Online-Journals.org

iJIM International Journal of Interactive Mobile Technologies

iJIM | eISSN: 1865-7923 | Vol. 19 No. 14 (2025) | OPEN ACCESS

https://doi.org/10.3991/ijim.v19i14.56871

SPECIAL FOCUS PAPER

Uncovering the Paradox: Digital Shifts in Human Resource Management through Mobile Technology and Wireless Communication – A Content Co-occurrence Analysis Using Citespace

Asokan Vasudevan[1,2] (✉), Packiyanathan Mathushan[3], Navaneethakrishnan Kengatharan[4], Yogarajah Nanthagopan[3], Arya Kumar[5]

[1]Faculty of Business and Communications, INTI International University, Nilai, Malaysia

[2]Wekerle Business School, Budapest, Hungary

[3]University of Vavuniya, Pampaimadu, Vavuniya, Sri Lanka

[4]Faculty of Management Studies and Commerce, University of Jaffna, Jaffna, Sri Lanka

[5]Department of Commerce, KIIT University, Bhubaneswar, Odisha, India

asokan.vasudevan@newinti.edu.my

ABSTRACT

This study explores digital shifts in human resource management (HRM) through content co-occurrence analysis, examining trends and the role of mobile technologies. A bibliometric content co-occurrence analysis was conducted on 28 papers from 2014 to 2024, sourced from the Scopus database. Cite space software visualized the scientific landscape and themes. The findings reveal that advanced technologies—including artificial intelligence (AI), big data analytics, cloud computing, Internet of Things (IoT), blockchain, and mobile computing—are increasingly integrated into HRM practices. These advancements have reinforced HRM's centrality in digital transformation, focusing on data-driven decision-making, employee engagement, and strategic alignment with business goals. However, challenges remain, such as data privacy concerns, skill gaps, and balancing technology with human-centric approaches. Mobile technology is growing, particularly in M-learning applications, mobile web and video conferencing, remote laboratories, and wireless networks, in reshaping HRM processes. Integrating mobile computing and smart agent technologies enhances adaptive environments for HR professionals and employees. This study emphasizes the need for research to navigate these complexities and improve HRM outcomes. Future research should focus on mobile architectures integration, cost-effectiveness, applications, and the social impact of next-generation mobile technologies on human resource management.

KEYWORDS

digital human resource management (HRM), mobile technology, wireless communication, content co-occurrence analysis, process innovation, cite space

Vasudevan, A., Mathushan, P., Kengatharan, N., Nanthagopan, Y., Kumar, A. (2025). Uncovering the Paradox: Digital Shifts in Human Resource Management through Mobile Technology and Wireless Communication – A Content Co-occurrence Analysis Using Citespace. *International Journal of Interactive Mobile Technologies (iJIM)*, 19(14), pp. 93–107. https://doi.org/10.3991/ijim.v19i14.56871

This article is a revised version of a paper presented at the Annual Conference on Innovating for Impact, held on February 19–20, 2025, at the Manipal Dubai Campus, Dubai, UAE. Article submitted 2025-04-26. Revision uploaded 2025-05-25. Final acceptance 2025-06-01.

1 INTRODUCTION

In the digital epoch, HR has emerged as a strategic driver of organizational success, spearheading efforts to attract and retain top talent [1] top talent [2], [3]. Digital-driven solutions are needed to achieve human resource management (HRM) goals focused on talent identification and development [3]. The evolution of HRM software and shifts in HRM practices have reshaped the landscape for HR managers [3], [4]. The HR function now leads innovation, utilizing technology, data analytics, and understanding of human behavior to create efficient, inclusive workplaces [1], [2], [5]. HR digital transformation uses technology, data, IoT, and digital resources to improve HR activities [4]. This approach embraces software, automation, analytics [2], [6], and artificial intelligence (AI) [7] to streamline operations from recruitment to workforce planning [8]. The goal is to create a more agile, data-driven HR division [9], [10]. Digital technologies help firms make informed decisions and improve employee experiences in today's business landscape [11], [12]. The deployment of new HR strategies requires digital skills development among HR staff [12].

Maintaining the human element amid technological innovations in HRM remains vital [1], [13]. New HRM technology implementation should prioritize employees' needs [14], recognizing its direct impact on individuals [15]. Organizations must modernize infrastructure to align with advancing technology, fostering productivity and task optimization. Most existing SLRs use traditional descriptive and content analysis approaches, classifying research based on predefined schemes [16]. These reviews focus on early HRM research and haven't unified fragmented studies on digital transformation in HRM, failing to assess whether recent research addresses criticisms about digital HRM understanding [2], [11]. Several works have addressed aspects of digital transformation in HRM, but comprehensive reviews of this domain are limited [2], [17]. Literature indicates the need for systematic reviews synthesizing findings from diverse sources [17]. While studies have explored the consequences of digital transformation in HRM, including employee performance [18], operational efficacy [19], and innovation [15], research gaps exist in linking digital HRM strategies to measurable outcomes [20]. This study addresses this gap through two aims: investigating trends in digital transformation in HRM literature and providing insights for firms and academia regarding digital technologies in HRM. To analyze trends in digital HRM literature, we combine systematic literature review (SLR) [21] with cite space co-occurrence analysis [22].

2 MATERIALS AND METHODS

2.1 Bibliometric analysis

Consolidating previous research findings is paramount for progressing in research. Researchers have traditionally used two methods: the qualitative structured literature review (SLR) and quantitative meta-analysis [23]. Bibliometric analysis has emerged as a widely used approach for analyzing scientific datasets [24], helping unravel evolutionary patterns and emerging trends within research domains.

2.2 Co-occurrence analysis

A keyword co-occurrence analysis was used to map the study area. Analytical techniques based on mathematical principles and statistics can transform co-occurrence data into a spatial configuration map [24]. Each data point's position is determined

by its relationship with other dataset elements. Co-occurrence analysis examines content interactions within publications' titles, abstracts, and keywords. Through reviewing literature content, researchers can uncover insights and contributions. This analysis enables identification of theories, methodologies, contexts, trending themes, cited concepts, and other relevant data that support research.

2.3 Selection of database and search criteria

The Scopus database was used as the source of bibliometric data for the research sampling process. Scopus is one of the most extensive repositories of peer-reviewed literature, encompassing journals, books, and conference proceedings. The following query was applied: Searched for Topic (TITLE-ABSKEY ((‘Digital HRM OR’ ‘Digital human resource management’ OR ‘HR technologies’) AND (LIMIT TO (DOCTYPE, “article”)) AND (LIMIT TO (SUBJAREA, “business”)) AND (LIMIT-TO (LANGUAGE, “English”)). Time span: 2015–2023.

2.4 Analysis and reporting procedure

Researchers can generate maps based on term co-occurrence within datasets using software like cite space, which operates on mapping algorithms. These maps visually represent interdisciplinary research, highlighting clusters within the selected topic and dataset. The preliminary search yielded 89 articles. Applying inclusion and exclusion, we narrowed the sample to publications between 2015 and 2023, resulting in 44 articles. This selection ensured consistency and transferability of findings, bolstering reliability.

The study followed PRISMA methodology, renowned for transparency in conducting systematic literature reviews and meta-analyses [25]. By adhering to PRISMA guidelines and sourcing articles from the Scopus database, this study upheld rigorous standards for inclusion criteria and academic research (see Figure 1).

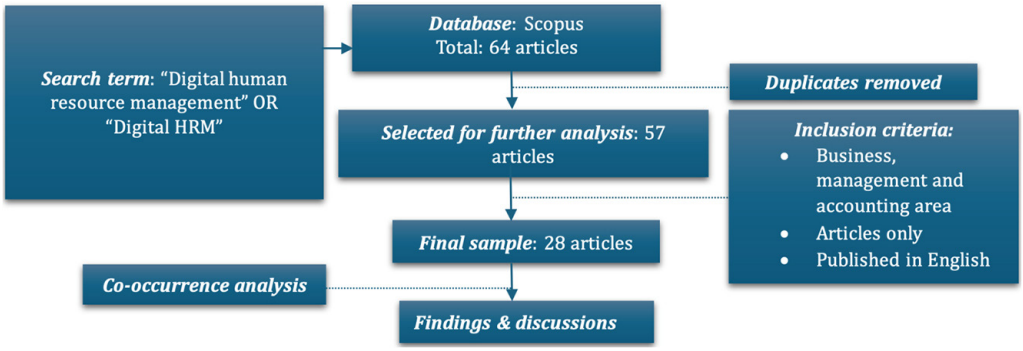

Fig. 1. PRISMA framework adopted form Moher et al. in 2009 [25]

3 ANALYSIS AND SYNTHESIS OF FINDINGS

3.1 Co-occurrence analysis

Co-occurrence analysis observes trends by showing relationships between keywords in published articles. The co-occurrence map visualizes keyword relationships

in digital HRM research. Nodes represent keywords, with node size indicating frequency. Lines between nodes show co-occurrence, with thicker lines indicating stronger relationships.

There is a strong connection between "Industry 4.0" and terms like "cloud computing" and "information technology", indicating their centrality to Industry 4.0 implementation. Big data analytics and HRM connections emphasize data-driven approaches in managing human resources. HR analytics supports decision-making and performance evaluation, highlighting the strategic importance of data-driven HR practices. The analysis focused on "HR analytics" and "evidence-based management," showing data analytics' crucial role in HR practices.

Themes like "ambidexterity," "competence management," and "dynamic capability" show organizations balancing current resources while exploring Industry 4.0 opportunities. Ambidexterity represents the balance between exploration and exploitation, while dynamic capability research examines maintaining competitiveness in dynamic environments. The prominence of "IT personnel training" and "employment" indicates a focus on workforce transformation for Industry 4.0. Smaller keyword groups indicate specialized research areas, with terms like "numerical model" and "virtual experimentation" representing specific subfields. Implementation challenges are evident through terms like "data quality" and "HR analytics implementation," showing concern for practical application.

Table 1. Top 20 Keywords with the strongest citation bursts

Keywords	Year	Strength	Begin	End	2019 – 2022
Big data	2021	4.5	**2021**	2020	
HR analytics	2021	3.27	**2021**	2020	
big data technology	2021	2.45	**2021**	2020	
Internet of things (IoT)	2021	1.63	**2021**	2020	
Adoption of HR analytics	2021	1.63	**2021**	2020	
economic and social effects	2021	1.63	**2021**	2020	
Dynamic capability	2021	1.63	**2021**	2020	
Cloud computing	2021	1.63	**2021**	2020	
Human capital analytics	2021	1.63	**2021**	2020	
Ambidexterity	2021	1.63	**2021**	2020	
employee training	2021	1.63	**2021**	2020	
learning systems	2019	4.39	**2020**	2022	
Talent analytics	2019	2.19	**2020**	2022	
Industry 4.0	2019	1.64	**2020**	2022	
Big data analytics	2019	1.64	**2020**	2022	
Software	2019	1.64	**2020**	2022	
Information management systems	2019	1.64	**2020**	2022	
Performance measurement	2019	1.64	**2020**	2022	
Human resource development	2019	1.64	**2020**	2022	
Business modelling	2019	1.64	**2020**	2022	

3.2 Artificial intelligence and HRM

AI and intelligent applications enable firms to achieve optimal business outcomes through improved service quality, productivity, cost-effectiveness, ROI, operational efficiency, customer loyalty [26], employee service quality [27], and reduced expenses [28]. Firms increasingly incorporate AI into their HRM strategies [29], [30], leading to extensive research on AI integration in HRM practices [31]. Studies examine AI's impact on workplace social dynamics [32], performance [33], and AI-driven HRM methods [31], [34], focusing on AI's influence across HRM functions. Malik et al. (2023) noted AI's significant impact on HRM, transforming work, workers, and workplaces [35]. While AI-assisted HRM improves organizational productivity, literature lacks a strategic framework for its adoption. AI and automation enhance HRM by attracting talent, improving training, identifying skill gaps, facilitating payroll, aiding personnel decisions, and reducing costs while minimizing cognitive biases [36], [37], [38]. These technologies strengthen overall HRM operations.

3.3 Big data, predictive analytics, and HRM

Big data (BD) has become pivotal for firms seeking to revolutionize their business processes in today's business landscape. Firms use Big Data for enhanced decision-making [39], [40]. Information technology (IT) advancement has enabled big data use [40]. Datasets require classification for utilization [41]. New technology is needed for Big Data initiatives [42]. The use of "data" in HRM has evolved [40], [43]. HR analysis traditionally focused on past events [44]. Big data enables predictive analytics through processing data from various sources [45], [46]. HR data lacks diversity, and managers often lack analysis qualifications [42], [47], [48]. HR departments must analyze data to assess employee performance. Big data analytics addresses human capital strategy. HR analytics can identify top performers and develop retention programs. Analytics should extend beyond administrative efficiency [43]. HR's use of big data should focus on connecting human capital and profitability [49]. HR should provide evidence that big data impacts company profitability. Senior HR personnel should understand the firm's business model [44]. HR professionals must demonstrate how analytics enhance organizational competencies [50]. Big Data enables unbiased decisions but raises discrimination concerns. Its core attributes include vast information sources and analysis. Through data processing, big data can enhance HR frameworks.

3.4 Advantages of adopting big data in HRM

To transition from conventional HR management to a more effective methodology, organizations must conduct assessments, implement screening for top-tier employees, and incorporate data analytics into HR management. The evolution of HR methods through data entails using data-driven insights to enhance decision-making, recruitment, and organizational progress. The use of big data enables methodical classification analysis and processing, optimizing HR resource utilization. Big data technology provides diverse information sources and analytical processes, empowering HR divisions to formulate strategies based on data analysis [43]. Incorporating big data into HR methods improves effectiveness, introduces screening for top employees, and advances HR management.

3.5 Algorithmic HRM and Learning algorithms in HRM

Algorithmic HRM applies algorithmic technologies to oversee work within HRM functions [15], [51], [52]. This strategy uses algorithms to assign tasks, manage performance, and align employee actions with firms' objectives, establishing a control mechanism that impacts HRM performance [15]. Algorithmic management improves efficiency through task distribution and performance evaluation but pressures workers to maintain constant availability, affecting work-life balance. Machine learning models forecast employee turnover by analyzing survey data, demonstrating AI's role in personnel evaluation [52]. Algorithmic HRM influences work dynamics, performance assessment, and employee retention strategies [15], [52], [53]. Algorithms enhance HRM decision-making by utilizing AI and machine learning. AI tools enable computational systems to derive outcomes by incorporating new data, improving HR decisions [54]. Algorithmic models in HRM, such as the Naïve Bayes model, streamline candidate evaluation and recruitment processes [53]. AI-driven tools and ML algorithms enhance HRM functions, including employee engagement and performance assessment, optimizing strategic approaches. [15], [52]. Using algorithms and AI, HRM departments can predict employee requirements, analyze attrition, and foster growth while maintaining ethical considerations. [53].

3.6 HR technologies

HR chatbots. Artificial intelligence has been successfully applied in domains like computer vision, natural language processing, speech recognition, and sentiment analysis [55]. The integration of HR services with IT has manifested through human resource information systems (HRIS), enterprise resource planning (ERP), and HR analytics [55], [56]. The emergence of AI has significantly impacted technological advancements in business operations. A chatbot, a computer program simulating human conversation online, is revolutionizing industries from marketing to customer engagement [57]. Acting as a digital assistant interacting with employees via text messages or apps, chatbots are reshaping human resource (HR) departments [58]. Chatbots serve as communication tools used by employees and customers for various tasks [58]. Through AI-driven technology, complex problems become simple solutions. Chatbots influence organizational decision-making and enhance employees' understanding of artificial intelligence. [56], [57], [58].

Cloud computing. Technology has enhanced business operations and provided competitive advantages. With evolving processing and storage technologies, computing resources have become cost-effective and accessible [59]. Cloud computing enables users to rent resources as services through the Internet. Cloud frameworks allow enterprises to store data on cloud infrastructures, enhancing systems and reducing expenses [60]. Firms rely on data for HR operations. HR departments need effective data management [61]. Cloud infrastructure enables managers to improve efficiency; firms must promote cloud-based HRM and ensure training. However, cloud-based HRIS faces challenges: apps require setup effort, firms need time to adjust, and third-party integration can be complex. Deloitte's 2011 survey showed 68% of workers endorsed cloud computing for HRM [62]. Laurano (2014) reported 11% of organizations use SaaS-based HR systems [63]. Rader (2012) noted this technology reduces process duration, overcomes limitations, cuts costs, and offers global communication [64].

Blockchain. Blockchain technology's transformative potential stems from its benefits in fraud prevention, decentralization, security, and data ownership. [65]. The impact of blockchain on future industry frameworks is recognized, integrating digital ledger technology with innovative industry elements to create a secure system [66]. Industries face pressure to maintain sustainable HRM frameworks. Blockchain provides HR departments a platform to simplify operations, enabling efficient issue resolution and stakeholder communication [67]. The technology enhances information gathering by detecting hazards in resource-intensive tasks. Research shows blockchain's positive impact on HR recruitment through improved credential verification and fraud mitigation. Integrating blockchain creates an organized entity, enabling a hybrid approach combining legacy systems with distributed ledger frameworks. HR functions like payroll and talent acquisition often require significant resources and external providers [68]. Blockchain could enhance candidate search efficiency with privacy measures ensuring unbiased interaction [69]. Blockchain will revolutionize HRM operations and facilitate secure information sharing between workers and companies. Digital validation of qualifications provides certainty to employers. This technology enables recruitment, verification, smart contracts, and compliance [70]. Firms use blockchain for HR solutions, including payroll and personnel operations [71]. However, blockchain's integration in HRM remains limited in organizations today.

Machine learning. The trend towards utilizing deep learning models and machine learning solutions for managing HR operations is gaining momentum [72], [73]. Organizations operate within a competitive landscape where leveraging machine learning or AI applications improves decision-making accuracy and operational efficiency [74]. During initial development phases, Management Information Systems (MIS) were employed for employee data management, payroll processing, and HR services [75]. With the progression of IT systems, the range has expanded to integrated systems for managing human resources [73]. The focus is on integrating AI and machine learning solutions into HRM. Real-time analytics and sentiment analysis using machine learning algorithms are highly viable [75]. Machine learning solutions are paramount in overseeing business operations. Although integration was postponed in HR management solutions, their advantages are becoming evident. Using bots for HR queries and nonhuman support systems has proven successful in trials. Organizations are shifting from email-based timetabling to collective messaging solutions for scheduling and communication. Machine learning-driven solutions for repetitive duties may offer a pragmatic approach.

3.7 Cluster analysis

Keywords were grouped into clusters based on their co-occurrence, revealing how often they appeared in the same research papers. The color and proximity of the nodes indicate the strength of their relationships. The colors represent different clusters, highlighting distinct thematic areas within the broader research landscape. Bibliometric cluster visualization analysis was performed in cite space to identify relevant clusters in digital transformation in HRM. Clusters are typically formed based on keyword co-occurrences and thematic similarities.

Industry 4.0 and HRM (orange cluster). Keywords: Industry 4.0, HRM, cloud computing, industrial revolutions, business modelling, employment, industrial revolutions, personnel training. This cluster revolves around integrating Industry 4.0 technologies into HRM practices. It explores the implications of technological

advancements, such as IoT, cloud computing, and business modelling, on HR functions and personnel training.

Industry 4.0 integrates cyber-physical systems, IoT, cloud computing, and cognitive computing to achieve smart manufacturing. It represents the fourth industrial revolution, characterized by smart factories and digitalization. Key technologies include IoT, cloud computing, and big data analytics, collectively driving efficiency, customization, and new business models. The role of HRM is evolving to meet the demands of Industry 4.0. This includes managing digital transformation, reskilling employees, and leveraging data-driven decision-making.

Big data and data analytics (red cluster). Keywords: big data, data analytics, HR analytics, advanced analytics, data set, ambidexterity, dynamic capability, agility. This cluster focuses on the utilization of big data and analytics in HRM. It includes studying HR analytics, adopting and implementing data-driven decision-making, and the impact of advanced analytics techniques on HR practices. Big data analytics is integral to Industry 4.0, providing insights that drive operational efficiency and innovations. HRM supports evidence-based management and strategic decision-making. The implementation of big data analytics faces challenges such as data quality, integration issues, and the need for analytical skills. However, it also offers opportunities for a significant competitive advantage.

Human resource development and management information systems (purple cluster). Keywords: human resource development, MIS, information management systems, empirical analysis, talent needs, industry transformation, evidence-based management, organizational strategy. This cluster focuses on the role of MIS and IT in HR. It investigates how HRM systems can be leveraged to enhance organizational capabilities and drive empirical research on HR practices.

Adoption and implementation of HR analytics (light red cluster). Keywords: implementation of HR analytics, workforce analytics, mediation analysis, performance measurement, synthesis, human capital analytics, data quality, adoption of HR analytics, competence management. This cluster is concerned with the practical aspects of implementing HR analytics in organizations. This study examines the methodologies for adopting HR analytics, measuring performance, and ensuring data quality in HR practices.

Digital technology management and virtual adaptation and collaboration (yellow cluster).

Keywords: virtual experimentation and simulation, virtual collaboration, research platforms, customer initialization, life cycle, product life cycle, digitalization, management quality, customer intimacy.

This cluster deals with virtual and digital tools for experimentation and collaboration in HRM. It examines the impact of virtual collaboration platforms on HR processes, customer interaction, and the overall lifecycle of HR products and services and highlights the strategic management of technology in HRM, including the adaptation and integration of new technologies. It also explores the managerial rationale for technology adoption and the development of industry-specific HR practices. Additionally, this cluster reports that studies often employ empirical methods to investigate the impact of Industry 4.0 technologies on HRM and organizational performance. This includes surveys, case studies, and analyses. Researchers have used inductive approaches to develop theories and frameworks based on observed data patterns, particularly to understand the nuances of technology adoption in human resource management.

4 DISCUSSION

Despite burgeoning scholarly interest, research on AI-driven HRM functions remains sparse and disjointed [76]. There is an urgent need to examine AI-assisted applications in HRM functions and human-AI interactions, particularly in large multinationals adopting such innovations. The co-occurrence map shows HRM's central role in incorporating digital technologies, big data for HR analytics, and related methodologies. As firms face pressure to adopt digital HRM practices, their strategies must enhance competitive edge and performance. Incorporating these technologies creates opportunities for employee engagement and optimizes resource allocation, decision-making, and problem-solving processes.

Studies highlight bots and intelligent digital assistants as co-workers in HRM strategy to achieve organizational outcomes [35], [52]. Organizations must manage HRM digitalization to respond to environmental threats during the Fourth Industrial Revolution. AI-assisted HRM is becoming a strategic imperative for company survival and growth. BD is crucial for improving operational excellence. HRM has advanced in data application, with HR analytics essential for informed personnel decisions. Despite challenges, BD in HRM enables advanced decision-making by analyzing datasets to forecast employee performance and organizational innovation.

Big data analytics uses charts, graphs, heat maps, and dashboards to show data patterns. Training analytics software requires representative data samples for machine learning [77]. Machine learning algorithms such as decision trees, logistic regression, random forests, k-nearest neighbors, XG boost classifier, and neural networks predict employee turnover, training needs, and performance. These algorithms help HR managers identify key variables for staff retention and organizational efficiency. Through AI technologies and data-centric forecasting, HRM improves decision quality, predicts employee needs, and supports revenue growth while addressing business and technological changes.

Algorithms play a pivotal role in augmenting recruitment procedures within HRM through task automation, efficiency enhancement, and bias mitigation [78]. AI systems and algorithms are deployed across HRM functions such as candidate screening [79], performance appraisals [51], and selection processes based on organizational preferences [53]. These algorithms process candidate information and identify promising candidates. Algorithms can analyze candidates' online presence, assess interpersonal skills, and propose matches using machine learning and NLP techniques, creating a swift, precise recruitment process. Algorithms optimize candidate acquisition in HRM by automating HR processes. AI-driven recruitment software elevates efficiency by processing candidate information and facilitating candidate identification. The Naïve Bayes model focuses on initial screening to identify eligible candidates, refining HRM operations [35], [80]. Algorithms leverage recruiter feedback to construct training datasets and establish ranking metrics based on past performance. Multiple criteria decision-making (MCDM) methodologies, such as AHP and TOPSIS, prioritize variables to streamline candidate selection, reducing manual labor and partiality [35]. HRM algorithms enhance recruitment performance through improved efficiency and impartiality.

5 CONCLUSION

The present study covers key themes and interrelationships shown in the co-occurrence thematic cluster map, evaluating literature in HRM, Industry 4.0, big

data analytics, and digital technologies in HRM. The convergence of Industry 4.0, HRM, and big data analytics is a developing topic. Firms that want to capitalize on technological breakthroughs for innovation and competitive advantage must understand synergies and challenges across fields. However, our examination shows this research topic is still in the early stages and requires further investigation through conceptual and empirical research that is aligned with technological advancements and HRM transformations. The data patterns indicate that inductive methodologies can develop creative theories for integrating technology into HRM. Despite the emphasis on AI and cloud computing, technologies such as blockchain and virtual reality remain unexplored in HRM. Extending the subject focus enables better understanding of digital transformation consequences.

6 REFERENCES

[1] S. Strohmeier, "Digital human resource management: A conceptual clarification," *German Journal of Human Resource Management*, vol. 34, no. 3, pp. 345–365, 2020. https://doi.org/10.1177/2397002220921131

[2] P. Vardarlier, "Digital transformation of human resource management: Digital applications and strategic tools in HRM," in *Digital Business Strategies in Blockchain Ecosystems: Transformational Design and Future of Global Business*, U. Hacioglu, Ed., Springer, Charm, 2020, pp. 239–264. https://doi.org/10.1007/978-3-030-29739-8_11

[3] C. Zhang, "Analyze the marketing strategy of mixue ice-cream&tea based on 4C theory," *HBEM*, vol. 19, pp. 491–495, 2023. https://doi.org/10.54097/hbem.v19i.11988

[4] I. Pantelidis, "Digital human resource management," in *Human Resource Management in the Hospitality Industry*, Routledge, 2019, pp. 337–352. https://doi.org/10.4324/9780429441400-21

[5] M. Thite, "Digital human resource development: Where are we? Where should we go and how do we go there?" *Human Resource Development International*, vol. 25, no. 1, pp. 87–103, 2020. https://doi.org/10.1080/13678868.2020.1842982

[6] S. V. Shet, T. Poddar, F. W. Samuel, and Y. K. Dwivedi, "Examining the determinants of successful adoption of data analytics in human resource management–A framework for implications," *Journal of Business Research*, vol. 131, pp. 311–326, 2021. https://doi.org/10.1016/j.jbusres.2021.03.054

[7] D. Vrontis, M. Christofi, V. Pereira, S. Tarba, A. Makrides, and E. Trichina, "Artificial intelligence, robotics, advanced technologies and human resource management: A systematic review," *The International Journal of Human Resource Management*, vol. 33, no. 6, pp. 1237–1266, 2021. https://doi.org/10.1080/09585192.2020.1871398

[8] M. Trujillo-Gallego, W. Sarache, and A. B. L. de Sousa Jabbour, "Digital technologies and green human resource management: Capabilities for GSCM adoption and enhanced performance," *International Journal of Production Economics*, vol. 249, p. 108531, 2022. https://doi.org/10.1016/j.ijpe.2022.108531

[9] V. Stein and T. M. Scholz, "Manufacturing revolution boosts people issues: The evolutionary need for 'human-automation resource management' in smart factories," *European Management Review*, vol. 17, no. 2, pp. 391–406, 2019. https://doi.org/10.1111/emre.12368

[10] S. Nadkarni and R. Prügl, "Digital transformation: A review, synthesis and opportunities for future research," *Management Review Quarterly*, vol. 71, pp. 233–341, 2021. https://doi.org/10.1007/s11301-020-00185-7

[11] Á. Nicolás-Agustín, D. Jiménez-Jiménez, and F. Maeso-Fernandez, "The role of human resource practices in the implementation of digital transformation," *International Journal of Manpower*, vol. 43, no. 2, pp. 395–410, 2022. https://doi.org/10.1108/IJM-03-2021-0176

[12] S. Bresciani, F. Ciampi, F. Meli, and A. Ferraris, "Using big data for co-innovation processes: Mapping the field of data-driven innovation, proposing theoretical developments and providing a research agenda," *International Journal of Information Management*, vol. 60, p. 102347, 2021. https://doi.org/10.1016/j.ijinfomgt.2021.102347

[13] S. Strohmeier, J. Collet, and R. Kabst, "(How) do advanced data and analyses enable HR analytics success? A neo-configurational analysis," *Baltic Journal of Management*, vol. 17, no. 3, pp. 285–303, 2022. https://doi.org/10.1108/BJM-05-2021-0188

[14] J. H. Marler and E. Parry, "Human resource management, strategic involvement and e-HRM technology," *The International Journal of Human Resource Management*, vol. 27, no. 19, pp. 2233–2253, 2015. https://doi.org/10.1080/09585192.2015.1091980

[15] J. Meijerink, M. Boons, A. Keegan, and J. Marler, "Algorithmic human resource management: Synthesizing developments and cross-disciplinary insights on digital HRM," *The International Journal of Human Resource Management*, vol. 32, no. 12, pp. 2545–2562, 2021. https://doi.org/10.1080/09585192.2021.1925326

[16] I. Ali and I. Gölgeci, "Where is supply chain resilience research heading? A systematic and co-occurrence analysis," *International Journal of Physical Distribution & Logistics Management*, vol. 49, no. 8, pp. 793–815, 2019. https://doi.org/10.1108/IJPDLM-02-2019-0038

[17] J. Zhang and Z. Chen, "Exploring human resource management digital transformation in the digital age," *Journal of the Knowledge Economy*, vol. 15, pp. 1482–1498, 2023. https://doi.org/10.1007/s13132-023-01214-y

[18] R. C. Sangaji, A. N. A. Setyaning, and E. G. Marsasi, "A literature review on digital human resources management towards digital skills and employee performance," in *International Conference on Business and Technology*, B. Alareeni, A. Hamdan, R. Khamis, and R. E. Khoury, Eds., vol. 620, Charm: Springer International Publishing, 2023, pp. 743–750. https://doi.org/10.1007/978-3-031-26953-0_68

[19] L. Ruiz, J. Benitez, A. Castillo, and J. Braojos, "Digital human resource strategy: Conceptualization, theoretical development, and an empirical examination of its impact on firm performance," *Information & Management*, vol. 61, no. 4, p. 103966, 2024. https://doi.org/10.1016/j.im.2024.103966

[20] C. Zehir, T. Karaboğa, and D. Başar, "The transformation of human resource management and its impact on overall business performance: Big data analytics and AI technologies in strategic HRM," in *Digital Business Strategies in Blockchain Ecosystems: Transformational Design and Future of Global Business*, U. Hacioglu, Ed., Charm: Springer, 2020, pp. 265–279. https://doi.org/10.1007/978-3-030-29739-8_12

[21] D. Denyer and D. Tranfield, "Producing a systematic review," in *The Sage Handbook of Organisational Research Methods,* 2009, pp. 671–689.

[22] S. Chen, "Analysis of marketing strategy of MIXUE ice cream & tea company based on SWOT model," *AEMPS*, vol. 87, no. 1, pp. 49–56, 2024. https://doi.org/10.54254/2754-1169/87/20241038

[23] F. Schmidt, "Meta-analysis: A constantly evolving research integration tool," *Organizational Research Methods*, vol. 11, no. 1, pp. 96–113, 2008. https://doi.org/10.1177/1094428107303161

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

[25] D. Moher, A. Liberati, J. Tetzlaff, and D. G. Altman; the PRISMA Group, "Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement," *Annals of Internal Medicine*, vol. 151, pp. 264–269, 2009. https://doi.org/10.7326/0003-4819-151-4-200908180-00135

[26] C. Prentice and M. Nguyen, "Engaging and retaining customers with AI and employee service," *Journal of Retailing and Consumer Services*, vol. 56, p. 102186, 2020. https://doi.org/10.1016/j.jretconser.2020.102186

[27] T. M. Nguyen and A. Malik, "Impact of knowledge sharing on employees' service quality: The moderating role of artificial intelligence," *International Marketing Review*, vol. 39, no. 3, pp. 482–508, 2022. https://doi.org/10.1108/IMR-02-2021-0078

[28] B. W. Wirtz, J. C. Weyerer, and C. Geyer, "Artificial intelligence and the public sector—applications and challenges," *International Journal of Public Administration*, vol. 42, no. 7, pp. 596–615, 2019. https://doi.org/10.1080/01900692.2018.1498103

[29] P. Budhwar, A. Malik, M. T. De Silva, and P. Thevisuthan, "Artificial intelligence–challenges and opportunities for international HRM: A review and research agenda," *The International Journal of Human Resource Management*, vol. 33, no. 6, pp. 1065–1097, 2022. https://doi.org/10.1080/09585192.2022.2035161

[30] E. Sipahi and E. Artantaş, "Artificial intelligence in HRM," in *Handbook of Research on Innovative Management Using AI in Industry 5.0*, pp. 1–18, 2022. https://doi.org/10.4018/978-1-7998-8497-2.ch001

[31] A. Radonjić, H. Duarte, and N. Pereira, "Artificial intelligence and HRM: HR managers' perspective on decisiveness and challenges," *European Management Journal*, vol. 42, no. 1, pp. 57–66, 2022. http://dx.doi.org/10.1016/j.emj.2022.07.001

[32] R. D. Pereira, A. C. Badino, and A. J. Cruz, "Framework based on artificial intelligence to increase industrial bioethanol production," *Energy & Fuels*, vol. 34, no. 4, pp. 4670–4677, 2020. https://doi.org/10.1021/acs.energyfuels.0c00033

[33] S. L. Wamba-Taguimdje, S. F. Wamba, J. R. K. Kamdjoug, and C. E. T. Wanko, "Impact of artificial intelligence on firm performance: Exploring the mediating effect of process-oriented dynamic capabilities," in *Digital Business Transformation: Organizing, Managing and Controlling in the Information Age*, R. Agrifoglio, R. Lambogliia, and F. Ricciardi, Eds., Charm: Springer International Publishing, 2020, pp. 3–18. https://doi.org/10.1007/978-3-030-47355-6_1

[34] N. Kaushal, R. P. S. Kaurav, B. Sivathanu, and N. Kaushik, "Artificial intelligence and HRM: Identifying future research agenda using systematic literature review and bibliometric analysis," *Management Review Quarterly*, vol. 73, pp. 455–493, 2023. https://doi.org/10.1007/s11301-021-00249-2

[35] A. Malik, P. Budhwar, and B. A. Kazmi, "Artificial intelligence (AI)-assisted HRM: Towards an extended strategic framework," *Human Resource Management Review*, vol. 33, no. 1, p. 100940, 2023. https://doi.org/10.1016/j.hrmr.2022.100940

[36] B. Karatop, C. Kubat, and Ö. Uygun, "Talent management in manufacturing system using fuzzy logic approach," *Computers & Industrial Engineering*, vol. 86, pp. 127–136, 2015. https://doi.org/10.1016/j.cie.2014.09.015

[37] N. Kshetri, "Evolving uses of artificial intelligence in human resource management in emerging economies in the global South: Some preliminary evidence," *Management Research Review*, vol. 44, no. 7, pp. 970–990, 2021. https://doi.org/10.1108/MRR-03-2020-0168

[38] D. Pessach, G. Singer, D. Avrahami, H. C. Ben-Gal, E. Shmueli, and I. Ben-Gal, "Employees recruitment: A prescriptive analytics approach via machine learning and mathematical programming," *Decision Support Systems*, vol. 134, p. 113290, 2020. https://doi.org/10.1016/j.dss.2020.113290

[39] C. Zhang, S. Bengio, M. Hardt, B. Recht, and O. Vinyals, "Understanding deep learning (still) requires rethinking generalization," *Communications of the ACM*, vol. 64, no. 3, pp. 107–115, 2021. https://doi.org/10.1145/3446776

[40] J. Garcia-Arroyo and A. Osca, "Big data contributions to human resource management: A systematic review," *The International Journal of Human Resource Management*, vol. 32, no. 20, pp. 4337–4362, 2021. https://doi.org/10.1080/09585192.2019.1674357

[41] W. Wan and L. Liu, "Intrapreneurship in the digital era: Driven by big data and human resource management?" *Chinese Management Studies*, vol. 15, no. 4, pp. 843–875, 2021. https://doi.org/10.1108/CMS-07-2020-0282

[42] M. L. Lengnick-Hall, A. R. Neely, and C. B. Stone, "Human resource management in the digital age: Big data, HR analytics and artificial intelligence," in *Management and Technological Challenges in the Digital Age*, 2018, pp. 1–30. https://doi.org/10.1201/9781351238922-1

[43] R. H. Hamilton and W. A. Sodeman, "The questions we ask: Opportunities and challenges for using big data analytics to strategically manage human capital resources," *Business Horizons*, vol. 63, no. 1, pp. 85–95, 2020. https://doi.org/10.1016/j.bushor.2019.10.001

[44] A. Levenson, "Using workforce analytics to improve strategy execution," *Human Resource Management*, vol. 57, no. 3, pp. 685–700, 2018. https://doi.org/10.1002/hrm.21850

[45] Y. Wang and N. Hajli, "Exploring the path to big data analytics success in healthcare," *Journal of Business Research*, vol. 70, pp. 287–299, 2017. https://doi.org/10.1016/j.jbusres.2016.08.002

[46] H. J. Watson, "Tutorial: Big data analytics: Concepts, technologies, and applications," *Communications of the Association for Information Systems*, vol. 34, pp. 1247–1268, 2014. https://doi.org/10.17705/1CAIS.03465

[47] D. Angrave, A. Charlwood, I. Kirkpatrick, M. Lawrence, and M. Stuart, "HR and analytics: Why HR is set to fail the big data challenge," *Human Resource Management Journal*, vol. 26, no. 1, pp. 1–11, 2016. https://doi.org/10.1111/1748-8583.12090

[48] D. McIver, M. L. Lengnick-Hall, and C. A. Lengnick-Hall, "A strategic approach to workforce analytics: Integrating science and agility," *Business Horizons*, vol. 61, no. 3, pp. 397–407, 2018. https://doi.org/10.1016/j.bushor.2018.01.005

[49] S. E. Jackson, R. S. Schuler, and K. Jiang, "An aspirational framework for strategic human resource management," *Academy of Management Annals*, vol. 8, no. 1, pp. 1–56, 2014. https://doi.org/10.5465/19416520.2014.872335

[50] D. B. Minbaeva, "Building credible human capital analytics for organizational competitive advantage," *Human Resource Management*, vol. 57, no. 3, pp. 701–713, 2017. https://doi.org/10.1002/hrm.21848

[51] M. M. Cheng and R. D. Hackett, "A critical review of algorithms in HRM: Definition, theory, and practice," *Human Resource Management Review*, vol. 31, no. 1, p. 100698, 2021. https://doi.org/10.1016/j.hrmr.2019.100698

[52] J. Duggan, U. Sherman, R. Carbery, and A. McDonnell, "Algorithmic management and app-work in the gig economy: A research agenda for employment relations and HRM," *Human Resource Management Journal*, vol. 30, no. 1, pp. 114–132, 2019. https://doi.org/10.1111/1748-8583.12258

[53] A. Köchling and M. C. Wehner, "Discriminated by an algorithm: A systematic review of discrimination and fairness by algorithmic decision-making in the context of HR recruitment and HR development," *Business Research*, vol. 13, pp. 795–848, 2020. https://doi.org/10.1007/s40685-020-00134-w

[54] W. Rodgers, J. M. Murray, A. Stefanidis, W. Y. Degbey, and S. Y. Tarba, "An artificial intelligence algorithmic approach to ethical decision-making in human resource management processes," *Human Resource Management Review*, vol. 33, no. 1, p. 100925, 2023. https://doi.org/10.1016/j.hrmr.2022.100925

[55] K. Venusamy, N. K. Rajagopal, and M. Yousoof, "A study of human resources development through chatbots using artificial intelligence," in *2020 3rd International Conference on Intelligent Sustainable Systems (ICISS)*, 2020, pp. 94–99. https://doi.org/10.1109/ICISS49785.2020.9315881

[56] S. Majumder and A. Mondal, "Are chatbots really useful for human resource management?" *International Journal of Speech Technology*, vol. 24, pp. 969–977, 2021. https://doi.org/10.1007/s10772-021-09834-y

[57] N. B. Andreas, "Ethics in international HRD: Examining conversational AI and HR chatbots," *Strategic HR Review*, vol. 23, no. 3, pp. 121–125, 2024. https://doi.org/10.1108/SHR-03-2024-0018

[58] S. Koivunen, S. Ala-Luopa, T. Olsson, and A. Haapakorpi, "The march of Chatbots into recruitment: Recruiters' experiences, expectations, and design opportunities," *Computer Supported Cooperative Work (CSCW)*, vol. 31, pp. 487–516, 2022. https://doi.org/10.1007/s10606-022-09429-4

[59] P. Ross and M. Blumenstein, "Cloud computing: The nexus of strategy and technology," *Journal of Business Strategy*, vol. 34, no. 4, pp. 39–47, 2013. https://doi.org/10.1108/JBS-10-2012-0061

[60] V. Ghosh and N. Tripathi, "Cloud computing and e-HRM," in *e-HRM*, 2018, pp. 106–122. https://doi.org/10.4324/9781315172729-7

[61] R. Sanjeev and N. S. Natrajan, "An empirical research on the role of cloud-based HRIS & HRM functions in organizational performance," in *Decision Analytics Applications in Industry*, P. K. Kapur, G. Singh, Y. S. Klochkov, and U. Kumar, Eds., Singapore: Springer Nature, 2020, pp. 21–35. https://doi.org/10.1007/978-981-15-3643-4_3

[62] Deloitte, "HR in the Cloud: It's inevitable," 2011. [Online]. Available: http://www.deloitte.com/assets/DcomUnitedStates/Local%20Assets/Documents/us_consulting_HCTrends_HRintheClouds_060611.pdf

[63] M. Laurano, "Three reasons to move your HR to the cloud. Analyst Insight by Aberdeen Group (white paper)," 2014. Retrieved from http://aberdeen.com/research/8816/ai-cloud-human-resources/content.aspx

[64] D. Rader, "How cloud computing maximizes growth opportunities for a firm challenging established rivals," *Strategy & Leadership*, vol. 40, no. 3, pp. 36–43, 2012. https://doi.org/10.1108/10878571211221202

[65] M. Andoni *et al.*, "Blockchain technology in the energy sector: A systematic review of challenges and opportunities," *Renewable and Sustainable Energy Reviews*, vol. 100, pp. 143–174, 2019. https://doi.org/10.1016/j.rser.2018.10.014

[66] D. Efanov and P. Roschin, "The all-pervasiveness of the blockchain technology," *Procedia Computer Science*, vol. 123, pp. 116–121, 2018. https://doi.org/10.1016/j.procs.2018.01.019

[67] H. Guo and X. Yu, "A survey on blockchain technology and its security," *Blockchain: Research and Applications*, vol. 3, no. 2, p. 100067, 2022. https://doi.org/10.1016/j.bcra.2022.100067

[68] R. Ramachandran, V. Babu, and V. P. Murugesan, "The role of blockchain technology in the process of decision-making in human resource management: A review and future research agenda," *Business Process Management Journal*, vol. 29, no. 1, pp. 116–139, 2023. https://doi.org/10.1108/BPMJ-07-2022-0351

[69] O. Fachrunnisa and F. K. Hussain, "Blockchain-based human resource management practices for mitigating skills and competencies gap in workforce," *International Journal of Engineering Business Management*, vol. 12, 2020. https://doi.org/10.1177/1847979020966400

[70] A. Spence, "Blockchain and chief human resource officer," Blockchain Research Institute, Mountain View, California, 2018.

[71] S. Mire, "Blockchain market map: Human resources," 2018.

[72] S. Garg, S. Sinha, A. K. Kar, and M. Mani, "A review of machine learning applications in human resource management," *International Journal of Productivity and Performance Management*, vol. 71, no. 5, pp. 1590–1610, 2022. https://doi.org/10.1108/IJPPM-08-2020-0427

[73] H. Zhu, "Research on human resource recommendation algorithm based on machine learning," *Scientific Programming*, vol. 2021, no. 1, p. 8387277, 2021. https://doi.org/10.1155/2021/8387277

[74] S. Achchab and Y. K. Temsamani, "Use of artificial intelligence in human resource management: 'Application of machine learning algorithms to an intelligent recruitment system,'" in *Advances in Deep Learning, Artificial Intelligence and Robotics*, L. Troiano et al., Eds., vol. 249, Charm: Springer, 2022, pp. 203–215. https://doi.org/10.1007/978-3-030-85365-5_20

[75] Q. Xie, "Machine learning in human resource system of intelligent manufacturing industry," *Enterprise Information Systems*, vol. 16, no. 2, pp. 264–284, 2022. https://doi.org/10.1080/17517575.2019.1710862

[76] A. Azadeh and M. Zarrin, "An intelligent framework for productivity assessment and analysis of human resource from resilience engineering, motivational factors, HSE and ergonomics perspectives," *Safety Science*, vol. 89, pp. 55–71, 2016. https://doi.org/10.1016/j.ssci.2016.06.001

[77] A. L'heureux, K. Grolinger, H. F. Elyamany, and M. A. Capretz, "Machine learning with big data: Challenges and approaches," *IEEE Access*, vol. 5, pp. 7776–7797, 2017. https://doi.org/10.1109/ACCESS.2017.2696365

[78] J. Vassilopoulou, O. Kyriakidou, M. F. Ozbilgin, and D. Groutsis, "Scientism as illusio in HR algorithms: Towards a framework for algorithmic hygiene for bias proofing," *Human Resource Management Journal*, vol. 34, no. 2, pp. 311–325, 2024. https://doi.org/10.1111/1748-8583.12430

[79] E. Walkowiak, "Digitalization and inclusiveness of HRM practices: The example of neurodiversity initiatives," *Human Resource Management Journal*, vol. 34, no. 3, pp. 578–598, 2023. https://doi.org/10.1111/1748-8583.12499

[80] E. K. Kelan, "Algorithmic inclusion: Shaping the predictive algorithms of artificial intelligence in hiring," *Human Resource Management Journal*, vol. 34, no. 3, pp. 694–707, 2023. https://doi.org/10.1111/1748-8583.12511

[81] P. Mongeon and A. Paul-Hus, "The journal coverage of Web of Science and Scopus: A comparative analysis," *Scientometrics*, vol. 106, pp. 213–228, 2016. https://doi.org/10.1007/s11192-015-1765-5

7 AUTHORS

Asokan Vasudevan is a Professor at the Faculty of Business and Communications, INTI International University, Nilai, Negeri Sembilan, Malaysia. He also serves as a Research Fellow at Wekerle Business School, Budapest, Jázmin u. 10, 1083 Hungary (E-mail: asokan.vasudevan@newinti.edu.my).

Packiyanathan Mathushan is with the University of Vavuniya, Pampaimadu, Vavuniya. Sri Lanka (E-mail: mathush92@gmail.com).

Navaneethakrishnan Kengatharan is with the Faculty of Management Studies and Commerce, University of Jaffna, Jaffna. Sri Lanka (E-mail: kenga@univ.jfn.ac.lk).

Yogarajah Nanthagopan is with the University of Vavuniya, Pampaimadu, Vavuniya. Sri Lanka (E-mail: ynanthagopan@vau.ac.lk).

Arya Kumar is an Assistant Professor (II) at the Department of Commerce, KIIT University, Patia, Bhubaneswar - 751 024, Odisha, India (E-mail: arya.kumarfcm@kiit.ac.in).