line managers in HRA adoption (Wang et al., 2024).

HRA & wellbeing

Mental well-being is an essential component of both human beings and employees. Scholars investigated an employee-supportive framework of mental well-being through HRA (Lathabhavan, 2023). This study examined the moderating role of managers and peer support between organizational mental health support and employees' mental well-being. A case study can explore the consequences of AI-enabled HRA among stakeholders, including managers, employees, unions, customers, and the broader community. This approach can help to mitigate risk and improve employee retention in the short term. Future researchers could analyze different viewpoints of stakeholders regarding HRA with well-being. Workplace violence is a crucial aspect that must be addressed through HRA solutions shortly (Pariona-Cabrera et al., 2023).

Tools and Technologies

Technological growth significantly affects HRM. Several technologies can be integrated with HRA as it is a promising area (Kiu & Chan, 2023). Siemens and Hyundai used metaverse technology to hire and administer personnel (Thakral et al., 2023). Future researchers can link HR with blockchain technology, explainable AI, and Metaverse. Researchers could explore the influence of metaverse on employees' onboarding and engagement in transforming remote work collaboration. Furthermore, how AI affects HR procedures such as hiring, and career planning needs to be focused.

Rasmussen et al., (2024) suggested PA can be regarded as a fourth wave to create impact by addressing valuable concerns to key stakeholders such as employees, senior management, and boards (investors, customers, and communities of the organization. It is essential to monitor and investigate the aspects of PA for HRD in the future (Chang & Ke, 2023).

Risks and Challenges

Despite the advantages, HRA faces many challenges called the dark sides of technology. Researchers have identified the negative aspects of HRA such as risks, challenges, potential abuse, and ethical dilemmas. The study investigated leadership styles, data security & privacy, cultural adaptability, analytic skills, competency, ethical guidelines, and organizational orientation challenges which should be included in future research. Researchers, industry experts, and practitioners mentioned the necessity for future research on ethical considerations for HRA (Lee & Lee, 2023).

Tursunbayeva et al., (2022) recommended that transparency and fairness, legal compliance, protection of data rights and consent inclusion of stakeholders' skills, and cultural evaluation of ethical business models should be included for PA. Future studies could investigate the potential risks and challenges of AI-enabled HRA that might bring negative experiences of AI to organizations and employees (Budhwar et al., 2022). Moreover, organizations should utilize HRA responsibly and effectively for a sustainable organization.

6. Implications and Limitations

This study provides an examination of HRA using a blended methodology that incorporates the outcomes of bibliometric and content analysis with substantial implications. This unified approach calls for a crucial discussion on the pivotal function of HRA in HRM development. Initially, bibliographic data were used for performance analysis to uncover growth trends and the top articles, journals, authors, countries, and institutions in the HRA domain. Subsequently, a detailed review of 50 papers investigated the current research trends. The findings of this study indicate that HRA can create novel strategic HR practices for decision-making at the managerial level.

Managers can devise strategies for HRA adoption to enhance OP. To formulate a business strategy; HR competencies, leadership, data security, integrity, and ethical guidelines should be included with HRA in the modern era of technology. Additionally, AI, robotic automation, blockchain, machine learning, augmented reality, relational analytics, metaverse, and virtual reality can be integrated with HRA. Organizations should utilize AI-enabled HRA to achieve organizational missions.

This holistic framework offers practical implications and suggestions for further research. Future research directions will be provided with statistical techniques to optimize HR functions and assist HRD scholars and practitioners. This paper summarizes and synthesizes the HRA theories, research themes, and methods to conduct empirical studies that will serve as a guideline. Policymakers should focus on reducing organizational politics, risks, and challenges of HRA adoption. However, this study focused on a specific period of HRA literature and used a Scopus-indexed database which is regarded as a limitation.

7. Conclusion

This study aims to comprehensively review existing knowledge and identify the research gaps, ultimately guiding future research. This review examined 227 documents from the Scopus database to offer past, present, and future research on HRA and demonstrates that HRA continues to grow. The findings reveal that India, Singh, RMIT University, and the Journal of Organizational Effectiveness are the productive countries, authors, institutions, and sources in HRA literature using bibliometric parameters.

The rigorous content analysis explored five different streams: HRA and organizational performance, HRA adoption, HRA and wellbeing, risks and challenges, and tools and technologies in HRA that ascertained HRA practices. HRA is an emerging technology, along with other technologies such as AI, blockchain, metaverse, and machine learning to promote OP. These technologies scan challenges such as blockchain helps to reduce ethical dilemmas, and machine learning can make review methods more robust. Employers should investigate the influence of metaverse on employee onboarding and engagement to foster good working relationships by enhancing their mental well-being, potentially reinventing distant work collaboration using a metaverse.

The conclusion of this study indicates that HR competence is receiving priority as HR professionals and managers lack analytical competence and skills. In addition, leadership capability must be increased to make evidence-based decisions. Researchers need to concentrate on HR competencies with leadership capability to adopt HRA to make evidence-based decisions. Furthermore, organizations should focus on rewards and promotions for HRA adoption and usage. This information is vital to researchers, practitioners, and policymakers as it offers a complete picture of the entire HRA literature.

References

Akther, N., Abdullah Al Mamun, M., Abul Kalam Azad, M., & Sorwar, G. (2022). Review of Human Resource Management (HRM) Literature: A bibliometric Analysis (1981-2019). In *Economics Review* (Vol. 32, Issue 1).

Angrave, D., Charlwood, A., Kirkpatrick, I., Lawrence, M., & Stuart, M. (2016). HR and analytics: why HR is set to fail the big data challenge. *Human Resource Management Journal*, *26*(1), 1–11.

Aral, S., Brynjolfsson, E., & Wu, L. (2012). Three-Way Complementarities: Performance Pay, Human Resource Analytics, and Information Technology. *Management Science*, *58*(5), 913–931. https://doi.org/10.1287/mnsc.1110.1460

Arora, M., Prakash, A., Dixit, S., Mittal, A., & Singh, S. (2023). A critical review of HR analytics: visualization and bibliometric analysis approach. *Information Discovery and Delivery*, *51*(3), 267–282. https://doi.org/10.1108/IDD-05-2022-0038

Arora, M., Prakash, A., Mittal, A., & Singh, S. (2022a). Examining the slow acceptance of HR analytics in the Indian engineering and construction industry: a SEM-ANN-based approach. *Engineering, Construction and Architectural Management*, *ahead-of-p*(ahead-of-print). https://doi.org/10.1108/ECAM-09-2021-0795

Boudreau, J., & Cascio, W. (2017). Human capital analytics: why are we not there? *Journal of Organizational Effectiveness: People and Performance*, *4*(2), 119–126.

Cayrat, C., & Boxall, P. (2022). Exploring the phenomenon of HR analytics: a study of challenges, risks and impacts in 40 large companies. *Journal of Organizational Effectiveness*. https://doi.org/10.1108/JOEPP-08-2021-0238

Chang, Y. L., & Ke, J. (2023). Socially Responsible Artificial Intelligence Empowered People Analytics: A Novel Framework Towards Sustainability. *Human Resource Development Review*. https://doi.org/10.1177/15344843231200930

Downes, P. E., Harris, T. B., & Allen, D. G. (2023). Getting from valid to useful: End user modifiability and human capital analytics implementation in selection. *Human Resource Management*.

Ekawati, A. D. (2019). Predictive analytics in employee churn: A systematic literature review. *Journal of Management Information and Decision Sciences*, *22*(4), 387–397.

Giermindl, L. M., Strich, F., Christ, O., Leicht-Deobald, U., & Redzepi, A. (2022). The dark sides of people analytics: reviewing the perils for organisations and employees. *European Journal of Information Systems*, *31*(3), 410–435.

Green, D. (2017). The best practices to excel at people analytics. *Journal of Organizational Effectiveness: People and Performance*, *4*(2), 137–144. https://doi.org/10.1108/JOEPP-03-2017-0027

Hamilton, R. H., & Sodeman, W. A. (2020a). The questions we ask: Opportunities and challenges for using big data analytics to strategically manage human capital resources. *Business Horizons*, *63*(1), 85–95.

Ikra, S. S., Rahman, M. A., Wanke, P., & Azad, M. A. K. (2021). Islamic banking efficiency literature (2000–2020): a bibliometric analysis and research front mapping. *International Journal of Islamic and Middle Eastern Finance and Management*, *14*(5), 1043–1060.

Jarin, T. A., Mumu, J. R., Talukder, A. A., & Azad, M. A. K. (2021). Integration of knowledge in education: a bibliometric review. *Bangladesh Journal of Integrated Thoughts*, *17*(1).

Johara, F., Mustafa, R., Hassan, M. K., & Azad, M. A. K. (2023). A Bibliometric Review of Islamic Work Ethics Literature. *Journal of Economic Cooperation and Development*, *44*(3), 91–127.

Kim, S., Wang, Y., & Boon, C. (2021). Sixty years of research on technology and human resource management: Looking back and looking forward. *Human Resource Management*, *60*(1), 229–247. https://doi.org/10.1002/hrm.22049

King, K. G. (2016). Data Analytics in Human Resources: A Case Study and Critical Review. *Human Resource Development Review*, *15*(4), 487–495. https://doi.org/10.1177/1534484316675818

Kiran, P. R., Chaubey, A., & Shastri, R. K. (2023). Role of HR analytics and attrition on organisational performance: a literature review leveraging the SCM-TBFO framework. In *Benchmarking*. Emerald Publishing. https://doi.org/10.1108/BIJ-06-2023-0412

Kiu, C. T. T., & Chan, J. H. (2023). Firm characteristics and the adoption of data analytics in performance management: a critical analysis of EU enterprises. *Industrial Management and Data Systems*. https://doi.org/10.1108/IMDS-07-2023-0430

Lathabhavan, R. (2023). Mental well-being through HR analytics: investigating an employee supportive framework. *Personnel Review*. https://doi.org/10.1108/PR-11-2022-0836

Lee, J. Y., & Lee, Y. (2023). Integrative Literature Review on People Analytics and Implications From the Perspective of Human Resource Development. *Human Resource Development Review*, *23*(1), 58–87. https://doi.org/10.1177/15344843231217181

Levenson, A. (2018). Using workforce analytics to improve strategy execution. *Human Resource Management*, *57*(3), 685–700.

Lismont, J., Vanthienen, J., Baesens, B., & Lemahieu, W. (2017). Defining analytics maturity indicators: A survey approach. *International Journal of Information Management*, *37*(3), 114–124.

Ljungholm, D. P., & Popescu, V. (2023a). Generative Artificial Intelligence Algorithms in Talent and Performance Management, Job Displacement and Creation, and Employee Productivity and Well-Being. *Contemporary Readings in Law and Social Justice*, *15*(2), 9–25.

Madhani, P. M. (2023). Human Resources Analytics: Leveraging Human Resources for Enhancing Business Performance. *Compensation & Benefits Review*, *55*(1), 31–45. https://doi.org/10.1177/08863687221131730

Margherita, A. (2020). Human Resource Management Review Human resources analytics : A systematization of research topics and directions for future research. *Human Resource Management Review*, *January*, 100795. https://doi.org/10.1016/j.hrmr.2020.100795

Marler, J. H., & Boudreau, J. W. (2017). An evidence-based review of HR Analytics. *The International Journal of Human Resource Management*, *28*(1), 3–26. https://doi.org/10.1080/09585192.2016.1244699

McCartney, S., & Fu, N. (2021a). Bridging the gap: why, how and when HR analytics can impact organizational performance. *Management Decision*, *60*(13), 25–47. https://doi.org/10.1108/MD-12-2020-1581

Penpokai, S., Vuthisopon, S., & Saengnoree, A. (2023). The Relationships Between Technology Adoption, Hr Competencies, and Hr Analytics of Large-Size Enterprises. *International Journal of Professional Business Review*, *8*(3). https://doi.org/10.26668/businessreview/2023.v8i3.971

Pessach, D., Singer, G., Avrahami, D., Chalutz Ben-Gal, H., Shmueli, E., & Ben-Gal, I. (2020). Employees recruitment: A prescriptive analytics approach via machine learning and mathematical programming. *Decision Support Systems*, *134*, 113290. https://doi.org/https://doi.org/10.1016/j.dss.2020.113290

Qamar, Y., & Samad, T. A. (2022). Human resource analytics: a review and bibliometric analysis. *Personnel Review*, *51*(1), 251–283. https://doi.org/10.1108/PR-04-2020-0247

Rasmussen, T. H., Ulrich, M., & Ulrich, D. (2024). Moving People Analytics From Insight to Impact. *Human Resource Development Review*, 15344843231207220.

Safarishahrbijari, A. (2018). Workforce forecasting models: A systematic review. *Journal of Forecasting*, *37*(7), 739–753. https://doi.org/https://doi.org/10.1002/for.2541

Soltis, S. M., Methot, J. R., Gittell, J. H., & Harris, T. B. (2023). Leveraging relational analytics in human resource research and practice. *Human Resource Management*.

Study, A. B. (2023). *behavioral sciences Exploring the Evolution of Human Resource Analytics : A Bibliometric Study*.

Tahmid, T., Mumu, J. R., Hassan, K. M., & Azad, A. K. (2021). What did We Miss? A Bibliometric Review of Electronic Human Resource Management and Research Agenda. *Journal of Economic Cooperation & Development*, *42*(4), 79–107.

Thakral, P., Srivastava, P. R., Dash, S. S., Jasimuddin, S. M., & Zhang, Z. (Justin). (2023). Trends in the thematic landscape of HR analytics research: a structural topic modeling approach. In *Management Decision* (Vol. 61, Issue 12, pp. 3665–3690). Emerald Publishing. https://doi.org/10.1108/MD-01-2023-0080

Todolí-Signes, A. (2021). Making algorithms safe for workers: occupational risks associated with work managed by artificial intelligence. *Transfer: European Review of Labour and Research*, *27*(4), 433–452. https://doi.org/10.1177/10242589211035040

Ulrich, D., & Dulebohn, J. H. (2015). Are we there yet? What's next for HR? *Human Resource Management Review*, *25*(2), 188–204. https://doi.org/10.1016/J.HRMR.2015.01.004

Vargas, R., Yurova, Y. V., Ruppel, C. P., Tworoger, L. C., & Greenwood, R. (2018). Individual adoption of HR analytics: a fine grained view of the early stages leading to adoption. *International Journal of Human Resource Management*, *29*(22), 3046–3067. https://doi.org/10.1080/09585192.2018.1446181

Wang, L., Zhou, Y., Sanders, K., Marler, J. H., & Zou, Y. (2024). Determinants of effective HR analytics Implementation: An In-Depth review and a dynamic framework for future research. *Journal of Business Research*, *170*, 114312. https://doi.org/10.1016/J.JBUSRES.2023.114312

Wirges, F., & Neyer, A. K. (2022). Towards a process-oriented understanding of HR analytics: implementation and application. In *Review of Managerial Science* (Issue 0123456789). Springer Berlin Heidelberg. https://doi.org/10.1007/s11846-022-00574-0