Human Systems Management 43 (2024) 755–771
DOI 10.3233/HSM-230004
IOS Press

Review Article

Investigating research in human resource analytics through the lens of systematic literature review

Shanti Devi Chhetri[a,b], Devesh Kumar[c,*] and Deepesh Ranabhat[a,b]
[a]*Faculty of Management Sciences, Shoolini University, Bajhol, India*
[b]*School of Business, Pokhara University, Pokhara, Nepal*
[c]*School of Commerce and Management Studies, Central University of Himachal Pradesh, Dharamshala, India*

Received 11 January 2023
Accepted 22 March 2023

Abstract.
BACKGROUND: In today's data-driven society, most organizations use data to streamline their processes and achieve greater efficiencies. Human resource management is also affected by this new management style. Human Resource Analytics (HRA) is a novel and emerging method for enhancing human resource management. Due to the novelty of this field, few studies have been published in HRA.
OBJECTIVE: The purpose of this paper is to investigate the primary research area of Human Resources Analytics (HRA) and to identify the research gaps.
METHODS: This paper employs a systematic literature review methodology and bibliometric approach to analyze 91 pieces of academic literature published between 2008 and 2022. The exclusion and inclusion criteria of the PRISMA framework were used to select the publications. Descriptive analysis, citation analysis, three field plot analysis, and level of study analysis were some of the analysis techniques used.
RESULTS: The findings showed that there has been an increase in interest in HRA recently, with most of the research coming from India. Additionally, it was found that most research are carried out at the organisational level. The main areas of research are awareness and comprehension of HRA, HRA software, HRA applications, and barriers to HRA adoption in companies. The primary study needs were determined to include post-implementation effects, an examination of industry acceptance of HRA, and factors influencing the adoption of HRA successfully.
CONCLUSION: This paper makes distinctive contribution to the body of knowledge on human resource analytics while also opening up fresh directions for in-depth investigation into the use of human resource analytics in businesses.

Keywords: Human Resource Analytics (HRA), decision making, adoption, systematic, bibliometric analysis

Shanti Devi Chhetri is a PhD Scholar in Human Resources in the Faculty of Management Sciences at Shoolini University, India and an Assistant Professor at Pokhara University, Nepal. Her research area is Human Resource Analytics.

*Corresponding author: Devesh Kumar, Associate Professor, School of Commerce and Management Studies, Central University of Himachal Pradesh, Dharamshala, India-176215. Tel.: +91 9816570563. E-mails: devesh.shrma@gmail.com and deveshkumarsharma@cuhp.ac.in. ORCID ID: 0000-0001-7261-9898.

ISSN 0167-2533/$35.00

Devesh Kumar is working as Associate Professor at the School of Commerce and Management Studies, Central University of Himachal Pradesh, Dharamshala, India. He has completed his PhD in Information Systems. He is having more than 23 years of experience in academics and industry. He has published several research papers in cloud computing, innovation diffusion, e-learning and information systems. He has also presented papers in many conferences in India and abroad. His teaching interests include Business Analytics, Predictive Modeling, Machine Learning and Information Systems.

Deepesh Ranabhat is an assistant professor at School of Business, Pokhara University, Nepal. He has been teaching various subjects in the areas of financial management since last 10 years. Currently, he is pursuing PhD at Shoolini University, India. He has published several research articles in international and national peer-reviewed journals. He has accomplished few research projects and also participated in few international conferences.

1. Introduction

Human Resources Management (HRM) has undergone a significant transformation as a result of digitalization such as the introduction of Human Resource Analytics (HRA). HRA is a data-driven methodology that facilitates the Human Resources (HR) function's ability to make predictions and decisions regarding the organization's employees. It appears to be the potent isomorphic component that the corporate world of the future will accept regardless of changing business conditions [1]. Today, the world is moving toward an economy based on talent. Focus is now on the acquisition and retention of talent.

HRA have introduced a new function and facet to the field of HRM (2). Historically, the functions that were performed manually and where decisions were made based on intuition had undergone significant transformations. Today, software such as R, Tableau, Power BI, Microsoft Excel, Computer Intelligence (CI), Artificial Intelligence (AI), and Human Resource Information System (HRIS) are being used by many practitioners to implement and use HRA [3–8]. HRA has enabled the HRM department to analyze data using statistical technique and make decisions based on the facts [2]. HRA provide numerous benefits to both employees and businesses. It increases employee productivity and ensures a satisfactory return on investment in HR [9]. It validates the decision-making procedure from personnel recruitment to organizational integration. Adoption of HRA will help companies gain a competitive advantage by attracting and retaining top talent [10]. HRA focuses solely on eliminating human bias and generating novel insights, rather than on the technical aspect alone. Strategic functions supported by appropriate analytics are required for the efficient operation of HR departments [11].

The significance of HRA has been highlighted by prior research. Employees, HR managers, HR professionals, and practitioners are becoming acquainted with HRA [1, 12–18]. Alamelu et al. [10] discovered that HRA provides a long-term commitment to the financial success of the organization.

In addition, it was noted that HRA is still in its infancy, but still, it represents a major advancement in the realm of evidence-based decision making. Despite the numerous advantages of HRA, only a few organizations have adopted it. The low adoption rate of HRA in organizations is primarily attributable to a number of factors, including privacy concerns, data security, high levels of uncertainty, a lack of analytics awareness, a dearth of resources, and organizational support for analytics [9, 19–23].

We believe, the Scopus database contains five literature reviews in the field of HRA. Annexure 1 shows the basis of comparison of past review papers with this current study. Concerning the HRA's present standing comes first [24]. Second, expressing HR analytics from a return on investment perspective [25]. Third, indicating the use of data mining tools to analyze and anticipate HR functions in an organization [26]. Fourth, concentrated on current HRA research trends [27]. Though this review provides knowledge on HRA, there is room for additional contributions through a systematic literature review and bibliometric approach that aims to advance the field's study and encourage organizations to shift from reporting to actual analytics. This technique enables various analyses, such as country-by-country study, key-word analysis, citation analysis, etc., that provide a picture of current status of HRA research and study gaps and help identify potential future research areas.

This study is necessary because HRA is still a relatively new idea for HR professionals. Developing countries are only beginning to use it and are unaware of its full potential. There is a shortage of research on

the post-adoption effects of HRA in organisations, and there are only a few research areas that concentrate on certain topics such obstacles and benefits. The literature is dispersed and needs to be synthesised. As a result, this study clarified and gave a thorough account of how HRA is examined.

Utilizing a systematic literature review and bibliometric approach, this study seeks to comprehend the fundamentals of HRA, its adoption in organization and present research directions. The articles are extracted from the Scopus database through the end of September 2022. The study aims to achieve the following objectives:

- To analyse the nature of prior HRA research
- To conduct a citation analysis
- To conduct three field plot analysis
- To discuss the focus of the HRA study.

The remainder of this paper is organized as follows: section 2 is devoted to the methodology, section 3 to the results and discussion, and section 4 to the conclusion.

2. Methodology

This study is based on a systematic review of literature related to HRA. This section includes the sources of data, data collection process, and data analysis techniques used in this study.

2.1. Sources of data and search strategy

For this study, only articles published in Scopus through the end of September 2022 are considered. Included in the study are review articles and conference proceedings. The study incorporates articles written in English. Several different keywords, including "HR analytics", "human resource analytics", "workforce analytics", "people analytics", "talent analytics" and "human capita analytics", were used to identify relevant literature. Consequently, the following search strategy was applied in this systematic review for the inclusion of all keywords to extract articles related to the HRA:

TITLE-ABS-KEY ("HR analytics" OR "Human resource analytics" OR "workforce analytics" OR "people analytics" OR "talent analytics" OR "human capital analytics") AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE, "cp")) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (SRCTYPE, "j") OR LIMIT-TO (SRCTYPE, "p"))

2.2. Data collection process and articles screening

Initially, 256 articles were extracted on September, 2022, using the above-mentioned search strategy. The initial screening of 256 papers was based on their titles, abstracts and keywords. 142 literatures that were review articles and unrelated to HRA were eliminated, leaving 114 articles. Again, after conducting a full-text review, 23 articles were deemed irrelevant to the study and removed, leaving 91 articles on the final list. The inclusion and exclusion criteria are given in Table 1.

The study considers English-language journal articles and conference papers published from the year 2008–2022. Similarly, the literature pertaining to the fundamentals of HRA is included only for systematic review. Excluded from the study are review articles, book chapters, and non-English articles. Figure 1 shows the PRISMA framework for inclusion and exclusion criteria.

3. Data analysis and results

The nature of the articles is analyzed based on their yearly distribution, journal publications, country-by-country study, data sources, and level of study analysis. A citation analysis is used to determine the significance of the retrieved articles, and a keyword analysis is employed to illustrate the relationship between the most important keywords. The software R is used to create both citation analysis and bibliographic map. In order to determine the primary focus area of study in HRA, the overall papers are classified into five broad categories and further subdivided. Finally, a percentage analysis of various categories is conducted. This study identified 91 articles for a systematic review of HRA through the end of September 2022. This section provides an overview of the articles retrieved.

3.1. Descriptive analysis

Various analyses, such as yearly distribution, journal publications, country-by-country study on HRA, and data sources were performed to determine the nature of the selected literature as a whole. Figure 2 depicts the distribution of articles selected for the

Table 1
Inclusion and exclusion criteria

Inclusion Criteria	Exclusion Criteria
• Document Type: Articles and Conference Proceeding Papers	• Books
• Language: English	• Non-English Articles
• Focused on HRA	• Review Articles
	• The study not related to HRA

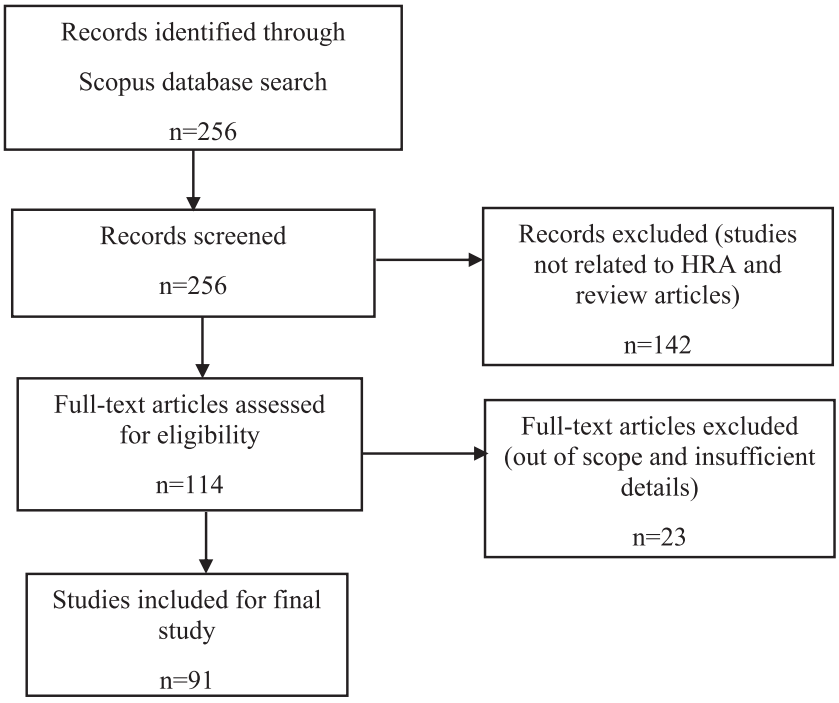

Fig. 1. PRISMA framework.

study by year. According to the graph, publications and interests related to HRA began in 2008, whereas there were no publications between 2009 to 2011, also in the year 2013 and 2015 no publication was there. The publication of articles began in 2016 and continued until 2022. In addition, the graph displays a gradual increase beginning in 2019. This suggests that HRA has become a significant area of study in recent years.

Figure 3 depicts the geographic origin of the institution contributing to the study scope of the current investigation using the collected information and Excel's "Geographic Heat Map" add-in. The created global heat map is an interactive tool for assessing each nation's contribution. Areas with low densities of published research papers (0–20) and high densities (60–80) are indicated by areas with deep red to deep green color scales, respectively. India, The United States, Israel, and Romania exhibit a higher density of the contributing nation. The contribution of various countries is outlined in Table 2. It is evident from the table that India publishes the greatest number of articles on HRA (84.62 percent). It is followed by the United States (39.56%), Israel (16.48%), Romania (12.09%), Ireland (10.99%), and Australia (9.89%). Similarly, in the remaining countries, eight or less than eight paper has been studied by the year 2022.

Figure 4 depicts the research methods utilized by the researchers in their study. The majority of studies employed quantitative research methods (69 percent). Whereas 29% of the study employed the qualitative research method and only 2% utilized the mixed research method.

Figure 5 illustrates the data sources used for the study. As much as 74 percent of the study is based

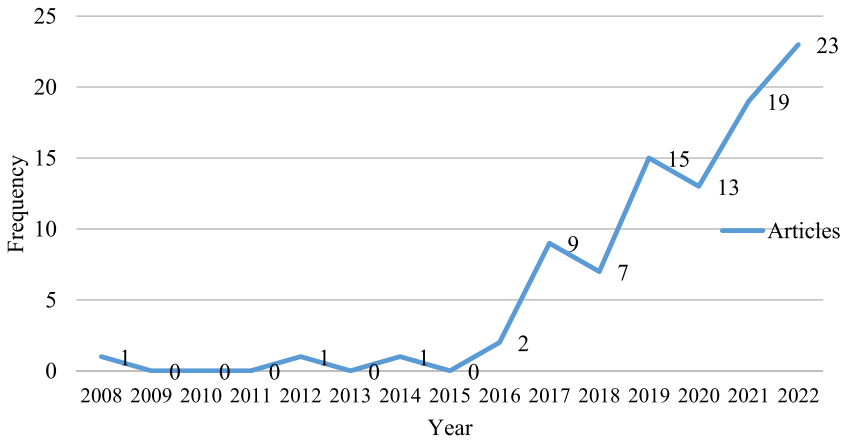

Fig. 2. Yearly distribution of articles.

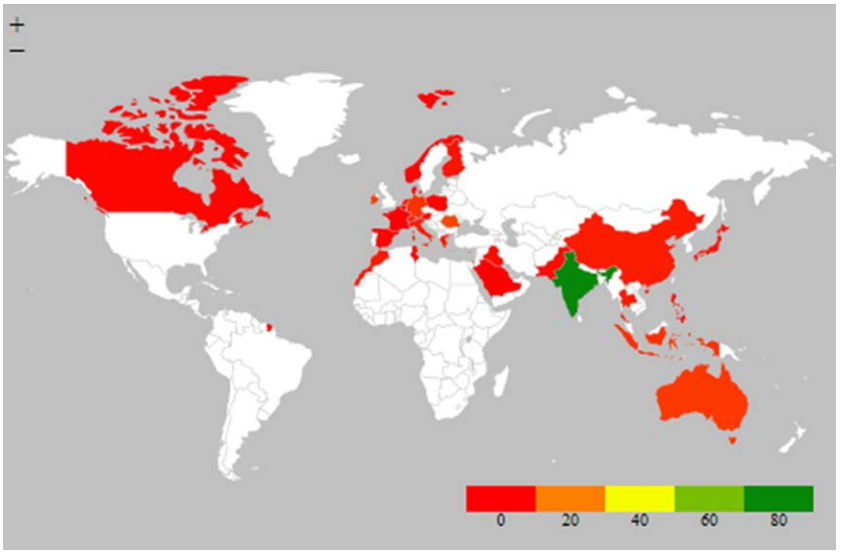

Fig. 3. Contributing institutions places of origin.

on primary sources of data, 22 percent on secondary sources of data, and 4 percent on both primary and secondary sources of data.

The topmost contributing authors are listed in Table 3. Mccartney S. has published the highest number of papers on HR analytics. Similarly, Escolar-Jimenez C.C., Gaur B., Gelbard R., Gustilo R.C., Jain P., Matsuzaki K., Ali S.S., Arora M. and Bagga T. have published two papers each.

Table 4 displays the number of citations in various nations. The table indicates that the selected papers from this study were cited in seventeen distinct nations. The United States had the most citations with 286 times. This is followed by Australia, which is cited 44 times, India (35), Israel (29), Spain (20), the United Kingdom (17), Switzerland (16) and Finland and Ireland (15 citations each).

In Table 5, the number of citations per document is displayed. Here, local citations and global citations with their ratio is displayed. The table reveals that only 14 documents were cited locally.

Table 6 provides the number of citations per journal with at least three citations. The table reveals that only 10 journals have received at least three or more citations. It has been determined that "Human Resource Management" has received the most cita-

Table 2
Contributing nations

Country	No. of Papers	Percent	Country	No. of Papers	Percent
India	77	84.62	Greece	4	4.40
USA	36	39.56	Japan	4	4.40
Israel	15	16.48	Austria	3	3.30
Romania	11	12.09	Iraq	3	3.30
Ireland	10	10.99	Pakistan	3	3.30
Australia	9	9.89	Switzerland	3	3.30
Germany	8	8.79	Belgium	2	2.20
Indonesia	8	8.79	Canada	2	2.20
UK	6	6.59	Norway	2	2.20
China	5	5.49	Philippines	2	2.20
Italy	5	5.49	Poland	2	2.20
Morocco	5	5.49	Spain	2	2.20
Netherlands	5	5.49	Tunisia	2	2.20
Thailand	5	5.49	Cyprus	1	1.10
Finland	4	4.4	Denmark	1	1.10
France	1	1.1	Saudi Arabia	1	1.10

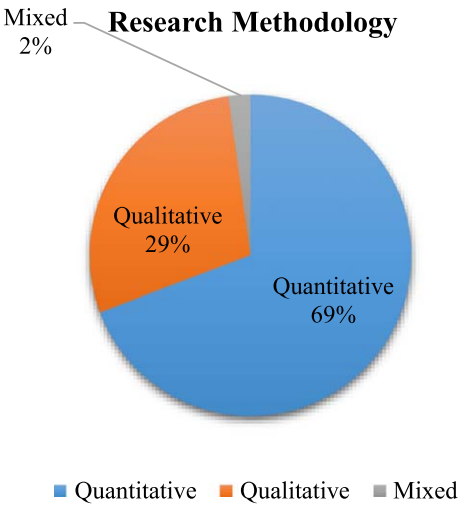

Fig. 4. Different methods used.

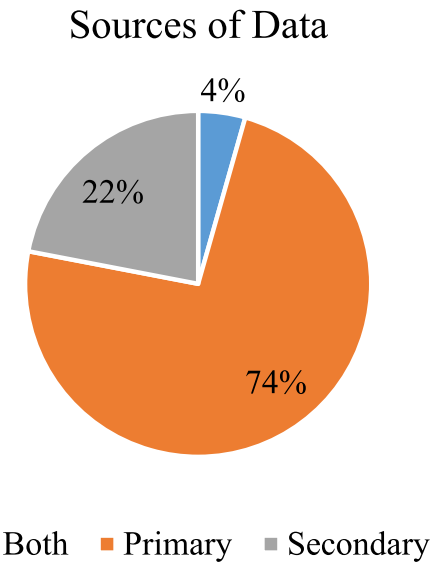

Fig. 5. Sources of data.

tions (106 times). It is followed by "Journal of Organizational Effectiveness" (84 citations), "International Journal of Human Resource Management" (33 citations), "Human Resource Management Journal" (20 citations), and " International Journal of Advanced Trends in Computer Science and Engineering " (19 citations).

Table 7 depicts the level of analysis performed and/or the type of respondents used in the study. According to the table, the majority of the research is conducted at the organizational level (68.1 percent). HR professionals constituted 11.0 percent of the respondents. HRA practitioners account for 4.4 percent, employees for 9.9 percent, and all others for 1.1 percent.

3.2. *Three field plot analysis*

The three-field plot is used in Biblioshiny to visually analyse the relationships between publication sources, various nations, affiliations, keywords, well-

Table 3
Author impact analysis

S.No.	Element	H_index	G_index	M_index	TC	NP	PY_Start
1	Mccartney S.	2	3	0.667	9	3	2020
2	Escolar-Jimenez C.C.	2	2	0.5	19	2	2019
3	Gaur B.	2	2	0.5	6	2	2019
4	Gelbard R.	2	2	0.4	29	2	2018
5	Gustilo R.C.	2	2	0.5	19	2	2019
6	Jain P.	2	2	0.667	4	2	2020
7	Matsuzaki K.	2	2	0.5	19	2	2019
8	Ali S.S.	1	1	0.5	1	2	2021
9	Arora M.	1	1	0.5	1	2	2021
10	Bagga T.	1	1	0.5	2	2	2021

Note: NP = No. of papers, TC = Total Citations and PY_Start = Starting Publication Year.

Table 4
Country-wise citations

Country	TC	Country	TC
USA	286	Morocco	7
Australia	44	Romania	7
India	35	France	6
Israel	29	Austria	5
Spain	20	Norway	4
United Kingdom	17	Thailand	3
Switzerland	16	Belgium	2
Finland	15	Saudi Arabia	2
Ireland	15	Canada	0
Iraq	0	Germany	0
Netherlands	0	Pakistan	0

known authors, cited sources, author-keywords, etc. Important details are shown in a range of colours in rectangular diagrams. The height of the rectangle displays the correlation between numerous features, such as nations, sources, eminent writers, author-keywords, etc. The number of connections between various components increases as the size of the rectangle increases. In Figure 6, the relationships between authors (left), keywords (centre), and publishing source (right) were looked at. The authors aim to recognize significant trends in the study of HRA across time in addition to raising awareness of this research strategy. The results show that top 15 authors have published papers using HR analytics as a key word. Also, researchers are publishing the papers with keyword people analytics which are linked to Journal of Organizational Effectiveness, International Journal of Human Resource Management, Personnel Review and Lecture Notes in Information System and Organization. Keywords such as Artificial Intelligence, Machine Learning, Data Analytics, Decision Making and Strategic HR are also of high interest among researchers.

3.3. Key word analysis

Figure 7 illustrates the word map of the key words used in the study. The figure shows that the term HR analytics is mostly used, followed by people analytics, human resource management, Artificial Intelligence and machine learning. From the word cloud map, it can be concluded that interest in Artificial intelligence in human resource is an emerging trend. Table 8 provides the detail about the words occurred in the selected papers.

3.4. Focus area of study in HRA

Figure 8 depicts the primary focus of the HRA research. The study found five main area of study. Out of 91 articles reviewed 27% of the studies are related to the importance of HRA usage, leading to the conclusion that HRA is important in organizations for achieving competitive advantage, enhancing individual performance, and making data-driven decisions. In contrast, 25 percent of the studies focus on HRA application, suggesting that HRA is still in its infancy.

3.4.1. Importance of adoption of HR analytics

Business organizations today typically deal with excessive competition. In order to compete in the market, the businesses began using new technological advancements. In the form of human resource information systems (HRIS), enterprise resource planning

Table 5
Document-wise citations

Document	Local Citations	Global Citations	LC/GC Ratio (%)
(Kryscynski et al., 2018)	10	30	33.33
(Aral et al., 2012)	10	140	7.14
(van der Togt and Rasmussen, 2017)	8	26	30.77
(Vargas et al., 2018a)	7	25	28.00
(Levenson, 2018)	6	35	17.14
(Greasley and Thomas, 2020)	5	14	35.71
(van den Heuvel and Bondarouk, 2017a)	5	58	8.62
(Simon and Ferreiro, 2018)	4	20	20.00
(Schiemann et al., 2018)	4	21	19.05
(King, 2016)	4	33	12.12
(Kapoor and Kabra, 2014)	4	12	33.33
(Gelbard et al., 2018)	3	26	11.54
(Ellmer and Reichel, 2021)	2	5	40.00
(McCartney et al., 2020)	2	7	28.57

Table 6
Source-wise citations

Journal	NP	TC	H_Index	PY_Start
Human Resource Management	4	106	4	2018
Journal of Organizational Effectiveness	3	84	2	2017
International Journal of Human Resource Management	3	33	3	2018
Human Resource Management Journal	3	20	2	2016
International Journal of Advanced Trends In Computer Science And Engineering	2	19	2	2018
Personnel Review	3	9	2	2020
International Journal on Emerging Technologies	2	6	2	2019
2019 4th International Conference on Information Systems and Computer Networks, ISCON 2019	1	3	1	2020
2020 11th International Conference on Computing, Communication and Networking Technologies, ICCCNT 2020	1	3	1	2019
2021 7th International Conference on Engineering, Applied Sciences and Technology, ICEAST 2021 - Proceedings	1	3	1	2020

Table 7
Level of analysis and/or type of respondents

Level of analysis and/or Type of Respondents	Frequency	Percent
Employees	9	9.9
High and mid-level managers	2	2.2
HR analytics experts/practitioners	4	4.4
HR managers/professionals	10	11.0
IT professionals	1	1.1
Management professionals	1	1.1
Organizational level	62	68.1
Programmers and software consultants	1	1.1
Students	1	1.1
Total	91	100

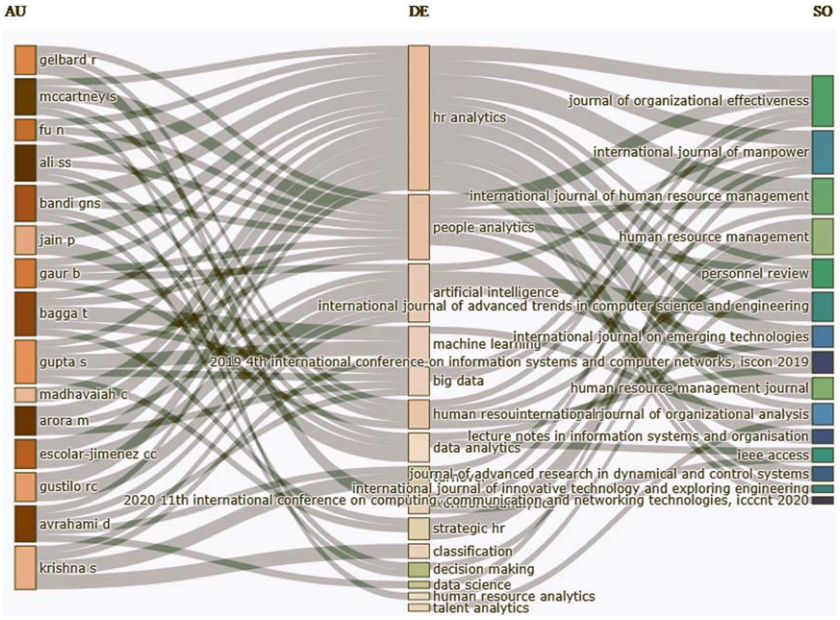

Fig. 6. Three field plot with 15 authors, 15 keywords and 15 sources.

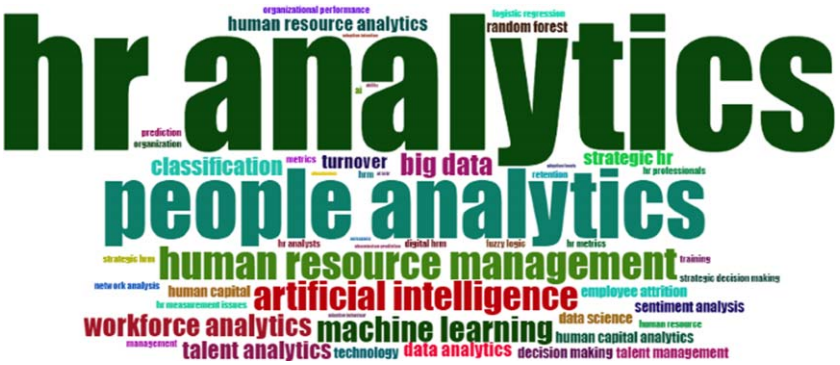

Fig. 7. Word cloud map.

(ERP), HR analytics, data mining, etc., HR services have incorporated digital technologies in recent years. The benefit of adopting HR analytics in the organization is highlighted by many researchers. HR analytics principles are highly helpful for assessing employee performance, making informed decisions about pay and promotions, and boosting employee retention, evaluating employee engagement, tracking employee growth, and examining learning outcomes [2]. Automation through tools like analytics in the organization brings significant changes on human introspection and enhance decision making abilities [40]. Predictive models generates more accurate information about employee attrition [41]. Most of the organizations revealed that the comprehension of employee performance has improved after analytics were introduced [42]. Prior to this, it was impossible to get insights that could be used to guide business decisions. Analytics aid HR departments in their transition to a more proactive examination of employee data [43]. When employing HR analytics to conduct performance appraisals, past studies shows that employees are more confident in the entire process, despite the fact that traditionally performance review processes are viewed as biased and erroneous. Employees respond favorably to the outcomes and exhibit a motivation to improve their performance since the procedure is viewed as being accurate and fair generally. Utilizing technology in personnel management advances people analytics

Table 8
Key word analysis

Key word	Occurrences	Key word	Occurrences
HR Analytics	37	Fuzzy Logic	2
People Analytics	19	HR Analysts	2
Human Resource Management	9	HR Measurement Issues	2
Artificial Intelligence	8	HR Metrics	2
Machine Learning	7	HR Professionals	2
Big Data	6	HRM	2
Workforce Analytics	6	Human Resource	2
Classification	5	Logistic Regression	2
Talent Analytics	5	Management	2
Data Analytics	4	Metrics	2
Human Resource Analytics	4	Network Analysis	2
Strategic HR	4	Organization	2
Turnover	4	Organizational Performance	2
Data Science	3	Prediction	2
Decision Making	3	Retention	2
Employee Attrition	3	Strategic Decision Making	2
Human Capital	3	Strategic HRM	2
Human Capital Analytics	3	Training	2
Random Forest	3	Ability	1
Sentiment Analysis	3	Absenteeism	1
Talent Management	3	Absenteeism Prediction	1
Technology	3	Adoption Behaviour	1
AI	2	Adoption Intention	1
Digital HRM	2	Adoption Levels	1
AI In HR	1	Aerospace	1

and strategic HR planning (SHRM). The creation of a high-performing personnel pool is facilitated by talent analytics and SHRM, which in turn improves organizational performance [44]. the development of workplace technology has aided HR managers in improving workplace behavior, productivity, and employee well-being by giving them more access to employee data [45]. The cutting-edge statistical methods and HR Analytics help in delivering crucial insights into human behaviour [46]. And with these inputs, a firm might prepare for sustainable HRM policies for identifying, rewarding, and retaining excellent human resources.

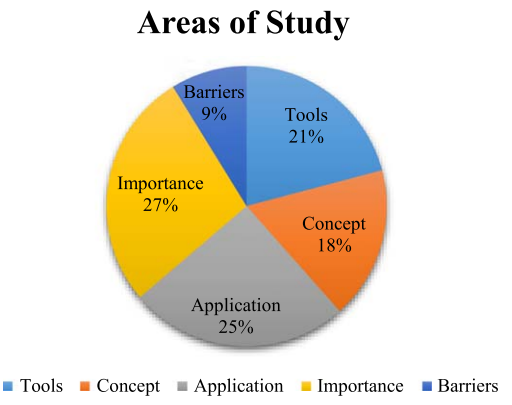

Fig. 8. Focus area of study in HRA.

3.4.2. Application of HR analytics

The application and adoption of HR analytics and machine learning tools provides an understanding about the turnover of employees in an organization [47]. The behavioural intention to use HRA was positively impacted by performance expectancy, social influence, effort expectancy, and enabling circumstance [48]. Arora [49] found that the behavioral intention to adopt HR analytics was positively influenced by data accessibility, hedonic incentive, and performance anticipation (BI). Bechter [50]

demonstrated how contextual factors and business characteristics both affect how HR analytics are used. In terms of company characteristics, they discovered that organizations need to have the structural and managerial capacity to utilize HR analytics. Regarding contextual considerations, some market conditions encourage businesses to employ HR analytics, the institutional environment more specifically, the legal, political, and cultural framework in which businesses are rooted influences businesses' opportunities to do so. Wawer [51] found that nearly half of the organizations examined does not use an analytical approach to HR management. Aral [29] revealed that the adoption of HCM software is highest among businesses that also use performance pay and HR analytics procedures.

3.4.3. Analytical tools used in organization

The present study found that most of the organization use Machine learning as the analytical tools, followed by Artificial Intelligence, Regression, Power Bi and fuzzy logic networks.

3.4.4. Concept on HR analytics

For effective execution and to have an impact of HR analytics, HR experts must have analytical and storytelling skills [52]. McCartney [39] identifies set of six specific competencies, consulting, technical knowledge, data fluency, data analysis, business and HR savvy, exploration, discovery, and both narrative and communication required by HR analysts. Kakkar [53] demonstrated that data-driven investments are becoming more common. Predictive analytics aid in decision-making and corporate plan evaluation. Gelbard [37] revealed that with the use of digital sources and digital footprints found in the information systems of any organization provide a trustworthy and practical technique to assess human aspects. Additionally, it allows a unified view of a variety of opinions revealing levels of individual and collective behaviors in businesses. An organization's ability to identify and foretell new behavioral trends is improved by using sentiment analysis. This thus makes it possible for the organization to engage in "preventive activities" or "promoting actions" that can shape behavior in the direction of a desired outcome. Scholars like [30] in their study says that to achieve evidence-based HR, HR analytics is a critical step. In a world where we have greater access to a wider range of data, like knowledge about people and their behaviors, HR analytics presents the opportunity to improve HR for much less money, link HR activities with organizational outcomes and value, challenge belief systems through statistics, inform professionals about what appears to work and what does not and improve decision-making with the help of accurate predictions. HR analytics, in other words, has the ability to improve HR's foundational assumptions and data. In relation to future about HR analytics [54] suggested that by 2025, HR analytics will be a well-established discipline with a demonstrated effect on company results and a significant impact on tactical and strategic decision-making. King [35] recommended that organizations shouldn't adopt HR analytics initiatives because they are popular or because their rivals adopted this technique. It should be adopted because it can spur broad company improvement both now and in the future.

3.4.5. Barriers on adoption of HR analytics

Many organizations fail to adopt HR analytics because of the challenges faced by the organization in its implementation. According to [9] employee privacy act as the barrier to adopt HR analytics in the organization. Whereas, [55] found that "using existing enterprise resources" Improvement of the talent acquisition processes, Forgetting the "human component" in people analytics, Maintaining HR hygiene, optimizing Process Automation, Incorporating talent management data into the DNA of the organization, and Transforming Feedback into Actionable Insights act as the basic elementary challenges. Also, the "Organizational support," "Data governance," "Streamlining and maintaining big data," and "Inadequate IT resources for people analytics" are the barriers in adoption of HR analytics. Likewise, [56] identified that operating with very basic HR processes, archaic information systems, and low data quality, together with other technological and human barriers, prevent adoption of sophisticated HRA. Along with this, traditional compliance-oriented HR culture, a lack of analytics and business understanding, a failure to move beyond reporting are the barriers. Authors like [57] found that fail to select software and interpretation of data act as a barrier in adoption of HR analytics. While [58] reports that lack of analytical skills in HR professionals prevent from adoption of HR analytics. Lastly, [59] argues that lack of training, poor analytics knowledge, lack of resources, and lack of organizational support for adopting analytics and its tools, low self-efficacy, fear of math/statistics, etc. are the main barriers to adopt HR analytics.

4. Discussion and future research directions

The systematic review indicates that HRA publications have been trending upward since the year 2019. The two nations from which the majority of publications are coming are India and the United States. The findings demonstrate that the majority of studies rely on a quantitative methodology, are carried out at the organisational level, and employ primary data sources. Most studies refer to HR analytics as such, and artificial intelligence in HR is a new trend. Machine learning is used by the majority of the organisation to reduce employee attrition. The study identified five key areas of research on HRA: the value of HRA, the use of HR analytics, the analytical tools utilised in HRA, the concept of HRA, and the challenges to adopting HRA. Further study in areas like factors influencing HRA adoption and post adoption impacts is highly recommended.

Academics are focusing more on the literature on HR analytics, which is expanding. This research expands on previous analyses and contributes to the body of HR analytics knowledge. By combining bibliometric and content analysis, it also contributes to the expansion of HR analytics knowledge. This facilitates a better understanding of the field of study, the identification of significant themes, authors, and keywords, as well as the identification of the primary geographical areas of study. The study advances HRA research by identifying the most important research topics and revealing research gaps. Awareness and understanding of HRA, the software used for HRA, the application of HRA, and the barriers to the adoption of HRA in organizations are identified as the primary research areas in HRA. A small group of scientists was responsible for the majority of significant investigations, according to the findings. In addition, a number of researchers have emerged to expand this body of knowledge in order to examine expanded HR practices in light of the area's rapid expansion. Since 2016, the number of HRA studies and publications has grown steadily. The vast majority of publications are produced between 2016 and 2021. In contrast, the majority of significant studies were conducted in 2021 [2, 6, 9, 12, 15, 38, 60]. After conducting a review of the pertinent literature, we identified 32 research articles from which we extracted four essential study areas in HR analytics. The article indicates that India and the United States have conducted the most studies. Some researchers have also attempted to focus on applications of HRA [51, 61, 62]. The research further provides information about the way HRA should be implemented in the organizations in terms of software and other applications. Through this study, HRA adoption barriers can be readily identified.

The focal topic was broken down into five categories for the current study: the value of HRA and its usage, HRA concept, HRA software, and organizational impediments to HRA implementation. It was found that organizations are becoming more aware of the value and applications of HRA. Workers, HR managers, experts, and practitioners are learning more about HRA. Decisions are now based on data analysis rather than intuition, as was the case in the past. For the majority of their data analysis requirements, businesses use applications like R, Power BI, Microsoft Excel, and machine learning. Despite HRA's many advantages, most organizations do not use it. Organizations are unable to embrace HRA because of issues like human barriers, data tracking, privacy concerns, and a lack of analytical awareness, among other things.

By exposing the gaps in this subject, we evaluate many potential research directions based on the knowledge gained from analyzing the papers. Table 9 provides future areas of research in HR analytics. Very few nations have conducted research on HRA, which may not provide an accurate image of the use of HRA; consequently, it is essential to conduct research on multiple nations. In addition, while the majority of studies are based on quantitative methodology, researchers should focus on mixed method because it combines paradigms and permits inquiry from both the inductive and deductive perspectives, allowing them to combine theory development and hypothesis testing within a single study [63]. In addition, relatively few HR analytics studies have employed an empirical technique. Those who opted for the empirical method utilized just surveys and case studies. Few studies employed employee level analysis as their primary level of analysis; the majority of research concentrated on the organization level. It is essential to do individual-level research to determine individuals' perceptions on HRA adoption intent. Additionally, post-implementation consequences and proof of genuine HRA uptake by industry were recognized as the key study needs. Future study should concentrate on providing businesses with empirical evidence on the factors of effective HRA adoption and should highlight the actual benefits and concerns associated with HRA implementation. Also, the study proposes that additional research can be undertaken on the aim of HRA use in organizations, the types

Table 9
Content analysis for future areas of research

Focus areas of study	Content analysis	Future areas of research
1. Importance of adoption of HR Analytics	Elaborates about the importance of HR analytics (Bandi et al., 2021; Ellmer and Reichel, 2021; Gaur, 2020; Gaur and Riaz, 2019; Larsson and Edwards, 2021; Raguvir and Babu, 2020; Sivathanu and Pillai, 2020; Yahia et al., 2021)	• To identify the importance of analytics in increasing employee experience in the challenging corporate environment. • To determine the importance of analytics in recruiting and retention of the employees. • To examine the importance of HR analytics on organization performance using mixed research approach.
2. Application of HR analytics	Focus on the use of HR analytics in different functions of HR department (Arora et al., n.d.; Avrahami et al., 2022; Bechter et al., 2022; Belizón and Kieran, 2021; Ekka and Singh, 2022; Krishna and Sidharth, 2022)	• To assess the factors hindering use of HR analytics by HR professionals. • To study use of HR analytics in making better decisions. • To assess how remote work affects work-life balance and employee satisfaction. • To investigate moral issues and ways to solve the problem related to adoption of HR analytics
3. Analytical Tools Used in Organization	Explore the analytical tools used in organization (Alsaadi et al., 2022; Chakraborty et al., 2021; Saxena et al., 2021; Setiawan et al., 2020; Shet and Nair, 2022; Sooraksa, 2021)	• To study about employee attrition using different approaches other than Machine learning. • To identify the technology which helps in faster data cleaning. • To compare and contrast between software used in HR department in different organizations.
4. Concept on HR Analytics	Study about HR analytics (Fu et al., 2022; Greasley and Thomas, 2020; Jain and Jain, 2020; Mahasumran et al., 2021; McCartney et al., 2020; Wirges and Neyer, 2022)	• How the decoupling dynamics vary over time in response to changes in the level of sophistication of HR analytics? • To study about technologically innovative software that can be built for relatively little and has excellent processing capabilities. • Analysis of personnel's and human resources' capabilities in the age of digital technology with the purpose of preparing them with the information, skills, and technological proficiency needed.
5. Barriers on Adoption of HR Analytics	Identify the factors that prevents from adopting HR analytics (Chatterjee et al., 2022; Dahlbom et al., 2020; Hota, 2021; Priya and Sinha, 2019; Sripathi and Madhavaiah, 2018b; Yurova et al., 2017)	• To carry out a longitudinal study to investigate the potential downside of human resource analytics. • To identify the problems with People Analytics Adoption in developing economies other than India. • To determine the different elements that influence a user's behavioral intention to use new technologies in the HR area.

of data utilized for HRA, and how barriers to HRA adoption can be eliminated. Also, research can be conducted on the benefits of HRA in various nations, with a focus on the preparedness and adoption of HRA in developing nations, in order to comprehend the scenario of HRM functions altering.

5. Conclusion

HRA is a new study area within the field of human resource management. Every organization's decision-making process is important. For any conclusion to be reached, a comprehensive study and

critical analysis of earlier occurrences are necessary. HRA is a method for enhancing the effectiveness of people-related workplace decision-making. In addition to bringing attention to this research approach, the authors want to identify major patterns in the study of HRA throughout time.

Current research reveals that HRA-related research is expanding in numerous countries. In addition, the study identified the countries where the bulk of studies are conducted, the research techniques employed, the HRA instruments utilized, and the barriers to HRA adoption. The study also identified the significance of HRA in organizations. Literature demonstrates that HRA facilitates data-driven decision making. Future research could clarify whether and how these HR managers utilize HRA results in their decision-making.

However, the results must be evaluated considering a number of restrictions. The Scopus database only comprises works published between 2008 and September 2022. The second condition is that publications written in English are evaluated. It is probable that some relevant research was omitted due to the employed database and filtering technique. Future scholars will be able to do comparative analyses utilizing many databases. Third, the analysis utilized solely scientific journal articles and conference proceedings.

Acknowledgments

The authors have no acknowledgements.

Author contributions

CONCEPTION: Shanti Devi Chhetri
METHODOLOGY: Shanti Devi Chhetri and Deepesh Ranabhat
DATA COLLECTION: Shanti Devi Chhetri
INTERPRETATION OR ANALYSIS OF DATA: Shanti Devi Chhetri and Deepesh Ranabhat
PREPARATION OF THE MANUSCRIPT: Devesh Kumar
REVISION FOR IMPORTANT INTELLECTUAL CONTENT: Devesh Kumar
SUPERVISION: Devesh Kumar

Annexure

Annexure 1
Comparison with prior review studies

Author/s and Year	Topic of the study	Methodology	Number of articles	Interval time	Variables classified
(Nair, 2018)	Current status of analytics in HR: Evidence based review	Integrative Synthesis approach	not indicated	not indicated	work done by HR analytics, outcomes of HR analytics, moderating factors that impact HR analytics outcomes
(Chalutz Ben-Gal, 2019)	An ROI-based review of HR analytics: practical implementation tools	Systematic review	80	2000–2016	Emergence of HR analytics research, Trends in HR analytics research, Theoretical framework: ROI-based analysis of HR analytics, HR Analytics – practical implementation tools and expected ROI, Contributions: ROI model to guide the way forward
(Changkakati and Das, 2020)	Data Mining Techniques In HR Analytics: A Review Of Domain Specific Concepts And Technicalities	Systematic review	30	not indicated	Data mining technique used, Existing Vendors dealing with HR Analytics

(*Continued*)

Annexure 1
(*Continued*)

Author/s and Year	Topic of the study	Methodology	Number of articles	Interval time	Variables classified
(Qamar and Samad, 2022)	Human resource analytics: a review and bibliometric analysis	Systematic review and bibiometric analysis	125	2008–2019	Descriptive analysis, Author influence, Affiliation statistics, Keyword analysis, Citation analysis, Co-citation network analysis, Data clustering, Content analysis of research clusters, future research direction
This Paper	Investigating Research in Human Resource Analytics through the Lens of Systematic Literature Review and Bibliometric Aanalysis	Systematic review and bibliometric analysis	91 (only empirical studies)	2008–2022	Yearly distribution of articles, Contributing nations, Different methods used, Sources of data, Author Impact Analysis, Country-wise citations, Document-wise citations, Source-wise citations, Level of analysis and/or type of respondents, Three field plot analysis, Key word analysis, Focus Area of study in HRA

References

[1] Jain P, Jain P. Understanding the concept of HR analytics. International Journal on Emerging Technologies. 2020;11:644-52.

[2] Bandi GNS, Rao TS, Ali SS. Data Analytics Applications for Human Resource Management. 2021 Int Conf Comput Commun Informatics, ICCCI 2021, pp. 31-4.

[3] Bali AS. An analytical study of applications of human resource information system in modern human resources management. Int J Sustain Agric Manag Informatics. 2019;5(4):216-29.

[4] Kalvakolanu S, Madhavaiah C, Hanumantharao S. Applying fuzzy logic to measure analytical competencies of HR professionals. J Adv Res Dyn Control Syst. 2019;11(6): 219-24.

[5] Ameer M, Rahul SP, Manne S. Human Resource Analytics using Power Bi Visualization Tool. Proc Int Conf Intell Comput Control Syst ICICCS 2020. 2020(Iciccs), pp. 1184-9.

[6] Nasar N, Ray S, Umer S, Mohan Pandey H. Design and data analytics of electronic human resource management activities through Internet of Things in an organization. Softw - Pract Exp. 2021;51(12):2411-27.

[7] Saxena M, Bagga T, Gupta S. Competitive Role of HR Analytics–A Study of SMEs in India. [pre-print] Researchgate.net; Available from: https://www.researchgate.net/profile/Ravi-Gupta-43/publication/354034583_Management_Dynamics_in_Digitalization_Era/links/611fe79e1e95fe241ae7206e/Management-Dynamics-in-Digitalization-Era.pdf#page=211

[8] Sooraksa N. A Survey of using Computational Intelligence (CI) and Artificial Intelligence (AI) in Human Resource (HR) Analytics. 2021 7th Int Conf Eng Appl Sci Technol ICEAST 2021 - Proc. 2021, pp. 129-32.

[9] Chatterjee S, Chaudhuri R, Vrontis D, Siachou E. Examining the dark side of human resource analytics: An empirical investigation using the privacy calculus approach. Int J Manpow. 2022;43(1):52-74.

[10] Alamelu R, Nalini R, Cresenta Shakila Motha L, Amudha R, Bowiya S. Adoption factors impacting Human Resource analytics among employees. International Journal of Economic Research. 2017;14:417-423.

[11] Lochab A. HR analytics: The winding path ahead. Journal of the Gujarat Research Society. 2019;21(11):69-79.

[12] Belizón MJ, Kieran S. Human resources analytics: A legitimacy process. Hum Resour Manag J. 2021;(October):1-28.

[13] Fink A, Vickers M. Fresh Approaches to HR Analytics. People Strateg. 2011;34:2-3.

[14] Greasley K, Thomas P. HR analytics: The onto-epistemology and politics of metricised HRM. Hum Resour Manag J. 2020;30(4):494-507. doi: 10.1111/1748-8583.12283

[15] Kifor CV, Nicolaescu SS, Florea A, Savescu RF, Receu I, Tirlea AV, et al. Workforce analytics in teleworking. IEEE Access. 2021;9:156451-64.

[16] Saraswathy R, Vaijayanthi P, Shreenivasan KA. A snapshot of HR analytics - An overview of the influence of contingency factors on the applicability of HR analytics in INDIAN organizations. International Journal of Applied Business and Economic Research. 2017;15: 345-52.

[17] Heuvel S van den. 'HR kan het niet alleen'-People analytics in de praktijk [Internet]. narcis.nl; 2019. Available from: https://www.narcis.nl/publication/RecordID/oai:hbokennisbank.nl:sharekit_hu%3Aoai%3Asurfsharekit.nl%3Ab6910808-91e3-43d6-95fd-5e4e4e23ab75

[18] Belizon M. The HR Analytics Management Cycle | Analytics in HR [Internet]. 2019. Available from: https://www.analyticsinhr.com/blog/the-hr-analytics-management-cycle/

[19] Khan SA, Tang J. The Paradox of human resource analytics: Being mindful of employees. Journal of General Management. 2017;42(2):57-66. doi: 10.1177/0306307017042002005

[20] Sripathi K, Madhavaiah C. Are HR professionals ready to adopt HR analytics? A study on analytical skills of HR professionals. J Adv Res Dyn Control Syst. 2018;10(8):303-8.

[21] Vargas R, Yurova YV, Ruppel CP, Tworoger LC, Greenwood R. Individual adoption of HR analytics: A fine grained view of the early stages leading to adoption. Int J Hum Resour Manag. 2018;29(22):3046-67.

[22] Berk L, Bertsimas D, Weinstein AM, Yan J. Prescriptive analytics for human resource planning in the professional services industry. Eur J Oper Res. 2019;272(2):636-41. doi: 10.1016/j.ejor.2018.06.035

[23] Dahlbom P, Siikanen N, Sajasalo P, Jarvenpää M. Big data and HR analytics in the digital era. Balt J Manag. 2020;15(1):120-38. doi: 10.1108/BJM-11-2018-0393

[24] Nair M. Current status of analytics in HR: Evidence based review. SCMS J Indian Manag. 2018;15(2):23-30.

[25] Chalutz Ben-Gal H. An ROI-based review of HR analytics: Practical implementation tools. Pers Rev. 2019;48(6):1429-48. doi: 10.1108/PR-11-2017-0362

[26] Changkakati B, Das C. Data mining techniques in hr analytics: A review of domain specific concepts and technicalities. Int J Sci Technol Res. 2020;9(3):4358-62.

[27] Qamar Y, Samad TA. Human resource analytics: A review and bibliometric analysis. Pers Rev. 2022;51(1):251-83.

[28] Kryscynski D, Reeves C, Stice-Lusvardi R, Ulrich M, Russell G. Analytical abilities and the performance of HR professionals. Hum Resour Manage. 2018;57(3):715-38.

[29] Aral S, Brynjolfsson E, Wu L. Three-way complementarities: Performance pay, human resource analytics, and information technology. Manage Sci. 2012;58(5):913-31.

[30] van der Togt J, Rasmussen TH. Toward evidence-based HR. J Organ Eff. 2017;4(2):127-32.

[31] Levenson A. Using workforce analytics to improve strategy execution. Hum Resour Manage. 2018;57(3):685-700.

[32] van den Heuvel S, Bondarouk T. The rise (and fall?) of HR analytics: A study into the future application, value, structure, and system support. J Organ Eff. 2017;4(2):157-78.

[33] Simón C, Ferreiro E. Workforce analytics: A case study of scholar–practitioner collaboration. Hum Resour Manage. 2018;57(3):781-93.

[34] Schiemann WA, Seibert JH, Blankenship MH. Putting human capital analytics to work: Predicting and driving business success. Hum Resour Manage. 2018;57(3):795-807.

[35] King KG. Data analytics in human resources: A case study and critical review. Hum Resour Dev Rev. 2016;15(4):487-95.

[36] Kapoor B, Kabra Y. Current and future trends in human resources analytics adoption. J Cases Inf Technol. 2014;16(1):50-9.

[37] Gelbard R, Ramon-Gonen R, Carmeli A, Bittmann RM, Talyansky R. Sentiment analysis in organizational work: Towards an ontology of people analytics. Expert Syst. 2018;35(5):1-15.

[38] Ellmer M, Reichel A. Staying close to business: The role of epistemic alignment in rendering HR analytics outputs relevant to decision-makers. Int J Hum Resour Manag. 2021;32(12):2622-42. doi: 10.1080/09585192.2021.1886148

[39] McCartney S, Murphy C, Mccarthy J. 21st century HR: A competency model for the emerging role of HR Analysts. Pers Rev. 2020;50(6):1495-513.

[40] Weiskopf R, Krause Hansen H. Algorithmic governmentality and the space of ethics: Examples from 'people analytics'. Human Relations. 2022. doi: 10.1177/00187267221075346

[41] Yahia N Ben, Hlel J, Colomo-Palacios R. From big data to deep data to support people analytics for employee attrition prediction. IEEE Access. 2021;9:60447-58.

[42] Raguvir S, Babu S. Enhance employee productivity using Talent analytics and Visualization. 2020 Int Conf Data Anal Bus Ind W Towar a Sustain Econ ICDABI 2020. 2020.

[43] Gaur B. HR4.0: An Analytics Framework to redefine Employee Engagement in the Fourth Industrial Revolution. 2020 11th Int Conf Comput Commun Netw Technol ICCCNT 2020. 2020;3-8.

[44] Sivathanu B, Pillai R. Technology and talent analytics for talent management – a game changer for organizational performance. Int J Organ Anal. 2020;28(2):457-73.

[45] Gaur B, Riaz S. A Two-Tier Solution to Converge People Analytics into HR Practices. 2019 4th Int Conf Inf Syst Comput Networks, ISCON 2019. 2019, pp. 167-73.

[46] Reddy AJM, Rani R, Chaudhary V. Technology for sustainable HRM: An empirical research of health care sector. Int J Innov Technol Explor Eng. 2019;9(1):2919-24.

[47] Avrahami D, Pessach D, Singer G, Chalutz Ben-Gal H. A human resources analytics and machine-learning examination of turnover: Implications for theory and practice. Int J Manpow. 2022;43(6):1405-24.

[48] Ekka S, Singh P. Predicting HR professionals' adoption of HR analytics: An extension of UTAUT model. Organizacija. 2022;55(1):77-93.

[49] Arora M, Prakash A, Singh S. HR Analytics–New Insight in Human Resource Management. In T. Rahman (ed.). Advances in Management, Social Sciences and Technology. Empyreal Publishing House; 2020, pp. 56-64.

[50] Bechter B, Brandl B, Lehr A. The role of the capability, opportunity, and motivation of firms for using human resource analytics to monitor employee performance: A multi-level analysis of the organisational, market, and country context. New Technol Work Employ. 2022;37(3):398-424. doi: 10.1111/ntwe.12239

[51] Wawer M, Muryjas P. The utilization of the HR analytics by the high and mid-level managers: Case from Eastern Poland. Commun Manag Inf Technol - Proc Int Conf Commun Manag Inf Technol ICCMIT 2016. 2017, pp. 97-106.

[52] Fu N, Keegan A, McCartney S. The duality of HR analysts' storytelling: Showcasing and curbing. Hum Resour Manag J. [ahead of print] 2022.

[53] Kakkar H, Kaushik S. Technology driven human resource measurement–A strategic perspective. Int J Emerg Technol. 2019;10(1):179-84.

[54] van den Heuvel S, Bondarouk T. The rise (and fall?) of HR analytics: A study into the future application, value, structure, and system support. Journal of Organizational Effectiveness. 2017;4:157-78.

[55] Hota J. Framework of challenges affecting adoption of people analytics in India using ISM and MICMAC analysis. Vision. [ahead of print] 2021. doi: 10.1177/09722629211029007

[56] Dahlbom P, Siikanen N, Sajasalo P, Jarvenpää M. Big data and HR analytics in the digital era. Balt J Manag. 2020;15(1):120-38.

[57] Priya R, Sinha V. An empirical reseaech of various factors influencing digital access towards HRM. Int J Innov Technol Explor Eng. 2019;8(11):298-301.

[58] Sripathi K, Madhavaiah C. Are HR professionals ready to adopt HR analytics? A study on analytical skills of HR professionals. Journal of Advanced Research in Dynamical and Control Systems. 2018;10:303-8.

[59] Vargas R, Yurova YV, Ruppel CP, Tworoger LC, Greenwood R. Individual adoption of HR analytics: A fine grained view of the early stages leading to adoption. Int J Hum Resour Manag. 2018;29(22):3046-67. doi: 10.1080/09585192.2018.1446181

[60] Belyaeva T, Kozieva I. Employee engagement in HR analytical systems. Economic Annals-XXI. 2020;186(11-12):94-102. doi: 10.21003/ea.V186-11

[61] Liu L, Akkineni S, Story P, Davis C. Using HR analytics to support managerial decisions: A case study. Proc ACM Southeast Conf. 2020;168-75.

[62] Kim J, Dibrell C, Kraft E, Marshall D. Data analytics and performance: The moderating role of intuition-based HR management in major league baseball. Journal of Business Research. 2021;122:204-16.

[63] Jogulu UD, Pansiri J. Mixed methods: A research design for management doctoral dissertations. Manag Res Rev. 2011;34(6):687-701.

[64] Chalutz Ben-Gal H. An ROI-based review of HR analytics: Practical implementation tools. Pers Rev. 2019;48(6):1429-48.