JOURNAL OF TECHNOLOGY MANAGEMENT AND BUSINESS
ISSN: 2289-7224 e-ISSN: 2600-7967

Vol. 11 No. 2 (2024) 156-169
https://publisher.uthm.edu.my/ojs/index.php/jtmb

JTMB

Decadal Review of Human Resource Analytics Research

Luther Yuong Qai Chong[1]*, Thien Sang Lim[1], Debbra Toria Nipo[1]

[1] *Faculty of Business, Economics and Accountancy*
Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu, Sabah, MALAYSIA

*Corresponding Author: LUTHER_CHONG_DB23@iluv.ums.edu.my
DOI: https://doi.org/10.30880/jtmb.2024.11.02.011

Article Info

Received: 3 August 2024
Accepted: 7 November 2024
Available online: 10 December 2024

Keywords

HR analytics, strategic HRM, bibliometric analysis, science mapping, performance analysis

Abstract

Human Resource (HR) analytics has grown exponentially with widespread belief in its positive impact on organizational performance. The steady influx of new research in HR analytics has flooded scholars with vast amounts of qualitative and conceptual data, making it increasingly difficult to navigate and identify the most significant contributions. This study evaluates publication trends over the past decade and aims to reveal evolving research patterns. Subsequently, the focus shifts to identifying the most influential sources in HR analytics research. Finally, pinpointing emerging themes within HR analytics publications aims to offer valuable insights into current trends and guide future research in this field. This study analyzed 262 articles sourced from the Scopus database using VOSviewer. Using scientific mapping of literature and performance analysis, the discussion encompasses publication trends, geographical distribution of research, identification of influential publications, and emerging trends. The consistent upward trajectory of HR analytics publications since 2019, along with notable contributions from various regions, underscores the growing global significance of the field. Notably, ethical considerations remain a central theme, while the research focus has evolved from general HR topics to more specialized areas. The analysis further reveals the transformation of HR analytics into a cross-disciplinary field, incorporating terms from computer science which points to its potential to revolutionize traditional HR practices. The study provides a foundational analysis of HR analytics research and offers a structured overview of the trends.

1. Introduction

Human resource (HR) Analytics is a data and statistical method to understand and improve human resources. It encompasses the data collection, analysis, and interpretation of the workforce within an organization (Bahuguna et al., 2023). Other common terms used in this field include People Analytics, Workforce Analytics, Talent Analytics, Employee Analytics, and Human Capital Analytics (Bonilla-Chaves & Palos-Sánchez, 2023; Peres et al., 2023). Recently, there have been a few scholars who suggested alternative terms to describe HR analytics, such as HR Big Data Analytics, Analytics-based HR Practices, and Hyper-personal Analytics (Arora et al., 2023). The origin of HR analytics dates back to the late 1900s, with Frederick W. Taylor, who analyzed employee performance and set up performance measurements in his Scientific Management studies (Arora et al., 2020).

Extensive research has confirmed the significant role of HR in driving improvements in firm performance (Danvila-del-Valle et al., 2019). With the aid of technology, HR analytics reshaped the traditional HR approach and paved the way for transformative practices (Bonilla-Chaves & Palos-Sánchez, 2023). It has emerged as a crucial field that helps organizations derive actionable insights related to HR processes, particularly in optimizing

workforce strategies (Lopez et al., 2022). Ultimately, HR analytics help firms enhance overall efficiency. This advantage has prompted firms to adopt HR analytics, and according to Bahuguna et al. (2023), the global HR analytics market is projected to grow at a compound annual rate of 12.8% from 2019 to 2027. Despite the growing interest, HR analytics is still considered to be in its infancy (Wirges & Neyer, 2022). This is mainly due to the concentration of conceptual and qualitative research and the lack of quantitative studies and frameworks for hypothesis testing (Tunsi et al., 2023).

Bibliometric analysis is a common approach used to examine a set of scientific data, however, its application within business research is relatively recent and immature (Donthu et al., 2021). One of the major advantages of this approach is it enables scholars to understand the details of development and emerging areas within a field. Although there are few bibliometric studies relating to HR analytics (Madsen & Slåtten, 2022; Qamar & Samad, 2021), the crucial period of the development of HR analytics during 2014 to 2023, which is a decade after the start of its popularity (Arora et al., 2023; Bonilla-Chaves & Palos-Sánchez, 2023), remains unexplored and intrigued. In addition, the constant influx of new research findings has made it difficult for scholars to keep up with the latest developments. Hence, there is a need to identify and analyze the newest focuses. Besides, this study also strives to generate and suggest new ideas and offer guidance on its use for evidence-based management (EBM).

2. Literature Review

According to Marler and Boudreau (2017), HR analytics was initially introduced in HR literature from 2003 to 2004. Despite HR metrics being the foundation of HR analytics, both terms were often distinguished for clarification (Coron et al., 2024). HR metrics are measurements of key Human Resource activity outcomes, and HR analytics is involved with statistical and experimental methods that demonstrate cause-and-effect relationships of HR initiatives. Newer definitions of HR analytics put forward an emphasis on the process-oriented approach (McIver et al., 2018). It is seen not only as a statistical instrument focused on key figures but also as a systematic process. Most recently, HR analytics has been increasingly recognized for its role in fostering dynamic capabilities within organizations, where Falletta and Combs (2021) provide a contemporary definition, and describe HR analytics as a proactive and systematic approach that involves data collection, evaluation, and application of the findings in solving HR issues to aid organizations in achieving their goals. These definitions share two common attributes, which are the utilization of advanced analysis of HR-related data, the utilization of advanced analysis of HR-related data, and a focus on supporting people-related decisions. Therefore, HR analytics is not only about data analysis but also about helping organizations make decisions based on evidence. This enables organizations to gain clarity about their current situation and customize their strategies to achieve a competitive advantage and enhance organizational performance. However, few researchers have doubts about the positive impact of HR analytics. Rasmussen and Ulrich (2015) and, to a minor extent, Angrave et al. (2016) signal HR Analytics as a potential fad if certain criteria are not placed. These contrasting views present the dynamic nature of HR Analytics and its possible impacts on business management, which makes the subject more interesting. Most recently, there is a growing consensus that HR analytics does have a significant impact on organizational performance, although it has some “dark side”. Common issues include the misuse of employee data and IT resources (Chatterjee et al., 2021), as well as over-reliance on quantitative data, data manipulation, and skill gaps, which can lead to unintended consequences.

According to Chalutz Ben-Gal (2019), HR analytics is able to help the organization achieve three main goals. The first goal is to forecast workforce trends by collecting and maintaining HR data, which aids organizations in the optimal acquisition, development, and retention of employees. The second goal is to offer insights into better management of employees for the efficient achievement of business objectives. The third goal is to influence an organization in its strategy implementation positively. In short, HR analytics can be defined as the systematic use of information technology for statistical analysis of HR metrics and processes in a manner that builds dynamic capabilities within organizations toward making informed decisions for improved organizational performance. Theories commonly used to explain these goals include the Resource-Based View, Dynamic Capabilities Theory, Organizational Capabilities Theory, and the Strategic HR Perspective. While HR analytics helps firms achieve their business goals, researchers have also made efforts to understand the determinants and challenges of its adoption. Such studies are frequently conducted through the lens of frameworks like the Theory of Planned Behavior (TPB), Diffusion of Innovation (DOI), Unified Theory of Acceptance and Use of Technology (UTAUT), and others. Intriguingly, the adoption of HR analytics is influenced not only by organizational factors but also by individual-level factors (Arora et al., 2024; Tunsi et al., 2023). However, literature has yet to conclude which type of factor is more crucial. Table 1 summarizes some of the recent studies of HR analytics.

J. of Technology Management and Business Vol. 11 No. 2 (2024) p. 155-169

Table 1 *Overview of recent studies*

Author(s)	Year	Title	Study Focus	Methodology	Major Findings
Okatta, C. G., Ajayi, F. A., & Olawale, O.	2024	Leveraging HR Analytics for Strategic Decision Making: Opportunities and Challenges	Examine HR analytics as a strategic tool in HR Management, emphasizing its role in evidence-based decision-making and enhancing organizational performance.	Case study with six companies.	HR analytics is able to provide insights into employee behavior, performance, and organizational trends. It allows companies to anticipate workforce issues, improve recruitment strategies, and optimize talent management. However, significant challenges such as data availability, quality, and privacy concerns can impede effective implementation.
Arora, S., Chaudhary, P. and Singh, R.K.	2024	Adoption of HR analytics for future-proof decision making: role of attitude toward artificial intelligence (AI) as a moderator	Examine the link between adopting HR analytics and managerial decision-making, examining whether attitudes toward AI may act as a moderating factor.	Quantitative analysis with 377 managers as respondents.	Adopting HR analytics and a positive attitude toward AI greatly impact decision-making, with structural factors being the main influence, followed by individual factors, values, and system support.
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	Provide a thorough and detailed understanding of the factors that impact the successful implementation of HR analytics in organizations.	Systematic literature review of 89 publications.	Identified 18 factors essential for the successful implementation of HR analytics and, using theoretical dimensions, developed a distinct framework of determinants from a dynamic perspective.
Thakur, S. J., Bhatnagar, J., Farndale, E., & Aeron, P.	2024	Human resource analytics, creative problem-solving capabilities, and firm performance: mediator moderator analysis using PLS-SEM	Examine how HR analytics can enhance HRM and organizational performance, with creative problem-solving capability (CPSC) as a key mediator.	Quantitative analysis with 191 firms.	HR Analytics adoption and maturity, directly and indirectly, impact HR management and organizational performance, with CPSC acting as a mediator.
Huang, X., Yang, F., Zheng, J., Feng, C., & Zhang, L.	2023	Personalized human resource management via HR analytics and artificial intelligence: Theory and implications.	Explore personalized HR management using analytics to create customized HR solutions and competitive advantage.	Theory integration and literature review.	Personalized HR management improves productivity, enhances the HR climate, provides greater flexibility, boosts HR return on investment, and positively impacts firm financial performance.

Muhammad, G., Siddiqui, M. S., Rasheed, R., Shabbir, H., & Sher, R. F.	2023	Role of External Factors in Adoption of HR Analytics: Does Statistical Background, Gender and Age Matters?	Examine how external factors, like social influence and statistical background, affect the adoption of HR Analytics using the UTAUT model.	Quantitative analysis with 123 HR practitioners in Pakistan's banking sector.	Social influence and statistical background significantly affect HR Analytics adoption, with statistical background also moderating the relationship between social influence and HR Analytics
Priyanka Thakral, Praveen Ranjan Srivastava, Sanket Sunand Dash, Jasimuddin, S. M., & Zhang, Z	2023	Trends in the thematic landscape of HR analytics research: a structural topic modeling approach	Review existing research on HR analytics to highlight key areas of current study and to suggest directions for future research in this emerging field.	Latent Dirichlet allocation (LDA) topic modeling approach with 503 articles.	HR analytics research is organized into four main areas, specifically HR functions, statistical methods, organizational results, and employee traits. The study also proposes a framework for organizations implementing HR analytics. Future research directions include exploring the integration of HR with advanced technology such as blockchain, AI, and Metaverse.
Arora, M., Prakash, A., Mittal, A., & Singh, S.	2022	HR analytics: what's holding users back?	Determine the facilitator and inhibitor of HR Analytics adoption among the banking, financial services, and insurance (BFSI) sector.	Quantitative analysis with 387 HR practitioners from the BFSI sector.	Data availability, hedonic motivation, and performance expectancy have a positive relationship with behavioral intention to adopt HR analytics, while effort expectancy, social influence, and habit had an insignificant impact on it.
Wirges, F., & Neyer, A.-K.	2022	Towards a process-oriented understanding of HR analytics: implementation and application	Explore the challenges firms face in transforming HR data into strategic value, highlighting the limited progress in implementing HR analytics.	A qualitative study with 17 HR practitioners	Although firms acknowledge the strategic potential of HR analytics, HR departments face challenges in translating raw data into strategic insights. The study highlights that HR analytics requires reconsidering its functional role, suggesting a need to re-evaluate how HR analytics is structured and integrated within organizations.

J. of Technology Management and Business Vol. 11 No. 2 (2024) p. 155-169

3. Methodology

Bibliometric analysis is one of the most prominent review techniques that employ performance analysis and science mapping (Donthu et al., 2021; Sajovic et al., 2023). Performance analysis is the measurement of the influence and productivity of an entity based on metrics such as the number of publications and citations (Sajovic et al., 2023). It is extensively applied due to the easy comprehension and calculation on both aggregate and specific levels (Donthu et al., 2021). Conversely, science mapping employs visual representations and analytical techniques, mainly to uncover the structure and relationships within scientific fields (Baker et al., 2021). By clustering related documents and visualizing networks, it reveals the evolution of disciplines, emerging trends, and connections between different research topics (Morris & Van, 2009; Sajovic & Boh Podgornik, 2022). Researchers often combine performance analysis and science mapping to obtain a thorough understanding of both the impact and structure of scientific research.

3.1 Data Collection

Bibliographic data was gathered through the Scopus database since it offers a comprehensive collection of peer-reviewed literature, ensuring reliable, high-quality sources that support rigorous analysis in research studies. In addition, Scopus is often sufficient on its own as it contains more publications than other databases (Arora et al., 2023; Tiwari et al., 2021). In the initial stage, a preliminary literature search and document analysis were conducted to identify keywords related to HR analytics. The selection of keywords was based on their usage in the literature. Various forms and equivalents of the keywords were used in order to give the broadest possible coverage. Also, the search period was limited between 2014 and 2023 because most of the previous studies considered the year 2014 to be the start of the rapid growth of interest in HR analytics research (Arora et al., 2023). The preliminary search shows 278 articles. To enhance the quality of the raw data set for the subsequent analyzes, one duplicated record and thirteen publications without author information were excluded. Figure 1 illustrates the flow diagram of the search protocol.

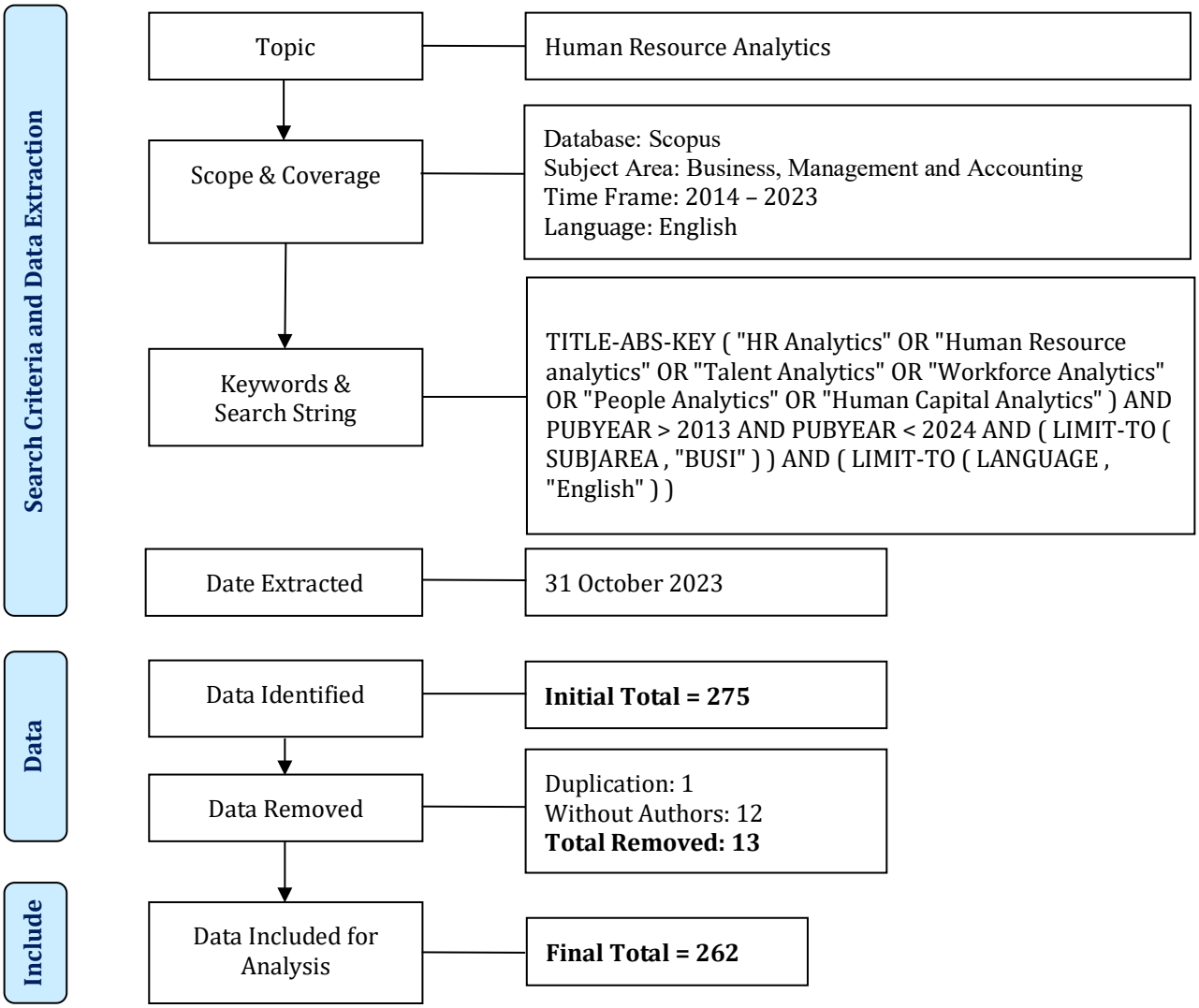

Fig. 1 *Flow diagram of the search protocol*

4. Data Analysis and Discussion

This dataset for analysis contains 262 articles written by 594 different authors from 156 unique sources. Each article had an average of 58.3 citations, and a total of 195 index keywords and 751 keywords have been identified in these publications.

4.1 Data Collection

The field of Human Resources Analytics has grown progressively over the last decade, reflecting a growing interest in this area of study. Figure 2 illustrates the annual publication count in the past 10 years.

J. of Technology Management and Business Vol. 11 No. 2 (2024) p. 156-169

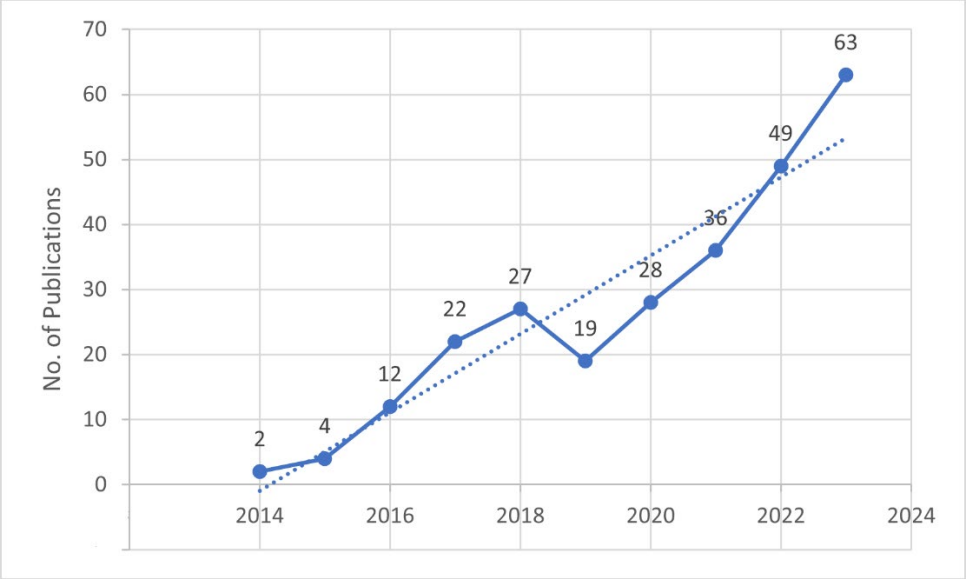

Fig. 2 *Number of publications from 2014 to 2023*

The findings indicate an astonishing and continuous rise since 2019. This increased publication in the area of HR analytics may be due to two main reasons. Firstly, there is growing recognition of the strategic imperative to leverage value from HR information using technology (Margherita, 2022). Organisations perceive HR analytics not only for operational efficiency but as a strategic asset in shaping key decisions. The second aspect would be that, over the past years, there has been remarkable cross-field collaboration in the domain of computer science. As researchers from other fields delve into HR analytics, they introduce new perspectives, and hence, publications start to increase at an extremely rapid rate. This trend reflects the ongoing advancement of knowledge and maturation of the field (Bonilla-Chaves & Palos-Sánchez, 2023).

4.2 Leading Country

Table 2 presents a summary of HR Analytics publications by country. Evidently, India is the leading country in HR analytics research and is slightly ahead of the USA. The reason for such Indian leadership is due to their supportive government for research and development, and a large pool of skilled tech professionals (Chhapia, 2023; Singh, 2023). Moreover, India has a particular focus on analytics, while other countries focus on the diversification of technological aspects such as AI, Machine Learning, cybersecurity, etc. (Joshi, 2022; Roth, 2023).

While analyzing by continent, Europe leads the way with numerous countries represented on the list of most productive nations. Besides, there are also countries from Asia, North America, and Oceania that are also found to be productive in HR analytics research. In some ways, this again goes to prove that HR Analytics is a global initiative.

Table 2 *Countries with the highest productivity*

Rank	Country	No. of Publications	Percentage	Continent	Development
1	India	78	24%	Asia	Developing
2	USA	73	22%	North America	Developed
3	United Kingdom	17	5%	Europe	Developed
4	Australia	16	5%	Oceania	Developed
5	Germany	15	5%	Europe	Developed
6	Netherlands	15	5%	Europe	Developed
7	Italy	9	3%	Europe	Developed
8	Spain	8	2%	Europe	Developed
9	China	7	2%	Asia	Developing
10	Denmark	7	2%	Europe	Developed
11 - 43	Others	82	25%	-	-
Total	-	327	100%	-	-

4.3 Leading Publication

Table 3 lists the top ten most cited publications. The article by Angrave et al. (2016), which received the most citations, challenges the idea that HR analytics is vital for the future of HR. This study emphasizes the need for HR professionals to understand both the potential and pitfalls in this emerging area. HR analytics may not bring about transformative change without strategic and operational engagement. The article also warns that if current trends continue, HR might be excluded from strategic board-level influence, potentially harming both organizations and employees.

Next, Marler and Boudreau (2017) review the current literature, addressing five key questions regarding its definition, processes, theories, outcomes, and success factors. Their insights indicated that while HR analytics holds huge promise in improving the performance of organizations, evidence has also been found regarding the low diffusion rates among firms. Along with this, another major problem is that the existing academic studies on this subject area have been very scarce, with an overreliance on qualitative case studies.

In another study, Sivathanu and Pillai (2018) discuss the role of Smart Human Resources 4.0 (SHR 4.0) in business management. Taking Credit Suisse as an example, the researchers found out that the adoption of HR analytics can help the firm reduce employee turnover. The research elaborated on how SHR 4.0 will improve HR processes like onboarding of employees, talent development, and offboarding, emphasizing the need for successful strategy during transformation towards Industry 4.0. It highlights technologies like Internet-of-Things, Big Data, and AI for automating HR tasks to improve efficiency. The authors suggest that organisation should change their structure and leadership style in order to implement SHR 4.0 effectively so that HR would act as the partner in driving overall organizational growth.

Table 3 *The publications with the highest number of citations*

Rank	Authors	Title	Year	Theory	Source title	Cited
1	Angrave D.; Charlwood A.; Kirkpatrick I.; Lawrence M.; Stuart M.	HR and analytics: why HR is set to fail the big data challenge	2016	Resource-based Theory	Human Resource Management Journal	265
2	Marler J.H.; Boudreau J.W.	An evidence-based review of HR Analytics	2017	Diffusion of Innovation Theory	International Journal of Human Resource Management	249
3	Sivathanu B.; Pillai R.	Smart HR 4.0 – how industry 4.0 is disrupting HR	2018	Functional Perspective Theory	Human Resource Management International Digest	180
4	Ulrich D.; Dulebohn J.H.	Are we there yet? What's next for HR?	2015	HR Outside-in Approach	Human Resource Management Review	177
5	Rasmussen T.; Ulrich D.	Learning from practice: How HR analytics avoids being a management fad	2015	HR Outside-in Approach	Organizational Dynamics	149
6	Newman D.T.; Fast N.J.; Harmon D.J.	When eliminating bias isn't fair: Algorithmic reductionism and procedural justice in human resource decisions	2020	Procedural Justice Approach	Organizational Behavior and Human Decision Processes	121
7	Minbaeva D.B.	Building credible human capital analytics for organizational competitive advantage	2018	Organizational Capabilities Theory	Human Resource Management	98
8	Gal U.; Jensen T.B.; Stein M.-K.	Breaking the vicious cycle of algorithmic management: A virtue	2020	Virtue Ethics Approach	Information and Organization	97

		ethics approach to people analytics				
9	van den Heuvel S.; Bondarouk T.	The rise (and fall?) of HR analytics: A study into the future application, value, structure, and system support	2017	Multidimensional Perspective	Journal of Organizational Effectiveness	92
10	Hamilton R.H.; Sodeman W.A.	The questions we ask: Opportunities and challenges for using big data analytics to strategically manage human capital resources	2020	Strategic HR Perspective	Business Horizons	82

In order to gain a more comprehensive understanding of the top cited articles, this study further analyzes bibliographic coupling to reveal the conceptual similarity between documents. The network visualization is presented in Figure 3.

Fig. 3 *Bibliographic coupling of documents*

Notably, the study of Marler and Boudreau (2017), Ulrich and Dulebohn (2015), and Newman et al. (2020) exhibit the strongest link strength in bibliographic coupling, since these articles share a common concern regarding the potential effects that HR analytics can have on organizational dynamics. Intriguingly, it was discovered that three out of the top ten articles, specifically the articles by Sivathanu and Pillai (2018), Rasmussen and Ulrich (2015), and Hamilton and Sodeman (2020), were not connected to any of the top ten cited articles.

4.4 Trend Analysis

Utilizing the co-occurrence network of keywords enables researchers to categorize the trending topics and contribute to the continual advancement of research in the field. Findings show that the top 60% of the keywords revolve directly around HR and analytics. Among the terms that extend beyond the business field, "Big Data" is prominent, with 21 co-occurrences. As early as 2016, Angrave et al. highlighted the growing interest in big data from a human resources analytics perspective. Similarly, Hamilton and Sodeman (2019) suggested the strategic application of big data analysis in HR to enhance overall firm performance. While co-occurrence keyword analysis is straightforward and facilitates the identification of trending topics, it lacks the ability to determine the timeline of these topics. Therefore, trend analysis is more comprehensive. Figure 4 illustrates the emerging themes in HR analytics in recent years.

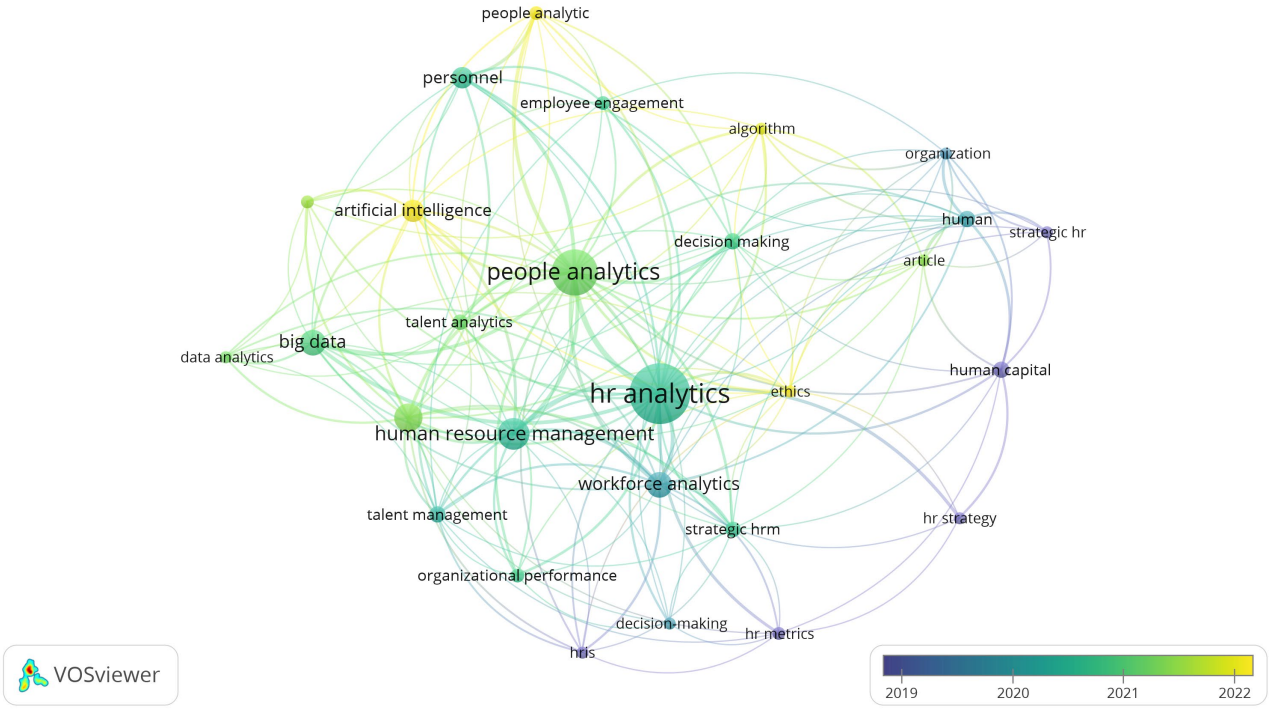

Fig. 4 *Trending themes in HR analytics*

In 2019, research in HR analytics was representative of the broad exploration of the core issues pertaining to HR strategy (Chalutz Ben-Gal, 2019), decision-making processes (Jabir et al., 2019; Mohammed, 2019), and ethical theme (Simbeck, 2019). The focus then started to taper into a narrower view of HR metrics and HRIS. This evolution has resulted in evaluating the impact of HR analytics on business operational aspects, remarkably delving into areas like organizational performance and Strategic Human Resource Management (SHRM).

The thematic strand of ethics has retained relevance in the dynamic landscape of HR analytics research (Edwards et al., 2022; Simbeck, 2019). The concerns revolve around handling personal data, especially sensitive information (Jha, 2021). Therefore, the HR department must be tactful and comply with the data protection regulations like the Personal Data Protection Act (PDPA). This enduring focus on ethics underscores its perennial relevance in the field, serving as an anchor amid the dynamic shifts and advancements in HR analytics discussions.

As the narrative unfolded, there was a proliferation of themes very closely aligned with HR analytics, specifically workforce analytics, talent analytics, and people analytics. Although some scholars have attempted to clarify differences between these terms (Arora et al., 2023; Bokatenko & Sidorov, 2021; Rai, 2020), they are often used interchangeably within the literature and, to some extent, share the same meaning (Zeidan & Itani, 2020). Noticeably, the contemporary discourse on HR analytics has become very much intertwined with technological terminologies. Big data, AI, and machine learning are some of the concepts that have been integrated with part of HR analytics (McCartney & Fu, 2022; Huang et al., 2023; Fallucchi et al., 2020; Shet & Nair, 2023). This shows that the rapid growth and interest in sophisticated technology applications within the sphere of HR are fast-tracking. However, some researchers doubt how HR analytics should be characterized as big data. Cappelli (2017) previously questions the practical reality of big data in HR by suggesting very few companies have enough employees to be eligible for the use of specialized software and tools associated with big data. However, Sivathanu and Pillai (2018) pointed out that Big Data is very fit for talent acquisition. They underline how these advanced technologies can effectively minimize the enormous amount of time and manual effort spent on HR duties, for instance, resume screening. Essentially, it is recognized that HR data extends beyond internal realms, and although it may not strictly conform to big data definitions (volume, velocity, variety, and veracity), it undeniably contributes substantial value to organizational processes and decision-making.

5. Conclusion

Over the past decade, the growing body of research highlights the increasing recognition of HR analytics as a critical driver of organizational performance. It has rapidly advanced into a powerful tool for enhancing

organizational outcomes by aligning HR practices with strategic objectives. From an organizational perspective, the most valuable capability of HR analytics is its ability to provide insights into employee engagement, retention, and productivity, which enables informed decision-making rather than relying on unreliable methods like intuition. As a result, it helps firms foster a positive and fair working environment. Despite its significance, adoption rates remain sluggish, specifically in developing countries. Aside from China and India, research contributions are primarily from developed countries. At present, HR analytics remains in its early stages. Hence, it is important for researchers to make conclusions with solid evidence and avoid overgeneralizing. Studies have applied multiple theories to provide a more comprehensive understanding of this complex field by examining it from various perspectives. Common findings on challenges such as data accuracy, privacy concerns, and the over-reliance on quantitative analysis must be addressed to fully capitalize on its potential. According to the identified clusters, while HR analytics has roots in HR measurement fundamentals such as HR metrics and HRIS, it differs significantly from them as it incorporates data analysis techniques. The latest research trend is associating HR analytics with advanced technologies like machine learning and AI. With the aid of these technologies, it is believed that HR analytics will evolve exponentially in the near future. Amid this rapid development, continued focus on ethics is essential to mitigate the potential negative aspects of HR analytics adoption. To date, there has been limited focus on the risks, challenges, and required capabilities for adopting HR analytics.

Next, despite focusing on the critical decade of HR analytics development and conducting a thorough analysis, the data extracted is limited to the realm of Business Management. To broaden the scope for further investigations, future research may also explore interdisciplinary fields, particularly by combining HR analytics with related subjects like computer science and operations management, to uncover deeper insights and synergies. Additionally, expanding the analytical tools used beyond VOSviewer, such as Biliometrix, could provide a more comprehensive understanding of HR analytics' impact on organizational dynamics. Lastly, although this review delivers a reliable summary of HR analytics literature, a quantitative content analysis of the existing studies could enable a more structured, rule-based, and theory-focused exploration of HR analytics.

Acknowledgement

We would like to thank our colleagues who have given many valuable comments and support in the research process. We would also take this opportunity to thank the reviewers for their constructive comments and suggestions.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of the paper.

Author Contribution

The authors confirm their contribution to the paper as follows: ***Data curation and formal analysis****: Chong;* ***Draft manuscript preparation****: Chong;* ***Investigation, methodology development, and visualization****: Chong, Lim, and Nipo;* ***Supervision and validation****: Lim and Nipo;* ***Review and editing****: Lim and Nipo.*

References

Allaham, M. V. (2022). Bibliometric Analysis of HR Analytics Literature. *Elektronik Sosyal Bilimler Dergisi*, *21*(83), 1147–1169. https://doi.org/10.17755/esosder.950426

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.

Arora, M., Prakash, A., Dixit, S., Mittal, A., & Singh, S. (2022). 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. (2024). HR analytics: what's holding users back?. *Global Knowledge, Memory and Communication*, *73*(3), 432-452. https://doi.org/10.1108/gkmc-03-2022-0067

Arora, M., Prakash, A., & Singh, S. (2020). HR Analytics–New Insight in Human Resource Management. *Advances in Management, Social Sciences and Technology*, 56.

Arora, S., Chaudhary, P., & Singh, R. K. (2024). Adoption of HR analytics for future-proof decision making: role of attitude toward artificial intelligence as a moderator. *International Journal of Organizational Analysis*. https://doi.org/10.1108/ijoa-03-2024-4392

Bahuguna, P. C., Srivastava, R., & Tiwari, S. (2024). Human resources analytics: where do we go from here?. *Benchmarking: An International Journal*, *31*(2), 640-668. https://doi.org/10.1108/bij-06-2022-0401

Baker, H. K., Kumar, S., & Pandey, N. (2021). Forty years of the Journal of Futures Markets: A bibliometric overview. *Journal of Futures Markets*, *41*(7), 1027-1054. https://doi.org/10.1002/fut.22211

Bokatenko, I. Yu., & Sidorov, N. V. (2021). HR Analytics, People Analytics, Workforce Analytics and Talent Analytics. What is the difference between them. *Normirovanie I Oplata Truda v Promyshlennosti (Rationing and Remuneration of Labor in Industry)*, *8*, 63–68. https://doi.org/10.33920/pro-3-2108-06

Bonilla-Chaves, E. F., & Palos-Sánchez, P. R. (2023). Exploring the Evolution of Human Resource Analytics: A Bibliometric Study. *Behavioral Sciences*, *13*(3), 244. https://doi.org/10.3390/bs13030244

Cappelli, P. (2017). *There's No Such Thing as Big Data in HR*. Harvard Business Review. https://hbr.org/2017/06/theres-no-such-thing-as-big-data-in-hr

Chalutz Ben-Gal, H. (2019). An ROI-based review of HR analytics: practical implementation tools. *Personnel Review*, *48*(6), 1429–1448. https://doi.org/10.1108/pr-11-2017-0362

Chatterjee, S., Chaudhuri, R., Vrontis, D., & Siachou, E. (2022). Examining the dark side of human resource analytics: an empirical investigation using the privacy calculus approach. *International Journal of Manpower*, *43*(1), 52-74. https://doi.org/10.1108/ijm-02-2021-0087

Chhapia, H. (2023). India is world's 4th in research output, but ranks 9th in citations. *The Times of India*. https://timesofindia.indiatimes.com/india/india-is-worlds-4th-in-research-output-but-ranks-9th-in-citations/articleshow/98924312.cms

Coron, C., Scheibmayr, I., & Lescoat, P. (2024). How to do HRM with numbers? A performative lens on HR metrics, HR analytics and HR algorithms. *New Technology Work and Employment*. https://doi.org/10.1111/ntwe.12306

Danvila-del-Valle, I., Estévez-Mendoza, C., & Lara, F. J. (2019). Human resources training: A bibliometric analysis. *Journal of Business Research*, *101*, 627–636. https://doi.org/10.1016/j.jbusres.2019.02.026

Davenport, T., Barth, P., & Bean, R. (2012). *How "Big Data" is Different* . https://www.hbs.edu/ris/Publication%20Files/SMR-How-Big-Data-Is-Different_782ad61f-8e5f-4b1e-b79f-83f33c903455.pdf

Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, *133*, 285–296. https://doi.org/10.1016/j.jbusres.2021.04.070

Edwards, M. R., Charlwood, A., Guenole, N., & Marler, J. (2024). HR analytics: An emerging field finding its place in the world alongside simmering ethical challenges. *Human Resource Management Journal*, *34*(2), 326-336. https://doi.org/10.1111/1748-8583.12435

Falletta, S. V., & Combs, W. L. (2020). The HR analytics cycle: a seven-step process for building evidence-based and ethical HR analytics capabilities. *Journal of Work-Applied Management*, *13*(1), 51-68. https://doi.org/10.1108/jwam-03-2020-0020

Fallucchi, F., Coladangelo, M., Giuliano, R., & William De Luca, E. (2020). Predicting Employee Attrition Using Machine Learning Techniques. *Computers*, *9*(4), 86. https://doi.org/10.3390/computers9040086

Gutiérrez-Salcedo, M., Martínez, M. Á., Moral-Munoz, J. A., Herrera-Viedma, E., & Cobo, M. J. (2018). Some bibliometric procedures for analyzing and evaluating research fields. *Applied intelligence*, *48*, 1275-1287. https://doi.org/10.1007/s10489-017-1105-y

Hamilton, R. H., & Sodeman, W. A. (2020). The questions we ask: Opportunities and challenges for using big data analytics to strategically manage human capital resources. *Business Horizons*, *63*(1), 85-95. https://doi.org/10.1016/j.bushor.2019.10.001

Huang, X., Yang, F., Zheng, J., Feng, C., & Zhang, L. (2023). Personalized human resource management via HR analytics and artificial intelligence: Theory and implications. *Asia Pacific Management Review*, *28*(4), 598-610. https://doi.org/10.1016/j.apmrv.2023.04.004

Jabir, B., Falih, N., & Rahmani, K. (2019). HR analytics a roadmap for decision making: case study. *Indonesian Journal of Electrical Engineering and Computer Science*, *15*(2), 979. https://doi.org/10.11591/ijeecs.v15.i2.pp979-990

Jha, S. (2021). Data Privacy and Security Issues in HR Analytics: Challenges and the Road Ahead. *Expert Clouds and Applications*, 199–206. https://doi.org/10.1007/978-981-16-2126-0_17

Joshi, R. (2022). *Mint Explainer: Why India is stressing on data at G20*. Mint. https://www.livemint.com/opinion/online-views/mint-explainer-why-india-is-stressing-on-data-at-g20-11671564649775.html#:~:text=India%20is%20expected%20to%20capture

Lopez, J., Thakur, S., & Attar, S. S. (2022). Role of HR Analytics in Predictive Workforce Planning and Decision Making. *NeuroQuantology*, *20*(19), 4654. https://doi.org/10.48047/NQ.2022.20.19.NQ99428

Madsen, D. Ø., & Slåtten, K. (2022). An exploratory bibliometric analysis of the evolution of HR analytics as a popular management concept. *International Journal of Management Concepts and Philosophy*, *15*(3), 268-289. https://doi.org/10.1504/ijmcp.2022.124431

Malhotra, S., Dikshit, S., & Agarwal, V. (2023). Exploring the Other Side of the Coin: Evaluating the Dark Side of HR Analytics. In *HR Analytics in an Era of Rapid Automation* (pp. 80-92). IGI Global. https://doi.org/10.4018/978-1-6684-8942-0.ch006

Margherita, A. (2022). Human resources analytics: A systematization of research topics and directions for future research. *Human Resource Management Review*, *32*(2), 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.

McCartney, S., & Fu, N. (2022). Bridging the gap: why, how and when HR analytics can impact organizational performance. *Management Decision*, *60*(13), 25–47. Emerald. https://doi.org/10.1108/md-12-2020-1581

McIver, D., Lengnick-Hall, M. L., & Lengnick-Hall, C. A. (2018). A strategic approach to workforce analytics: Integrating science and agility. *Business Horizons*, *61*(3), 397–407. https://doi.org/10.1016/j.bushor.2018.01.005

Michalska-Smith, M. J., & Allesina, S. (2017). And, not or: Quality, quantity in scientific publishing. *PLOS ONE*, *12*(6), e0178074. https://doi.org/10.1371/journal.pone.0178074

Mohammed, D. A. Q. (2019). HR analytics: a modern tool in HR for predictive decision making. *Journal of Management*, *6*(3). https://doi.org/10.34218/jom.6.3.2019.007

Morris, S. A., & Van der Veer Martens, B. (2008). Mapping research specialties. *Annual review of information science and technology*, *42*(1), 213-295. https://doi.org/10.1002/aris.2008.1440420113

Muhammad, G., Siddiqui, M. S., Rasheed, R., Shabbir, H., & Sher, R. F. (2023). Role of External Factors in Adoption of HR Analytics: Does Statistical Background, Gender and Age Matters? *Journal of Business Analytics*, 7(2), 1–14. https://doi.org/10.1080/2573234x.2023.2231966

Newman, D. T., Fast, N. J., & Harmon, D. J. (2020). When eliminating bias isn't fair: Algorithmic reductionism and procedural justice in human resource decisions. *Organizational Behavior and Human Decision Processes*, *160*, 149–167.

Okatta, C. G., Ajayi, F. A., & Olawale, O. (2024). Leveraging HR Analytics for Strategic Decision Making: Opportunities And Challenges. *International Journal of Management & Entrepreneurship Research*, *6*(4), 1304–1325. https://doi.org/10.51594/ijmer.v6i4.1060

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), e0971. https://doi.org/10.26668/businessreview/2023.v8i3.971

Peres, A. R., Riccio, É. L., & Laurindo, ernando J. (2023). Management Implications for HR Analytics in Light of Systems Theory. *Cadernos de Educação, Tecnologia E Sociedade*, *16*(2), 307–329. https://doi.org/10.14571/brajets.v16.n2.307-329

Priyanka Thakral, Praveen Ranjan Srivastava, Sanket Sunand Dash, Jasimuddin, S. M., & Zhang, Z. (2023). Trends in the thematic landscape of HR analytics research: a structural topic modeling approach. *Management Decision*, *61*(12), 3665–3690. https://doi.org/10.1108/md-01-2023-0080

Qamar, Y., & Samad, T. A. (2021). Human resource analytics: a review and bibliometric analysis. *Personnel Review*, *ahead-of-print*(ahead-of-print). https://doi.org/10.1108/pr-04-2020-0247

Rai, D. (2020). *What is the Difference Between HR Analytics , People Analytics, Workforce Analytics and Talent Analytics ? - CHRMP*. Certified Human Resource Management Professional. https://www.chrmp.com/what-is-the-difference-between-hr-analytics-people-analytics-workforce-analytics-and-talent-analytics/#:~:text=Workforce%20Analytics%20and%20People%20Analytics

Rasmussen, T., & Ulrich, D. (2015). Learning from practice: How HR Analytics Avoids Being a Management Fad. *Organizational Dynamics*, *44*(3), 236–242. https://doi.org/10.1016/j.orgdyn.2015.05.008

Roth, A. (2023). *Top 9 countries for hiring tech talent*. Nioomi.com. https://nioomi.com/whitepaper/global-hiring

Sajovic, I., & Boh Podgornik, B. (2022). Bibliometric Analysis of Visualizations in Computer Graphics: A Study. *SAGE Open*, *12*(1), 215824402110711. https://doi.org/10.1177/21582440211071105

Sajovic, I., Kert, M., & Podgornik, B. B. (2023). Smart Textiles: A Review and Bibliometric Mapping. *Applied Sciences*, *13*(18), 10489–10489. https://doi.org/10.3390/app131810489

Sandström, U., & van den Besselaar, P. (2016). Quantity and/or Quality? The Importance of Publishing Many Papers. *PLOS ONE*, *11*(11), e0166149. https://doi.org/10.1371/journal.pone.0166149

Shet, S., & Nair, B. (2023). Quality of hire: expanding the multi-level fit employee selection using machine learning. *International Journal of Organizational Analysis*, *31*(6), 2103-2117.

Simbeck, K. (2019). HR analytics and ethics. *IBM Journal of Research and Development*, *63*(4/5), 9:1–9:12. https://doi.org/10.1147/jrd.2019.2915067

Singh, S. (2023). *The Remarkable Growth of India In Academic Research & Development*. www.linkedin.com. https://www.linkedin.com/pulse/remarkable-growth-india-academic-research-development-sanjeet-singh/

Sivathanu, B., & Pillai, R. (2018). Smart HR 4.0 – how industry 4.0 is disrupting HR. *Human Resource Management International Digest*, *26*(4), 7–11. https://doi.org/10.1108/hrmid-04-2018-0059

Thakur, S. J., Bhatnagar, J., Farndale, E., & Aeron, P. (2024). Human resource analytics, creative problem-solving capabilities and firm performance: mediator moderator analysis using PLS-SEM. *Personnel Review*, 53(7). https://doi.org/10.1108/pr-11-2021-0809

Tiwari, P., Ilavarasan, P. V., & Punia, S. (2021). Content analysis of literature on big data in smart cities. *Benchmarking: An International Journal*, *28*(5), 1837-1857. https://doi.org/10.1108/bij-12-2018-0442

Tunsi, W., Tayyoun, R. A., Othman, M., Saleh, Y., Assaf, R., Bakir, A., Kanan, M., Binsaddig, R., Alramahi, N., & Al-Sartawi, A. (2023). Factors Influencing Adoption of HR Analytics by Individuals and Organizations. *Information Sciences Letters*, *12*(7), 3193–3204. https://doi.org/10.18576/isl/120744

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

sjoerd Van Den, H., & Tanya, B. (2016). The Rise (and Fall?) of HR Analytics: The Future Application, Value, structure, and system support. In *Academy of Management Proceedings* (No. 1). https://doi.org/10.5465/ambpp.2016.10908abstract

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

Wijewickrema, M. (2022). A bibliometric study on library and information science and information systems literature during 2010–2019. *Library Hi Tech*. https://doi.org/10.1108/lht-06-2021-0198

Wirges, F., & Neyer, A.-K. (2022). Towards a process-oriented understanding of HR analytics: implementation and application. *Review of Managerial Science*, *17*. https://doi.org/10.1007/s11846-022-00574-0

Zeidan, S., & Itani, N. (2020). HR analytics and organizational effectiveness. *International Journal on Emerging Technologies*, *11*(2), 683-688.