

The impact of technological developments on the changing role of HR(M): A scoping review and research agenda[☆]

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ABSTRACT

Due to technological developments, jobs disappear, new jobs arise, and existing jobs change. This leads to opportunities and challenges regarding human resource management (HRM) and the role of the HR function in the future of work. In this article, we explore how technological developments such as the use of smart technologies, artificial intelligence (AI), and robotics influence HRM and the role of the HR function. Through a scoping review, we highlight the influence of technological developments across macro (societal), meso (organization/HRM) and micro (individual workers) level work themes. We specifically focus on the dynamic interplay between technological developments and HRM. At the meso level, the analysis zooms in on how technological developments influence HRM at the strategic, tactical, and operational levels within organizational contexts. Our findings inform a future research agenda comprising avenues aimed at deepening our understanding of the challenges and opportunities associated with technological change in the context of HRM. More specifically, we propose future research to explore how the HR function can prepare the organization, itself, and other stakeholders, including line managers and workers, for the impact of technological developments to enhance HRM for the greater good.

1. Introduction

Work in modern economy is continuously shaped by technological developments, which transform how work is structured, performed, and managed (Kim et al., 2021; Mukhuty et al., 2022). Innovations in (digital) technologies and automation enable remote work, reducing dependence on specific locations, and allowing greater flexibility in where and how individuals work (e.g., Cahyadi & Magda, 2021). These technological shifts influence organizational processes, redefine workflows, communication, and productivity, while shaping the roles and expectations of workers (e.g., Kholod et al., 2021; Malik et al., 2022; Narzary et al., 2025). As a result, human resource (HR) professionals must proactively adapt strategies, equipping both employees and organizations to navigate and leverage ongoing technological developments (e.g., Alexandro, 2025; Mukhuty et al., 2022; Stein & Scholz, 2020).

Issues arising from technological developments are intricately connected to how organizations shape human resource management (HRM) policies and practices, which position HR professionals at the center of managing this impact (Mukhuty et al., 2022; Parker &

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Grote, 2022; Stein & Scholz, 2020). Leveraging opportunities and being able to continue to operate in an increasingly unpredictable context requires a proactive, strategic perspective from the HR function (Nankervis et al., 2021; Van den Berg et al., 2020). Although scholars have emphasized the importance of considering external and internal organizational context, much research has focused narrowly on internal processes (Narzary et al., 2025). For example, studies have examined specific aspects, such as algorithmic control mechanisms (Keegan & Meijerink, 2023), technology's impact on leadership (Avwokeni, 2026), artificial intelligence (AI) in recruitment and selection (Clavel et al., 2025), human-robot collaboration (Sadangharn, 2022), and machine learning and human-decision making (Balasubramanian et al., 2022). While this body of work provides in-depth insights into specific technological developments and HRM, the literature remains fragmented (Kim et al., 2021), leaving a comprehensive, multilevel understanding of technological impacts on HRM largely absent (Lewis et al., 2019).

In response to these calls, the specific research question the present study seeks to answer is as follows: *How do technological developments influence HRM and how do these developments reshape HRM and the role of the HR function?* By means of a scoping review of empirical articles (cf. Arksey & O'Malley, 2005), we provide a holistic overview of how technological developments are translated into macro (societal), meso (organization/HRM), and micro (individual workers) levels. We particularly elaborate on the meso level wherein we explore how technological developments transform HRM strategically, tactically, and operationally within organizations. The meso level serves as a link between the external context and individual behaviors in organizations, providing insights into how technology is embedded within organizations. By providing an overview of how technological developments shape HRM across levels, this study maps the current state of literature on HRM and technology. We herewith identify gaps in the literature and offer directions for future research, focusing on technological developments and the role of the HR function in improving employment (Biron et al., 2021; Cooke, 2025; Shipton et al., 2024).

This study builds on and contributes to the literature on HRM and technology in several ways. First, rather than focusing on single technological artifacts such as e-HRM, AI, or HR analytics as examples, we trace the broader development of research on technology and HRM, covering a wide range of technologies that have emerged in organizational contexts in recent years (cf. Kim et al., 2021). Secondly, we identify the influence of technology on HRM at the macro (societal), meso (organizational/HRM), and micro (individual workers) levels (Mukhty et al., 2022; Parker & Grote, 2022). Third, we zoom in on the meso, i.e., organizational level by addressing the divergence in how technology influences HRM across multiple organizational levels by examining strategic, tactical, and operational dimensions within organizations, given that HRM is multilevel in nature (Renkema et al., 2017; Van Beurden et al., 2025).

This paper proceeds as follows. First, the theoretical background is discussed, wherein macro, meso (i.e., strategic, tactical, and operational), and micro levels of HRM and technological developments are defined. Next, the applied search and inclusion strategy of our scoping review is outlined, after which the main findings are presented. Finally, the discussion and proposed future research agenda are outlined, integrating theoretical reflections and implications for advancing the understanding of technological developments and HRM.

2. Theoretical framework

2.1. Macro, meso, and micro levels of HRM and technological developments

At the macro level, HRM is shaped by external forces such as technological change, economic conditions, and institutional frameworks that influence how organizations manage people and work. This level encompasses the broader national and international environment that defines labor market dynamics, skills demand, and regulatory systems (Donnelly & Hughes, 2023). Ultimately, the macro level highlights how technological development interacts with societal and institutional forces to define HRM priorities (Biron et al., 2021).

At the meso level, HRM focuses on how organizations internally respond to technological change through their structures, strategies, and HR policies. This level reflects the organizational context in which technological developments are managed through the integration of HR systems and processes (Iqbal et al., 2020; Li et al., 2025). Within this context, a distinction can be made between strategic, tactical, and operational levels, recognizing that HRM is multilevel in nature (Jackson et al., 2014; Renkema et al., 2017). Specifically, the *strategic HRM* level refers to the integration of HRM into the strategic management processes in organizations. At this level, HRM plays a crucial role in shaping and supporting the HR policies and alignment with the organizational objectives (Bilušić & Vokić, 2025; Paauwe & Boon, 2018; Wright & Boswell, 2002). For example, the management of changes in organizational structure resulting from technological developments, or the management of the impact of technological developments on organizational culture (e.g., Iqbal et al., 2020; Li et al., 2025).

Tactical HRM operates at the interface between strategic intent and operational execution, translating strategic objectives into concrete HR policies and practices (Collings et al., 2021). It also encompasses the role of HR and line managers in implementing and interpreting these policies within the organization, thereby shaping how intended HR practices are realized in practice (Wright & Nishii, 2013). Variations between intended and implemented HR practices can emerge as line managers provide directions in adapting HR policies to local conditions (Kehoe & Han, 2019). Line managers are therefore considered the central actors that translate the designed HR policies to the employees in this implementation process of HR practices, in which leadership, communication, and personal values are determined as crucial elements (Den Hartog et al., 2013). Examples are related to managers' perceptions and view on technological innovation, managing algorithmic-based HR decision-making to monitor employees (Gieselmann et al., 2025), and remote working (Galanti et al., 2023).

Operational HRM concerns the day-to-day execution of HR practices and functional tasks, ensuring that HR policies and practices are enacted and perceived by employees (Keegan et al., 2018; Wright & Boswell, 2002). Examples are the use of technological

developments in recruitment and selection (Choudhari et al., 2025), digital onboarding (Sani et al., 2023), and HR shared service operations (Figueiredo & Pinto, 2021). In the context of technological developments and HRM, all three levels are critical. Particularly, the effective integration and alignment between these three levels enhance organizational adaptability and organizational effectiveness (Huselid & Becker, 2011). For instance, decisions on the strategic level in organizations influence the policies and practices implemented at the tactical level, and how they are operationalized and experienced by workers.

Finally, at the micro level, the integration of technology into HRM reshapes the employment relationship by influencing how employees, for example, experience control, autonomy, and trust within the workplace (Guest, 2017). Drawing from literature on employment relationships, we argue that HRM and technology redefine psychological contracts by altering expectations about, for example, privacy, feedback and recognition (Budd & Bhawe, 2019; Guest, 2017). Thus, technology in HRM affects the quality and nature of the employment relationship, requiring the HR function to balance organizational goals with the human needs for dignity and agency (Budd & Bhawe, 2019).

3. Method

To answer the research question, a scoping review was conducted to examine how macro-level technological developments impact organizations (meso level) and individual workers (micro level). In addition, we explored how these technological developments are translated into HRM at the strategic, tactical, and operational levels (Jackson et al., 2014; Wright & Boswell, 2002). A scoping review entails the creation of a broad overview of “the key concepts underpinning a research area and the main sources and types of evidence available” (Arksey & O'Malley, 2005, p. 21) and is most appropriate when the existing literature has a heterogeneous nature and consists of a broad range of topics (Pham et al., 2014). With this approach, we aim to provide a descriptive overview by mapping the most recent knowledge on technological developments and their impact on organizations, HRM, and individual workers, and by outlining avenues for future research based on the existing literature (Arksey & O'Malley, 2005; Pham et al., 2014). Our scoping review draws on studies published between 2019 and 2025, reflecting our focus on contemporary developments at the intersection of technology, work, organizations, and HRM. Building on Kim et al. (2021), who conducted an evolutionary review of HRM and technology literature from 1961 to 2019, our scoping review follows the PRISMA-ScR guidelines (Tricco et al., 2018) and applies the five-staged iterative process outlined by Arksey and O'Malley (2005), which we discuss below.

3.1. Identifying the research question

First, we identified the research question as the central focus of our scoping review: *How do technological developments influence HRM and how do these developments reshape HRM and the role of the HR function?* In our research question, the two central topics are ‘technological developments’ and ‘HRM’. To prepare our search strategy, we consulted an information specialist affiliated with the University’s library, conducted trial searches in September 2025, and organized an expert consultation session with six scholars who are experts on the topic of technology and HRM. The purpose of these consultations was to identify the appropriateness of our scoping review, refine our search strategy, and gain expert insights on the topic of technological impact on HRM. Based on the information sessions, we have included an additional search term (i.e., STARA) in our search string, and we received advice on the execution of our literature search and the application of the tool ASReview.

3.2. Identifying relevant studies

To search for literature addressing our research question, we used an extensive search string by combining search terms related to ‘technology’ (e.g., technological development, Information Technology, and Robot) and HRM (e.g., Human Resource Management, E-HRM, and workforce management). Boolean operators ‘AND’ and ‘OR’ were used to combine search terms, and the truncation symbol (*) was applied to capture different word forms. The full search string can be found in Appendix I. We performed the search in the electronic platform Web of Science (WoS), which is considered “the most comprehensive and frequently used database in business and management” (Bauwens & Cortellazzo, 2025, p. 3). The use of WoS as a single platform suits the aim of our scoping review, which was to identify key themes rather than achieving exhaustive coverage of all data sources. By using WoS as our search platform, we were able to strengthen the transparency and replicability of our search strategy (Haddaway et al., 2022). Furthermore, following the research approach of Bauwens and Batistič (2025) and Bauwens and Cortellazzo (2025), we selected WoS as this platform is known for its stringent indexing standards and strong representation of high-impact and peer-reviewed journals. In addition, WoS has a multi-disciplinary and wide-ranging coverage of research on technology, business, and management disciplines which is the central focus of our scoping review.

In WoS, we applied the following filters: we included articles that were peer-reviewed, in English, and included early access references that included the search terms in the title and/or abstract and were published in the period 2019–2025, given our focus on recent developments in the field and building on extant literature (Kim et al., 2021). To ensure we incorporated articles from different literature streams, we also filtered for 17 categories in WoS (see Appendix II for the search strategy), and no pre-selection for journals was done. The initial search provided 2,353 articles on October 2, 2025.

3.3. Study selection

To select relevant articles, we used ASReview (Van de Schoot et al., 2021), a software tool that supports the initial screening of titles

and abstracts (cf. [Bauwens & Cortellazzo, 2025](#)). First, all identified articles ($n = 2,353$) were imported in the ASReview tool. Second, to train the ASReview tool, we configured that 10% of the articles ($n = 235$) had to be evaluated and that minimal 1% of the total number of articles had to be labeled as irrelevant for our scoping review. Third, in the step of training ASReview, the tool presented us with titles and abstracts of the articles in the dataset, which we then evaluated as relevant for our scoping review (i.e., YES) or irrelevant (i.e., NO). Based on this assessment, the ASReview tool learned to distinguish between relevant and irrelevant articles and subsequently ranked all articles in the dataset from most to least likely to be relevant for our scoping review. Fourth, ASReview generated an Excel file in which all articles from the dataset were presented and ranked based on their estimated relevance to our scoping review. For each of the articles, its metadata (i.e., type of reference, title, author(s), DOI, keywords, year of publication, and other publication information) was provided. The database contained, among other details, the type of reference, full abstract, authors, key words, publication year, and title, and was exported to a Microsoft Excel file. This allowed us to efficiently exclude literature based on the following criteria: (1) duplicates, (2) sources such as books, book chapters, book reviews, and editorials, and (3) review articles, conceptual studies, and introductions to special issues. Only empirical studies were included in our review to ensure that our synthesis reflects the scope and nature of original research on technological development and HRM. After identifying relevant studies, we studied the articles by screening the title and abstract, and, in case relevant for our present study, we read the full paper ([Arksey & O'Malley, 2005](#)). An article was deemed relevant when the study addressed the topic of technological development in combination with work, organizations, and HRM. If an article was unrelated to these themes, it was excluded. This resulted in a final set of 584 articles published between 2019 and 2025. The PRISMA chart is presented in [Fig. 1](#).

3.4. Charting the data

Once the studies were selected, the literature was chartered following the framework of [Arksey and O'Malley \(2005\)](#). In the process of coding the included articles, two authors were in the lead and collaborated closely. More specifically, these authors independently coded the articles in the shared Excel file and subsequently cross-checked each other's coding, guided by the data charting form which was developed a priori (see the data charting form in Appendix III). Any discrepancies, doubts or ambiguities were resolved through



Fig. 1. PRISMA chart of the search and selection procedure.

discussion to reach consensus on the final coding. Because this collaborative approach involves interdependent rather than independent coders, calculating interrater reliability was not necessary (O'Connor & Joffe, 2020). Each study was classified according to its analytical level (macro, meso, and/or micro). The macro level captured technological developments shaping the labor market or broader organizational context. The meso level concerned organizational HRM responses to these developments, whereas the micro level focused on individual-level implications. Studies identified at the meso level were further categorized as strategic, tactical, or operational in focus. Most studies addressed the macro level in combination with either the meso or micro level. A few included all three levels in their study (e.g., Hannig et al., 2025; Herrera-Ballesteros et al., 2025; Nørskov et al., 2022; Sweiss & Yamin, 2024; Tandon et al., 2025). The central themes that covered the macro, meso, and/or micro level in the specific study were coded (see example in Appendix IV).

3.5. Collating, summarizing and reporting the results

Finally, the insights from the selected literature were collated and synthesized, producing an integrated overview of key themes across the macro, meso, and micro levels and outlining a future research agenda (Arksey & O'Malley, 2005), which is presented in Fig. 2.

4. Findings of the scoping review

In the following sections, we discuss how macro level technological developments translate into meso level (organization/HRM), and micro level (individual workers) themes. From an HRM perspective, our primary focus lies at the meso level, where we examine how these technological developments create challenges and opportunities for the design and alignment of HRM across the strategic, tactical, and operational levels.

4.1. Macro level: technological developments affecting the labor market and the organizational context

The global economy, increasingly shaped by technological development and wherein technological developments become part of individuals' common life, is referred to as 'Industry 5.0' (Aydin et al., 2024; Erro-Garcés & Aramendia-Muneta, 2023). In the context of Industry 5.0, technological developments are considered instrumental for obtaining organizational objectives while putting people and their work central in organizational contexts (Salvadorinho et al., 2024). According to the studies included in our scoping review, technological developments can roughly be categorized into digitalization (e.g., big data, gamification, metaverse, social media, cloud technology, and blockchain technology) (e.g., Mishra & Venkatesan, 2021; Stacho et al., 2022), robotics (e.g., robotic process automation, wearable robots, and service robots) (e.g., Erro-Garcés & Aramendia-Muneta, 2023; Zhang et al., 2023), and automation (e.g., chatbots, machine learning, cognitive computing technology) (e.g., Rukadikar & Khandelwal, 2024).

These technological developments generate both positive and negative effects on the labor market and the broader organizational context. Technological developments can yield positive labor market outcomes by enhancing employment and income levels (Sarabdeen & Alofaysan, 2023; Yuan et al., 2023; Zhu et al., 2024), and by mitigating labor shortages (Popescu et al., 2023), through productivity gains associated with human augmentation (e.g., Gómez Gandía et al., 2024; Zhang et al., 2023). These advances, in turn, may foster greater organizational effectiveness (e.g., Stacho et al., 2022; Wahyuningtyas et al., 2023), support organizations to take on their corporate social responsibility task (Zeshan et al., 2025), and strengthen countries' overall competitiveness (e.g., Gjika & Pano, 2023; Sotnikova et al., 2020). Conversely, technological change may contribute to job displacement (Weber, 2023), and may erode the quality of work by diminishing workers' sense of meaning and purpose in their jobs (Sani et al., 2023). Since technological developments affect both existing jobs and emergence of new ones, employees must continuously develop new (digital) knowledge, skills, and competencies (e.g., Bukartaite & Hooper, 2023; Maisiri & Van Dyk, 2021).

Technological developments have not only a direct effect on quantity and quality of jobs, but they also change organizational structures. Digital transformation requires organizations to sense, seize, and reconfigure (Froehlich et al., 2025). This means that organizations have to anticipate and deal with global events such as the Covid-19 pandemic (e.g., Galanti et al., 2023; Gonçalves et al., 2021; Ortiz-Lozano et al., 2022), the rise of flexible labor via digital platforms and app-work (i.e., the utilization of applications on mobile devices to perform specific tasks locally) (e.g., Liu, De Winne, et al., 2025; Williams et al., 2023), and the growth of global and virtual collaboration for example via telework (e.g., Cahyadi & Magda, 2021).

Monitoring the potential positive as well as negative effects of technological developments on the organizational context, organizations itself, and individual workers asks for a human-centered view on technological developments (Dong et al., 2025; Salvadorinho et al., 2024), whereby organizations also adhere to decent work principles and work ethics. For example, AI-driven HRM systems might negatively affect employee wellbeing in terms of "erosion of interpersonal autonomy, surveillance-induced precarity, algorithmic bias dilemma, and personalized discontentment" (Zheng et al., 2025, p. 1). In addition, there lies a challenge in exploring how technology could be used to neutralize and prevent potential biases and stereotypes in human decision-making processes affecting, for example, neurodiverse employees (Walkowiak, 2024). In doing so, the organization safeguards the organizational integrity as well as the shadow side of technology on individual workers (Jiang et al., 2025; Walkowiak, 2024; Zheng et al., 2025).

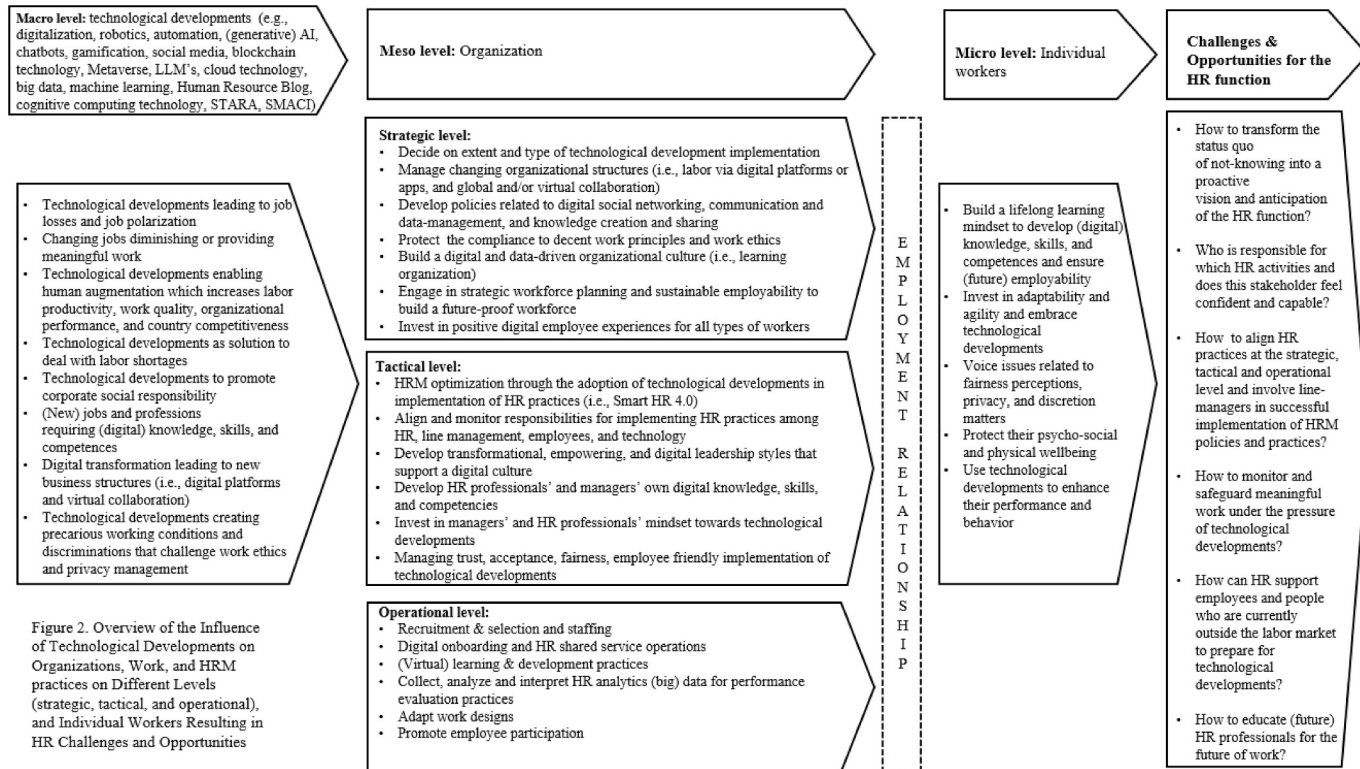


Fig. 2. Overview of the influence of technological developments on organizations, work and HRM practices on different levels (strategic, tactical, and operational), and individual workers resulting in HR challenges and opportunities.

4.2. Meso level: HRM at different levels in using technology in organizations and work

4.2.1. Strategic level

To understand how technological developments affect HRM, it is essential to understand the interrelationships between HRM at strategic, tactical, and operational levels. Although the value of employee participation in actively shaping technology in organizations has been acknowledged increasingly (e.g., Rubel et al., 2023), most decisions on the use of technology in organizations are predominantly made at a strategic level (e.g., Xu et al., 2020). From this point, the implications of such technological developments trickle down in the organization and implications for HRM on tactical, and operational levels arise. Consequently, the integration of technological developments requires careful alignment and interconnection of HRM on all three levels - strategic, tactical, and operational (Bilušić & Vokić, 2025).

The digital transformation of organizations often originates from strategic choices about the scope and depth of technological adoption (e.g., Xu et al., 2020). Such considerations are strategically driven by motives related to the extent to which technology can reduce personnel costs (Lai & Luo, 2022), enhance labor productivity (e.g., Ključnikov et al., 2023), and increase organizational competitiveness (e.g., Stacho et al., 2022; Wahyuningtyas et al., 2023). Especially for SME's, the selection of technology has become particularly relevant as they often have limited resources to purchase and implement technology (Kmecová et al., 2021).

Technological transformation involves organizational change, making the management of this change a crucial responsibility of HRM (Alexandro, 2025; Stehnei et al., 2025). Change management is therefore inevitable as technological transformation may substantially impact organizational structures. These technological developments have the potential to give rise to completely new types of businesses characterized by strategic flexibility. For example, a growing share of the workforce is engaged in flexible contracts or operates as independent workers via digital platforms (e.g., Buonocore et al., 2025), and app-work (e.g., Williams et al., 2023), which allows work to be shared and traded around the world and connects organizations and consumers through 'on-demand gig-workers' (e.g., Robinson et al., 2025; Swapna et al., 2023; Walldkirch et al., 2021). In this particular context, ethical and legal HRM responsibilities arise for managing the potential bias within algorithmic management via digital platforms (Williams et al., 2023), and managing the employment relationships with these flexible workers (Walldkirch et al., 2021). For example, Walldkirch et al. (2021) illustrated that a more bottom-up approach in designing and implementing HRM activities related to "access and mobility, training and development, scoring and feedback, appraisal and control, as well as platform literacy" (p. 2669) is necessary, which requires a different strategic HRM approach. Another example relates to technology enabling (global) virtual collaboration among employees (e.g., Ortiz-Lozano et al., 2022; Silue & Aguirre-Urreta, 2025), which leads to new forms of digital social networking (e.g., Nayak et al., 2022), communication and data management with internal and external stakeholders (Gouda & Tiwari, 2024; Newman & Gopalkrishnan, 2023; Pekkalä & Erkkilä, 2024), and knowledge creation and sharing via digital tools (Chin et al., 2023; Malik et al., 2024). These (digital) new ways of virtual and remote working have emerged rapidly due to the Covid-19 pandemic (e.g., Ortiz-Lozano et al., 2022). In response, organizations have been challenged to develop HR strategies related to flexible work arrangements and telecommuting from home (Herrera-Ballesteros et al., 2025), and protecting employees' privacy as technologies, for example in contact centers, could be used to "record, document and evaluate workers' calls, screens and keystrokes" (Doellgast et al., 2023, p. 107).

The use of technology for remote monitoring or using AI in HR-related decision-making has, in addition to challenges related to change management, raised concerns about privacy and discretion. As a result, organizations have to engage with other stakeholders such as unions and work councils to address the ethical implications of technology use (Doellgast et al., 2023). This phenomenon has become increasingly prevalent with the growing use of technology. Our review shows that in the past years scholars have examined the importance and impact of protecting compliance with decent work principles and ethics. More specifically, due to the integration of technology in work activities, providing meaningful work (Moulaï et al., 2022), and develop strategic policies about privacy management have become increasingly relevant, especially related to the use of Metaverse-meeting platforms, which is "an interconnected virtual universe where individuals engage in real-time interactions with one another using virtual entities, i.e., avatars" (Kumar et al., 2025, p. 770-771). Kumar et al. (2025) explain that in such virtual environments, it is an HRM responsibility to foster "employee engagement, collaboration, and training initiatives irrespective of geographical barriers" (p. 782).

Moreover, technological developments such as digitalization not only transform organizational ways of working and processes, but they also shape a more digital and data-driven organizational culture (e.g., Iqbal et al., 2020; Li et al., 2025). Organizations have to find a way to adapt to continuously and rapidly evolving technological developments necessitating to become a 'learning organization' (e.g., Alzadjali et al., 2023). Being a learning organization entails that organizations have to engage in strategic workforce planning and talent management (e.g., Bîrcă et al., 2025), to ensure that future proof knowledge, skills, and competencies are developed. Consequently, attracting and retaining employees is an important HRM theme (Martin, 2020; Santoso et al., 2021). In this way, digital and future proof skills and competencies as well as sustainable employability of the employees can be enhanced (Hizam et al., 2025; Ozkan-Ozen & Kazancoglu, 2022; Sharma et al., 2022).

In addition to using technology for strategic workforce planning, the impact of technological developments on inclusion and diversity management is key (e.g., Walkowiak, 2024), such as the impact of technological innovations on people with disabilities (e.g., Burnard et al., 2025), and managing generational differences when integrating technology in employees' work design (de Oliveira & de Barros Neto, 2022; Gupta et al., 2022; Mothe & Nguyen-Thi, 2021). Hence, strategically considering the digital employee experience of all types of employees within the organization is a crucial HRM subject (Gheidar & Shami Zanjani, 2021).

4.2.2. Tactical level

To translate strategic objectives into concrete HR policies and practices, e-HRM is increasingly used to optimize efficiency and effectiveness and achieve HR goals (Gouda & Tiwari, 2024; Sweiss & Yamin, 2024). This is also called Smart HR 4.0 which is defined as

practices derived from using advanced technologies such as AI, big data, and robotics for effectively managing employees and supporting data analysis for accurate decision-making processes (Pillai & Srivastava, 2024; Sithambaram & Tajudeen, 2023). Research highlights that successfully achieving organizational goals increasingly relies on shared responsibilities between HR professionals and (line) managers (Trullen et al., 2020). At the tactical level, this requires aligning and monitoring responsibilities for implementing HR practices among HR professionals, line management, employees, and technology (e.g., Dong et al., 2025; Gieselmann et al., 2025). The role of HRM appeared to be a key contingency in stimulating employee behavior in the context of technological innovation (Dong et al., 2025). For example, employees are required to engage in social networking and knowledge sharing through applications such as the "Human Resource Blog" (Mohiya, 2025), and to use self-service tools including chatbots in HR service operations as a form of employee empowerment (Newman & Gopalkrishnan, 2023; Sithambaram & Tajudeen, 2023).

When implementing HR policies in the context of Industry 5.0, the literature shows that managers are required to develop a transformational and empowering leadership style that supports being a learning organization encompassing strengthening an organizational culture that embraces technological developments (e.g., Zahrani, 2024). In addition, as virtual collaboration has emerged, managers have to engage in digital leadership practices (Awokeni, 2026) – also known as e-leadership or virtual leadership (Cahyadi & Magda, 2021) – by means of using technology to support, manage and motivate employees (Yoo et al., 2025). To ensure that leaders have the digital capabilities to take on these responsibilities, it is crucial to enhance a digital supportive culture and developing a long-term plan for supporting digital leaders (Yoo et al., 2025).

In order to effectively prepare employees for technological developments, it is a necessary HRM responsibility that line managers are aware of the urgency to develop digital knowledge, skills and competencies themselves (e.g., Cahyadi & Magda, 2021; Mutsuddi & Sinha, 2022), as well as a digital mindset to accept the integration of technology in their work context (e.g., Gieselmann et al., 2025; Radonjić et al., 2024). Their level of technological acceptance influences their managerial capabilities to manage employees' trust (e.g., Sweiss & Yamin, 2024), technology acceptance (Nyamubarwa & Chipunza, 2021), as well as their ability to implement technology in an employee friendly manner (Mo et al., 2025; Werens & von Garrel, 2023).

4.2.3. Operational level

The use of technological developments affects the "entire life cycle" of employees in an organization (Kholod et al., 2021, p.1). This means that at the operational level, technology has an impact on the execution of day-to-day HR practices and functional tasks. In line with Waldkirch et al. (2021), we identified HR policies and practices that could fit in three key areas which are people flow, appraisal and rewards, and practices that belong to employment relations (Bamberger et al., 2014).

People flow refers to how workers enter, move around, and leave organizations (Bamberger et al., 2014), and entails HR practices such as recruitment and selection (e.g., Zhang, 2025), internal staffing (e.g., Rogiers et al., 2020), onboarding (e.g., Sani et al., 2023), the use of shared service centers (e.g., Sithambaram & Tajudeen, 2023), learning and development (e.g., Sharma et al., 2022), and terminating employment (e.g., Figueiredo & Pinto, 2021). First, new technologies are used to recruit and select employees. For example, asynchronous video interviews (i.e., recorded interviews) have become a more common tool for recruiting employees (İlhan et al., 2025), as well as using "AI-job interviewers" whereby wherein virtual agents conduct the job interview with the applicant via an online platform and support managers in candidate selection (Clavel et al., 2025, p. 206). Using technological developments in recruitment and selection practices leads to multiple advantages such as providing candidates to complete job interviews at their preferred time and location and improving process efficiency (e.g., İlhan et al., 2025). For example, by adopting applications that combine semantic technologies with augmented reality in Curriculum Vitae (CV) analysis, recruiters can scan efficiently the candidates' profiles and assess whether the candidates possess the right knowledge, skills and competencies in specialist functions that have become more complex and are outside the field of expertise of the recruiters (Pocatilu et al., 2020).

However, the benefits of technology in recruitment and selection practices can easily become drawbacks. While technology might eliminate human biases and strengthen equity and objectivity in recruitment and selection processes (e.g., Choudhary et al., 2025; İlhan et al., 2025; Nørskov et al., 2022), the human-technology interaction in digital selection tools might also lead to the exclusion of people with disabilities or neurodivergent candidates (e.g., Burnard et al., 2025). AI tools (e.g., machine learning) provide algorithm-generated recruitment predictions based on big data analyses, which might lead to ethical concerns related to fairness and discrimination and generate distrust in the reliability and accuracy of AI-based decisions (Ore & Sposato, 2022). After the hiring process, employees may engage in digital onboarding practices which were particularly established during the Covid-19 pandemic. Digital onboarding refers to using technology to effectively support new employees to acclimatize and integrate into the organization (Sani et al., 2023). Finally, HR shared service operations provide self-service assistance by means of Chatbots, for example, related to user-centered guidance in basic employees' questions and needs regarding policy, providing links and assistance in applying for leave and benefits (Sithambaram & Tajudeen, 2023).

Another HRM issue related to people flow relates to the support of employees in preparing for technological developments (Ratnam & Devi, 2024). By means of learning and development practices, organizations invest in the reskilling, upskilling, and deployment of employees (e.g., Ratnam & Devi, 2024). Reskilling and upskilling are crucial for bridging the gap between employees' current versus required skills as well as enabling employees to avoid being dismissed when their job potentially will be taken over by technology (Di Sabato & Savov, 2024). In terms of learning and development practices, the challenge is to stimulate employees' lifelong learning mindsets and overcoming barriers related to resistance to change and technology acceptance (e.g., Bukartaite & Hooper, 2023; Di Sabato & Savov, 2024). The latter has become increasingly important, as from our scoping review it appeared that technology is also commonly integrated to strengthen the efficiency and effectiveness of learning and development practices. Digital training and development enable employees to gain new knowledge and skills via online (e-)learning platforms, for example, by using business game stimulators (Val Núñez et al., 2024), virtual training sessions, and adaptive AI-driven learning systems that "personalize content

based on employee skill gaps and learning styles, ideally linked to immediate work outcomes" (Alexandro, 2025, p. 24).

Appraisal and rewards refer to how employee performance in organizations is evaluated and rewarded, as well as how these processes are communicated, typically via performance appraisal (Bamberger et al., 2014). Specifically, technological developments have changed the way in which employee data is collected, analyzed, and interpreted. For example, machine learning technology and mobile apps (i.e., mobile Human Resource Management app) are used to predict employees' behavior based on big data to support decisions on talent management, succession planning, and performance appraisals (Choi & Choi, 2021; Shankar & Nigam, 2022; Uppal et al., 2025). The use of such technological tools has grown with the emergence of new work arrangements such as labor via digital platforms (e.g., Uber and Upwork). Whereas traditionally, workers were assessed by managers, platform workers are much more often controlled and influenced by automated systems and customer reviews (e.g., Chen & Chen, 2025; Waldkirch et al., 2021). The integration of technology and involvement of other (external) actors changes HRM activities and responsibilities towards workers within and outside organizations (Waldkirch et al., 2021). Subsequently, the challenge of determining which new methods of appraising and rewarding are appropriate and monitor workers' perceptions and experiences of these new ways of appraising and rewarding is a key HRM topic shaped by technological developments.

Lastly, employment relations refer to the way work is designed and how employee participation can be ensured (Waldkirch et al., 2021). Whereas workers used to be responsible for all the tasks that belonged to their job, technological developments led to more collaboration with robots (e.g., Liu, Lin, et al., 2025), and the digitalization or gamification of certain tasks (Benitez et al., 2022; Li et al., 2025). These technological advancements bring multiple advantages. For example, intelligent machines have the potential to increase labor productivity (e.g., Ključnikov et al., 2023), collaborative robots (i.e., cobots) protect employee safety in manufacturing (Ribeiro et al., 2025), wearable exoskeleton robots diminished physical demands, for example, in the military training field (Zhang et al., 2023), robotic sensors enable real-time tracking of waste reduction in assembly lines stimulating "environmentally responsible employee behavior" (i.e., green HRM) (Tari & Nirmala, 2025, p. 1421; De et al., 2024), gamification positively affects employees' job satisfaction and engagement (Benitez et al., 2022), and chatbots strengthen employees' precision in health care services (e.g., Battisti et al., 2025). More specific for the latter, while such technological tool facilitates efficient access to information for employees, it also enhances employees' effectiveness in providing care by promoting its interactivity, educational purposes and continuity as well as providing accessible and reliable information (Battisti et al., 2025). In contrast, the integration of technology in employees' daily work activities might also lead to job intensification (e.g., Peeters et al., 2025) and technostress defined as "the stress and strain individuals experience due to the introduction and ongoing evolution of technology in their work" (e.g., Li et al., 2025, p. 2), also among HR professionals and managers themselves (Camarena & Fusi, 2022; Florkowski, 2019). This brings us to the level of employee participation and involving employees so they can voice their needs and avoid negative feelings related to the implementation of technological developments in organizations (e.g., Jungst, 2023). Employee participation, which refers to the mechanisms supporting employee involvement directly or indirectly via representatives in organizational decision-making processes, appeared to positively affect the implementation of technological developments (Curzi & Ferrarini, 2024; Doellgast et al., 2023; Rubel et al., 2023). By involving employees in the transformation process, their readiness for change as well as their technology acceptance are fostered (e.g., Yıldırım Saatçi & Ovaci, 2022).

4.3. Micro level: consequences of technological developments in employee outcomes

Technological developments that influence organizations and impact the meso level also have profound implications for individual workers. With our scoping review, we identified five themes related to how technological developments (1) challenge employees to prepare for the future, (2) invite employees to embrace technology in their work context, (3) confront employees with ethical concerns related to their privacy and discretion, (4) affect the quality of employees' working life and wellbeing, and (5) affect employee behavior.

The integration of technology in the daily work of employees requires employees to develop a lifelong learning mindset (Bukartaite & Hooper, 2023), improve their technological awareness (e.g., Kong et al., 2021), and continuously develop (digital) knowledge, skills, and competence to ensure that they can perform their current jobs as well as ensure their future employability (e.g., Safrankova et al., 2020). Relatedly, to reskill and upskill, employees need to invest in their adaptability and agility (Hoang et al., 2025). They have to increase their openness to the digital transformation and embrace technology in the organizational context (e.g., Menshikova et al., 2025), as technology is not only integrated in their own daily work activities (e.g., Battisti et al., 2025), but also used in, for example, how they (virtually) collaborate with others (e.g., Liu & Wang, 2024), and how they are (digitally) managed and monitored (e.g., Doellgast et al., 2023). This forces employees to make actual use of technology and trust its effectiveness and outcomes (e.g., Sucharita & Roopalatha, 2025). The latter relates to the third consequence for employees, as the use of technological developments in various HR practices might harm workers' fairness perceptions, for example in recruitment and selection practices (e.g., Figueroa-Armijos et al., 2023), as well as privacy and discretion matter related to employee monitoring (Doellgast et al., 2023), and the use of service robots which might reveal users' personal information (e.g., Hannig et al., 2025).

Studies focusing on the impact of technological developments on the psycho-social and physical wellbeing of employees have shown that technology substantially affect the quality of employees' working life. For example, technology appeared to lead to technostress (e.g., Li et al., 2025), smart-working fatigue (e.g., Wohleber et al., 2019), work intensification (e.g., Rebelo et al., 2024), hyper-connectivity (e.g., Hu et al., 2024), and social marginalization and psycho-social alienation (Zheng et al., 2025). As a result, technological developments influence employee behavior. Our scoping review has identified several studies investigating the impact of technology on employees' digital performance (e.g., Wang et al., 2024), engagement (e.g., Divya et al., 2024), creativity (e.g., Sweiss & Yamin, 2024), innovative behavior (e.g., Du & Cai, 2025), and overall employees' smart experience (Noerman et al., 2025). The results

show that technology might have both positive and negative effects on such employee outcomes, implying that both workers, line management, and the HR function have a shared responsibility in using technology in the organization context.

4.4. Contextualizing the impact of technological developments on macro, meso, and micro levels

Technological developments are a global phenomenon that has an impact on countries, industries, organizations, and workers all around the globe. The way in which organizations, HRM, and employees are affected by technological developments is therefore influenced by the context wherein they operate. More specifically, from our scoping review it appeared that technological developments put developing countries with emerging economies, such as India (e.g., [Anam & Haque, 2023](#)), under pressure to keep up with the more developed countries ([Sotnikova et al., 2020](#)). The government can support countries by providing incentives and resources to help them prepare the workforce for the utilization of technology ([Beksultanova & Dzhankhotova, 2024](#)), which highlights the role of HRM to cooperate with other stakeholders even beyond organizational boundaries.

Furthermore, at the organizational level, our scoping review showed that the size and structure of an organization have an impact on the challenges that organizations have to cope with. For example, while multinational companies operating in multicultural contexts have to consider the impact of virtual work settings and differences in employee experiences ([Javali et al., 2025](#)), SME's are challenged with their lack of (financial) resources and have to carefully consider in which technology they want to invest and how the implementation of such technology might influence their personnel costs and employee behavior (e.g., [Kmecová et al., 2021](#)). These organizational differences affect the need for HR practices on the strategic, tactical, and operational level.

Another contextual factor that influences the impact of HRM, technological developments, and individual workers is industrial differences. From our scoping review, it appears that the way technology is used in the organizational context depends on the work that is performed within the organization. For example, in industries where work is mostly physically demanding, technologies are implemented such as wearable exoskeleton robots ([Zhang et al., 2023](#)), and robot-assisted surgery technology ([Wei et al., 2025](#)). Whereas in organizations specializing in, for example, banking, corporate services, and hospitality, other technologies are more commonly implemented, such as blockchain technology (e.g., [Kuchciak & Warwas, 2021](#)), conversational agents (i.e., chatbots) ([Battisti et al., 2025](#)), and service robots ([Liu, Lin, et al., 2025](#)).

Hence, these examples show that the impact of technological development is substantially determined by the context in which organizations, HRM, and the workforces operate. To conclude, there is no one-size-fits-all approach regarding the implementation of technological developments in work contexts and HRM plays a crucial role in aligning the use of technology with country and organizational objectives, as well as the workforce's work experiences within the larger context. [Fig. 2](#) presents a summary of the influence of technological developments on organizations, HRM at different levels (i.e., strategic, tactical, and operational), and individual workers resulting in challenges and opportunities for HRM.

5. Discussion

Through a scoping review, this research aimed to answer the question of how technological developments influence HRM and reshape the role of the HR function. The findings provide a holistic overview of key topics related to the role of HRM at strategic, tactical, and operational levels. By mapping these insights, we identified several research gaps within the literature studied.

The findings from our scoping review showed that to capitalize on the challenges and opportunities presented by technological developments, a proactive approach from the HR function across various organizational levels is essential ([Nankervis et al., 2021](#)). However, most existing studies have focused on the impact of technological developments on organizational structures and performances (e.g., [Froehlich et al., 2025](#); [Stacho et al., 2022](#); [Wahyuningtyas et al., 2023](#)) as well as employee experiences and outcomes (e.g., [Li et al., 2025](#); [Noerman et al., 2025](#); [Rebelo et al., 2024](#)). In contrast, there are only few studies that have examined the view, perceptions, and experiences of the HR function and manager with regard to technological developments in the organizational context ([Camarena & Fusi, 2022](#); [Florkowski, 2019](#); [Nayak et al., 2025](#)). There seem to be less insight into the HR functions' perspective on the implementation of technological developments in their work context, except from, for example, the study of [Nayak et al. \(2025\)](#) who found that using technology in remote work arrangements led to technostress among HR professionals in terms of increased role overload and role invasion which affected their work engagement, work-life balance, wellbeing, and performance.

In addition, although HR professionals acknowledge the value of technology, as it can improve the efficiency and streamlining of tasks, they also remain cautious and express concerns about its use and potential outcomes of using such tools, for example, in terms of AI-based tools in recruitment and selection practices ([Ore & Sposato, 2022](#)), and algorithmic decision-making processes ([Tandon et al., 2025](#)). As a result, HR professionals might experience resistance towards the actual use of technology in managing employees at a tactical level and implementing HR practices ([Charlwood & Guenole, 2022](#)). To strengthen the HR professionals' acceptance of technology in their work context, it is necessary that the HR function is equipped with sufficient (digital) knowledge, skills, and competencies to effectively use technology in their own work activities ([Nankervis et al., 2021](#)). Furthermore, it could be expected that involvement of the HR function in developing and training technological tools diminish their distrust in the outcomes, as training the datasets used by AI-tools is a critical component that determines the quality of the tool outcomes ([Özer et al., 2024](#)). However, HR professionals need to remain critical of potential biases, stereotypes, ethical values, and social norms ([Özer et al., 2024](#)). Concluding, more insight in how to ensure an optimal balance in the human-technology interaction in the implementation of HR practices will advance our understanding on how the HR professionals' acceptance of technology in their work context can be fostered ([Choudhary et al., 2025](#); [Ore & Sposato, 2022](#); [Radonjić et al., 2024](#)).

Furthermore, our findings showed that the implementation of technology has both positive and negative outcomes on the

organizational and employee level. While technology may enhance labor productivity and organizational competitiveness through human augmentation (e.g., Zhang et al., 2023), it also raises concerns related to amongst other biases in decision-making processes (e.g., Todolf-Signes, 2019), harming employees' human rights (Oravec, 2022), and the psycho-social and physical wellbeing of employees (e.g., Wohleber et al., 2019; Zheng et al., 2025). To mitigate ethical concerns and protect the wellbeing of employees in working with technological advancements, both the HR function and line management as well as individual workers have a shared responsibility (Bamel et al., 2022). HR professionals and managers must consider whether the starting point of integrating technology in the organizational context lies on the strategic organizational level forcing employees to adapt to the use of technology (Malik et al., 2021), or whether employee participation is stimulated in the implementation of technology in their work context (Curzi & Ferrarini, 2024). From the employee perspective, employees are required to act proactively and voice their feelings in case of reduced feelings of well-being and inclusion to ensure that line-management and the HR function can support the employees in guaranteeing high quality of work, for example via workers representatives (e.g., Doellgast et al., 2023). Both perspectives call for human-centered HRM in the implementation of technological developments in organizational context (Cherep et al., 2022; Salvadorinho et al., 2024), which encompasses that the individuals in the organization are considered top priority through "intellectual strength, empathy, humanity, and inclusiveness" (Cooke, 2025, p. 1395).

Another prevalent finding from our scoping review is that most studies have explored the impact of technological developments at the macro level in relation to either the meso or micro level themes. Only a few studies included in our scoping review addressed all three levels in their study (e.g., Hannig et al., 2025; Herrera-Ballesteros et al., 2025; Nørskov et al., 2022; Sweiss & Yamin, 2024; Tandon et al., 2025). Studies focusing on one specific level contribute to more specific insights on a particular topic, however, the alignment between different levels appeared to be a crucial element in the implementation of technological development in organizational contexts as HRM is multilevel in nature (Jackson et al., 2014; Renkema et al., 2017).

6. A future research agenda

To serve as a steppingstone for future scholars, we identified several critical research avenues that warrant further exploration based on the findings of our scoping review. First, as organizations operate in an increasingly unpredictable context, the HR function must proactively claim their position at meso level (i.e., the strategic, tactical, and operational level) to prepare the organization, themselves, and individuals for the impact of technological developments (Trullen et al., 2024). The challenge is to transform the status quo of not-knowing which and how technologies will affect work and organization into a proactive vision to enhance organizational resilience. Studies could therefore examine how macro level developments are integrated and aligned across the strategic, tactical, and operational levels of HRM, specifically how strategic decisions about technology adoption at the top of organizational, are translated into concrete HR practices and employee experiences. Also, it is interesting to know more about how feedback from employees and line managers informs high-level technology strategies. Understanding these interconnections could reveal how misalignments between macro, meso, and micro levels hinder the effective realization of digital transformation goals, and how HR can act as a coordinating function to bridge these gaps. Consequently, a key question for future research is: how can HR professionals identify and anticipate technological developments in a timely matter, enabling them to translate these insights into concrete actions at the strategic, tactical, and operational level in organizations? Exploring this anticipatory role of HR involves exploring how HR could impact the development of technology. For example, research could explore how the HR function could take an active role in shaping technological tools that could support and stimulate individuals to invest in lifelong learning and enhance their position in the labor market or even enter the labor market for those who are currently outside the labor market (Davenport & Kirby, 2016; van Heijster et al., 2024).

Next to the crucial role of the HR professional across levels and building on the idea that HRM is multilevel in nature (Renkema et al., 2017), our findings emphasize the importance of integration and alignment between actions at the strategic, tactical, and operational level, independent from whose responsibility the actions are (Bilušić & Vokić, 2025). Due to the importance of the line managers in integrating and aligning HRM practices at the strategic, tactical, and operational level (e.g., Roodbari et al., 2025), the question arises: how to deal with the joint responsibility of the HR function and line managers in aligning HRM practices? (Erro-Garcés & Aramendia-Muneta, 2023). Line-managers play an important role in translating the intended practices developed by HR professionals to how workers experience and perceive these practices in the workplace (Den Hartog et al., 2013). However, it remains unclear how technological developments related to the identified themes at the strategic, tactical, and operational levels result in an integral and aligned HRM policy. Therefore, for future research, we recommend a more in-depth analysis on the current alignment between HR practices performed by HR function and/or line managers and explore how collaboration between both stakeholders could be optimized considering future technological developments (Roodbari et al., 2025). Such in-depth analysis might include a qualitative study exploring how the HR-function can support line management in developing transformational and empowering leadership styles, as well as the role of technological developments in this relationship (Bauwens et al., 2021). Empowering leadership will also benefit the employees' participation in actively shaping technology in organizations in interaction with the HR function (e.g., Vereycken et al., 2021).

From a broader stakeholder perspective, technological developments have given rise to, for example, platform-based work, transformed business structures, and introduced new HR systems. As a result, the use of HR algorithms has expanded, and a growing number of (external) stakeholders have become involved in HR activities (Keegan & Meijerink, 2023). This development requires the HR function to strategically determine which internal or external stakeholders are best suited to manage certain HR activities and design an optimal HR system wherein general HR values and principles are respected. To broaden the scope in future research by also including the context, in terms of country, industry, and organizational characteristics, in which technological developments take

place, we recommend future scholars to include the perspectives of HR professionals, line-managers as well as other stakeholders, such as CEO's, research & development professionals, information analysts, employees, unions, temporary work agencies, AI developers, and customers or clients (Dhanpat et al., 2020). This multi-stakeholder approach would provide a comprehensive understanding of the division of responsibilities in the continuous emerging technological developments (Keegan & Meijerink, 2023). A pertinent research question is: do these responsible stakeholders feel competent and confident in their roles? If not, what are the necessary steps to enable them to develop the skills required to support the organization and employees and prepare for technological developments, ensuring that opportunities are fully realized? (Wastell & Cooper, 2008)

Another future research area concerns the topic of human augmentation. Human augmentation represents a fundamentally different approach to the integration of new technologies (Davenport & Kirby, 2016), compared to when labor is being (partially) replaced by robots purely based on efficiency reasons. Human augmentation focuses on how work that is currently performed by humans could be deepened instead of diminished by using machines (Davenport & Kirby, 2016). In this perspective, smart machines complement human competencies, which improves the functioning of both parties involved. Human Augmentation takes into account valued HR principles of meaningful work, ensuring that new technology does not threaten, but rather stimulates perceptions of autonomy, relatedness and competence in the workplace (Ryan & Deci, 2000). Many automated, rule-based systems rule out these principles, leading to less meaningful work. For example, in logistics, where workers traditionally collaborated with colleagues, the increasing use of robots may lead to reduced social contact (Vega & Brennan, 2000). Additionally, the cooperation between humans and robots negatively affects workers' autonomy as robots often determine the working pace (Van den Groenendaal et al., 2020). Therefore, a more proactive strategic HR discussion regarding the potential positive as well as the negative effects of technology on work conditions is essential yet often underexplored in literature. Hence, the ethical question that is important here relates to who's responsibility it is to monitor and safeguard meaningful work under the pressure of technological developments (Meijerink et al., 2021).

Additionally, HR professionals will face opportunities to determine which types of work are acceptable to replace with technology and what tasks should remain human-driven (Rossato et al., 2021). Specifically, the HR function must ensure that individuals are both willing and able to perform their tasks, which most likely require new skills, knowledge, and competencies (Safrankova et al., 2020). Hence, the HR professionals will be responsible for preparing and engaging workers to adapt to technological developments (e.g., Van Vuuren et al., 2020). Related to the latter, HR professionals could also explore how technology provides opportunities for people who aspire to enter the labor market but are currently still unemployed (van Heijster et al., 2024). To effectively anticipate the emergence of new types of jobs and ensure that these jobs are performed successfully, the HR function deepens its understanding of the employees' psychological contract in relation to these changes (e.g., Jacobs et al., 2021). Building on more human-centered approaches to technology implementation in Industry 5.0, such as the techno-optimist and socio-technical perspective (Erro-Garcés & Aramendia-Muneta, 2023; Vereycken et al., 2021), we recommend that future research incorporates the employee perspective when designing HR practices at the strategic, tactical, and operational levels (Van Beurden et al., 2021; Wastell & Cooper, 2008).

Finally, related to the previous avenue for future research and building on the work of Corporaal et al. (2018) who address the responsibility of education programs and organizations to educate technical professionals, our findings highlight the need to educate HR professionals for the future work (Erro-Garcés & Aramendia-Muneta, 2023; Van Beurden et al., 2024). Specifically, we call for research to investigate how technological developments are currently integrated into higher HRM education programs. Research involving program directors and lectures to identify necessary adaptations and additions are needed to better equip future HR professionals to address challenges and capitalize on opportunities arising from technological development. Beyond the development of the future HR professional, more research on how the HR function could play a more proactive role in preparing individual employees to keep up with technological advancements in their current and future work is needed. As technological shifts may require workers to make frequent transitions between roles, HR professionals can play a key role in helping individuals to enter or proactively safeguard their position in the labor market (Hoang et al., 2025). Studies exploring how HR can best support individuals in adapting to these transitions would be an important avenue for future investigation (van Heijster et al., 2024).

7. Limitations

This study is not without limitations. First, our study concerns the reliance on WoS as a single platform, which, like any platform or database, is subject to inherent biases to language, regional representation, and disciplinary coverage (Bauwens & Batistič, 2025). Although limitations have been highlighted in previous studies (Asubiaro et al., 2024; Mongeon & Paul-Hus, 2016), more recent studies indicate that WoS has expanded its coverage to address some of these concerns and continues to be a leading source for review studies (e.g., Liu et al., 2024). Second, we applied category filters during the literature search to refine results. While we included as many relevant categories as possible, it remains possible that some pertinent studies were omitted due to categorization limitations within WoS. Third, our study primarily focuses on academic journal articles as we aimed to prevent an overcrowded pool of sources and maintain a manageable scope. While this approach ensures a high level of academic rigor, it may not fully reflect the most recent developments in the field, particularly in rapidly evolving fields such as technology and AI, and may have led to the exclusion of potentially relevant but non-peer reviewed material. Some recent innovations and trends may therefore not be captured in our analysis (Bauwens & Batistič, 2025). Future studies could include grey literature including conference proceedings to include recent developments (Xiao & Watson, 2019). A final limitation of this study relates to the broad and holistic nature of our scoping review. Although adopting a holistic perspective allowed us to map the HRM and technology field comprehensively, this approach inevitably limited the depth with which specific themes and individual studies could be analyzed (Xiao & Watson, 2019). Future systematic literature reviews focusing on one or more specific themes identified in this review may provide more nuanced and detailed insights

into these areas.

8. Conclusion

Technological developments such as AI, robotics, and smart technologies are reshaping work, organizations, and the role of HRM. This scoping review demonstrates that these developments influence HRM across strategic, tactical, and operational levels, creating both opportunities and challenges for organizations, workers, and society. Our analysis highlights that HRM is not merely affected by technological change but also plays a critical role in shaping how organizations respond to and govern these transformations. HR professionals play a critical role in preparing organizations, line managers, and employees for ongoing technological change while safeguarding employee well-being, inclusion, and sustainable work. By integrating insights across levels of analysis, this review contributes to a more holistic understanding of the future of HRM and offers a research agenda aimed at advancing responsible and human-centered approaches to work.

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Declaration of competing interest

The authors declare no conflict of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.hrmr.2026.101179>.

Data availability

Data will be made available on request.

References

- *Alexandro, R. (2025). Strategic human resource management in the digital economy era: An empirical study of challenges and opportunities among MSMEs and startups in Indonesia. *Cogent Business & Management*, 12(1), Article 2528436.
- *Alzadjali, A. H., Adedeji, M. J., & Adwan, O. M. J. (2023). Adopting a learning organization perspective for improving human resources service quality during digital transformation. *Journal of Chinese Human Resources Management*, 14(3), 18–35.
- Anam, & Haque, M. I. (2023). Behavioural intention of HR professionals to use HR analytics in the Indian context: An analysis using the UTAUT model. *International Journal of Indian Culture and Business Management*, 28(1), 101–123.
- Arksey, H., & O'Malley, L. (2005). Scoping studies: Towards a methodological framework. *International Journal of Social Research Methodology*, 8(1), 19–32.
- Asubiaro, T., Onaolapo, S., & Mills, D. (2024). Regional disparities in Web of Science and Scopus journal coverage. *Scientometrics*, 129(3), 1469–1491.
- *Awkokeni, A. J. (2026). Strategic leadership and transactional leadership: The mediating effect of digital leadership in the world of Industry 4.0. *Journal of Economic and Administrative Sciences*, 42(1), 52–67.
- *Aydin, E., Rahman, M., Bulut, C., & Biloslavo, R. (2024). Technological advancements and organizational discrimination: The dual impact of industry 5.0 on migrant workers. *Administrative Sciences*, 14(10), 240.
- Balasubramanian, N., Ye, Y., & Xu, M. (2022). Substituting human decision-making with machine learning: Implications for organizational learning. *Academy of Management Review*, 47(3), 448–465.
- Bamberger, P. A., Biron, M., & Meshoulam, I. (2014). *Human resource strategy: Formulation, implementation, and impact*. Routledge.
- Bamel, U., Kumar, S., Lim, W. M., Bamel, N., & Meyer, N. (2022). Managing the dark side of digitalization in the future of work: A fuzzy TISM approach. *Journal of Innovation & Knowledge*, 7(4), Article 100275.
- *Battisti, E. S., Roman, M. K., Bellei, E. A., Kirsten, V. R., De Marchi, A. C. B., & Leal, G. V. D. S. (2025). A virtual assistant for primary care's food and nutrition surveillance system: Development and validation study in Brazil. *Patient Education and Counseling*, 130, Article 108461.
- Bauwens, R., & Batistić, S. (2025). The present and future of artificial intelligence in people management research: A bibliometric approach. *BRQ Business Research Quarterly*, 28(4), 768–787.
- Bauwens, R., & Cortellazzo, L. (2025). The different faces of e-leadership: Six perspectives on leading in the era of digital technologies. *Human Resource Management Review*, 35(1), Article 101058.
- Bauwens, R., Denissen, M., Van Beurden, J., & Coun, M. (2021). Can leaders prevent technology from backfiring? Empowering leadership as a double-edged sword for technostress in care. *Frontiers in Psychology*, 12, 1–13.
- *Beksultanova, A., & Dzhanhotova, P. (2024). Personnel of digital transformation in agriculture. *Sociología y Tecnociencia: Revista Digital de Sociología del Sistema Tecnocientífico*, 14(1), 106–114.

- Benítez, J., Ruiz, L., & Popovic, A. (2022). Impact of mobile technology-enabled HR gamification on employee performance: An empirical investigation. *Information & Management*, 59(4), Article 103647.
- *Bilusić, M. R., & Vokić, N. P. (2025). Digitalization of HRM for strategic human resource management orientation—logistic regression and dominance analysis approach. *Strategic Management-International Journal of Strategic Management and Decision Support Systems in Strategic Management*, 30(1).
- *Bircă, A., Sandu, C. B., Gogu, E., & Matveiciuc, I. (2025). The assessment of employees' competences on the labour market in the context of the development of artificial intelligence systems. *Montenegrin Journal of Economics*, 21, 45–56.
- Biron, M., De Cieri, H., Fulmer, I., Lin, C. H. V., Mayrhofer, W., Nyfoudi, M., ... Sun, J. M. J. (2021). Structuring for innovative responses to human resource challenges: A skunk works approach. *Human Resource Management Review*, 31(2), Article 100768.
- Budd, J. W., & Bhawe, D. P. (2019). The employment relationship: Key elements, alternative frames of reference, and implications for HRM. *The SAGE handbook of Human Resource Management*, 41–64.
- *Bukartaite, R., & Hooper, D. (2023). Automation, AI, and future skills needs: An Irish perspective. *Articles*, 63.
- *Buonocore, F., de Gennaro, D., & Del Barone, L. (2025). Ethical and organizational dynamics of non-standard work in public administration: Challenges and opportunities in the digital era. *Personnel Review*, 54(7), 1688–1704.
- *Burnard, M. J., Ugalde, D., Bruk-Lee, V., Allen, K. S., Heron, L. M., & Gutierrez, S. L. (2025). Exploring the applicant reactions of autistic individuals to digital personnel selection instruments: A reflexive thematic analysis. *International Journal of Selection and Assessment*, 33(2), Article e70013.
- *Cahyadi, A., & Magda, R. (2021). Digital leadership in the economies of the G20 countries: A secondary research. *Economies*, 9(1), 32.
- *Camarena, L., & Fusi, F. (2022). Always connected: Technology use increases technostress among public managers. *The American Review of Public Administration*, 52(2), 154–168.
- Charlwood, A., & Guenole, N. (2022). Can HR adapt to the paradoxes of artificial intelligence? *Human Resource Management Journal*, 32(4), 729–742.
- *Chen, J., & Chen, M. (2025). Humanized algorithms matter! From enabling social exchange factors to building affective trust mechanism for facilitating gig workers' task performance. *Personnel Review*, 54(2), 636–659.
- Cherep, A., Voronkova, V., & Androsova, O. (2022). Transformational changes in organizational management and human resources in the digital age. *Baltic journal of economic studies*, 8(3), 210–219.
- *Chin, T., Shi, Y., Shen, G., Usai, A., & Mirko, C. (2023). Employee psychological resources as a microfoundation for organizational knowledge creation across cultures: A Yin–Yang dialectical systems view. *IEEE Transactions on Engineering Management*, 71, 12815–12825.
- *Choi, Y., & Choi, J. W. (2021). A study of job involvement prediction using machine learning technique. *International Journal of Organizational Analysis*, 29(3), 788–800.
- *Choudhari, Y., Shrestha, P., Singh, G., & Bindra, S. (2025). The impact of artificial intelligence (AI) on talent acquisition in human resource management. *Australasian Accounting, Business and Finance Journal*, 19(1).
- *Clavel, C., d'Armagnac, S., Hebrard, S., Hesters, T., & Potdevin, D. (2025). Humanized AI in hiring: An empirical study of a virtual AI job interviewer's social skills on applicants' reactions and experience. *The International Journal of Human Resource Management*, 36(2), 206–234.
- Collings, D. G., McMackin, J., Nyberg, A. J., & Wright, P. M. (2021). Strategic human resource management and COVID-19: Emerging challenges and research opportunities. *Journal of Management Studies*, 58(5), 1378.
- Cooke, F. L. (2025). From strategic HRM to sustainable HRM? Exploring a common good approach through a critical reflection on existing literature. *Human Resource Management*, 64(5), 1381–1399.
- Corporaal, S., Vos, M., van Riemsdijk, M., & de Vries, S. (2018). Werken in de nieuwe industriële revolutie. *Tijdschrift voor HRM*, 2, 20–44.
- *Curzi, Y., & Ferrarini, F. (2024). High-performance work systems and firm innovation: The moderating role of digital technology and employee participation. Evidence from Europe. *Management Research Review*, 47(13), 51–68.
- Davenport, T. H., & Kirby, J. (2016). *Only humans need apply: Winners and losers in the age of smart machines*. New York, NY: Harper Business.
- *De, T., Verma, P., Gangaraju, P. K., Nibhanupudi Siva Bhaskar, A., Mahlawat, S., Kumar, V., & Singh, S. (2024). Exploring the synergistic effects of circular economy, Industry 4.0 technology, and green human resource management practices on sustainable performance: Empirical evidence from Indian companies. *Business Strategy & Development*, 7(3), Article e70002.
- Den Hartog, D. N., Boon, C., Verbarg, R. M., & Croon, M. A. (2013). HRM, communication, satisfaction, and perceived performance: A cross-level test. *Journal of Management*, 39(6), 1637–1665.
- Dhanpat, N., Buthelezi, Z. P., Joe, M. R., Maphela, T. V., & Shongwe, N. (2020). Industry 4.0: The role of human resource professionals. *SA Journal of Human Resource Management*, 18(1), 1–11.
- *Di Sabato, V., & Savov, R. (2024). Training as a facilitator for Industry 4.0. *Revista de Gestão*, 31(3), 291–306.
- *Divya, D., Jain, R., Chetty, P., Siwach, V., & Mathur, A. (2024). The mediating effect of leadership in artificial intelligence success for employee-engagement. *Management Decision*, 63(10), 3676–3699.
- *Doellgast, V., Wagner, I., & O'Brady, S. (2023). Negotiating limits on algorithmic management in digitalised services: Cases from Germany and Norway. *Transfer: European Review of Labour and Research*, 29(1), 105–120.
- *Dong, M., Choi, Y., Ma, P., Cai, H., & Cui, L. (2025). Employee ownership and firm digital transformation. *British Journal of Management*, 36(2), 511–528.
- Donnelly, R., & Hughes, E. (2023). The HR ecosystem framework: Examining strategic HRM tensions in knowledge-intensive organizations with boundary-crossing professionals. *Human Resource Management*, 62(1), 79–95.
- *Du, X., & Cai, C. (2025). How challenge stressors affect deviant innovation behavior among Chinese frontline textile workers in the age of artificial intelligence. *Scientific Reports*, 15(1), 26053.
- *Erro-Garcés, A., & Aramendia-Muneta, M. E. (2023). The role of human resource management practices on the results of digitalisation. From Industry 4.0 to Industry 5.0. *Journal of Organizational Change Management*, 36(4), 585–602.
- *Figueiredo, A. S., & Pinto, L. H. (2021). Robotizing shared service centres: Key challenges and outcomes. *Journal of Service Theory and Practice*, 31(1), 157–178.
- *Figuerola-Armijos, M., Clark, B. B., & da Motta Veiga, S. P. (2023). Ethical perceptions of AI in hiring and organizational trust: The role of performance expectancy and social influence. *Journal of Business Ethics*, 186(1), 179–197.
- *Florkowski, G. W. (2019). HR technologies and HR-staff technostress: An unavoidable or combatable effect? *Employee Relations: The International Journal*, 41(5), 1120–1144.
- *Froehlich, C., Reinhardt, L. B., Schreiber, D., & Eberle, L. (2025). Dynamic capabilities for digital transformation in an enterprise business. *Benchmarking: An International Journal*, 32(5), 1541–1558.
- *Galanti, T., Ferrara, B., Benevene, P., & Buonomo, I. (2023). Rethinking the unthinkable: A Delphi study on remote work during COVID-19 pandemic. *Social Sciences*, 12(9), 497.
- *Gheidar, Y., & Shami Zanjani, M. (2021). Designing a conceptual framework for digital employee experience. *Interdisciplinary Journal of Management Studies*, 14(4), 669–680.
- *Gieselmann, M., Erdsiek, D., Rost, V., & Sassenberg, K. (2025). Do managers accept artificial intelligence? Insights into the role of business area and AI functionality. *Journal of Economic Psychology*, 108, Article 102804.
- *Gjika, I., & Pano, N. (2023). Human resource development AS a contributor to industry 4.0 implementation IN Albania. *The Electronic Journal of Information Systems in Developing Countries*, 89(2), Article e12250.
- *Gómez Gandía, J. A., Gavrilá Gavrilá, S., de Lucas Ancillo, A., & del Val Núñez, M. T. (2024). RPA as a challenge beyond technology: Self-learning and attitude needed for successful RPA implementation in the workplace. *Journal of the Knowledge Economy*, 15(4), 19628–19655.
- *Gonçalves, S. P., Santos, J. V. D., Silva, I. S., Veloso, A., Brandão, C., & Moura, R. (2021). COVID-19 and people management: The view of human resource managers. *Administrative Sciences*, 11(3), 69.
- *Gouda, G. K., & Tiwari, B. (2024). Dynamic nexus between Smart HR 4.0 and innovation ambidexterity: A fuzzy-TISM and MICMAC approach. *Journal of Organizational Effectiveness: People and Performance*, 11(4), 807–824.

- Guest, D. E. (2017). Human resource management and employee well-being: Towards a new analytic framework. *Human Resource Management Journal*, 27(1), 22–38.
- *Gupta, M., Hassan, Y., Pandey, J., & Kushwaha, A. (2022). Decoding the dark shades of electronic human resource management. *International Journal of Manpower*, 43(1), 12–31.
- Haddaway, N. R., Rethlefsen, M. L., Davies, M., Glanville, J., McGowan, B., Nyhan, K., & Young, S. (2022). A suggested data structure for transparent and repeatable reporting of bibliographic searching. *Campbell Systematic Reviews*, 18(4), c12–1288.
- *Hannig, M., Stock-Homburg, R., & Knof, M. (2025). The privacy paradox in interactions with service robots in the workplace. *The International Journal of Human Resource Management*, 36(3), 385–413.
- van Heijster, H., van den Groenendaal, S. M. E., Bosman, R., Hartman, S., Freese, C., & Borghouts, I. (2024). Een stevige fundering voor een inclusieve arbeidsmarkt: Het samenspel tussen strategisch HRM en sociaalzekerheidsbeleid [A solid foundation for an inclusive labour market: The interplay between social security policies and strategic HRM]. *Tijdschrift voor Arbeidsvraagstukken*, 40(3), 366–382.
- *Herrera-Ballesteros, J., de Heras Rosas, C. J., Mota Veiga, P., & Sampaio Rodrigues, F. (2025). How do flexible working time policies, telework from home and work fatigue impact on the work-life balance? *International Journal of Organizational Analysis*, 33(12), 153–173.
- *Hizam, S. M., Akter, H., Ahmed, W., & Sentosa, I. (2025). Assimilating talent-centric approaches to digital workplace engagement behaviours. *SA Journal of Human Resource Management*, 23, 2947.
- *Hoang, T. H., Nguyen, T. T., Bui, T., Binh, A. D. T., Truong, H. Q., & Asif, M. S. (2025). Employee ambidexterity and adaptive resources in the face of digital HRM changes: Evidence from frontline banking staff. *International Journal of Productivity and Performance Management*, 74(11), 46–67.
- *Hu, Y., Kuang, T., & Lu, Y. (2024). The effect of work connectivity behavior after-hours on emotional exhaustion: The role of psychological detachment and work-family segmentation preference. *SAGE Open*, 14(3), 21582440241281417.
- Huselid, M. A., & Becker, B. E. (2011). Bridging micro and macro domains: Workforce differentiation and strategic human resource management. *Journal of Management*, 37(2), 421–428.
- *İlhan, Ü. D., Güler, B. K., Turgut, D., & Duran, C. (2025). Opportunities and challenges of asynchronous video interviews: Perceptions of human resources professionals from Türkiye. *PLoS One*, 20(6), Article e0325932.
- *Iqbal, M., Siti Astuti, E., Trialih, R., Wilopo Arifin, Z., & Alief Aprilian, Y. (2020). The influences of information technology resources on knowledge management capabilities: Organizational culture as mediator variable. *Human Systems Management*, 39(2), 129–139.
- Jackson, S. E., Schuler, R. S., & Jiang, K. (2014). An aspirational framework for strategic human resource management. *Academy of Management Annals*, 8(1), 1–56.
- Jacobs, R. A. J., Peters, P., De Ruiter, M., & Blomme, R. J. (2021). Het psychologische contract als dynamisch proces in complexe technologische contexten: Inzichten uit de sociomaterialiteitstheorie [The psychological contract as a dynamic process in complex technological contexts: Insights from sociomateriality theory]. *Gedrag & Organisatie*, 34(1), 53–77.
- *Javali, G. R., Madhu, B. K., & Kumar, K. S. (2025). Multicultural challenges and employee experience in globally dispersed teams: Insights from Indian software firms. *International Journal of Organizational Analysis*, 33(7), 1765–1788.
- *Jiang, Y., Cai, Z., & Wang, X. (2025). Leverage generative AI for human resource management: Integrated risk analysis approach. *The International Journal of Human Resource Management*, 36(11), 1929–1959.
- *Jungst, M. (2023). Technological complexity and employee silence: The buffering role of social support. *Human Systems Management*, 42(1), 41–53.
- Keegan, A., Bitterling, I., Sylva, H., & Hoeksema, L. (2018). Organizing the HRM function: Responses to paradoxes, variety, and dynamism. *Human Resource Management*, 27(5), 1111–1126.
- Keegan, A., & Meijerink, J. (2023). Dynamism and realignment in the HR architecture: Online labor platform ecosystems and the key role of contractors. *Human Resource Management*, 62(1), 15–29.
- Kehoe, R. R., & Han, J. H. (2019). An expanded conceptualization of line managers' involvement in human resource management. *Journal of Applied Psychology*, 105(2), 111–129.
- Kholod, S., Pavlova, V., Spitsyna, A., Maistrenko, Y., Anufrieva, O., & Lukianychin, V. O. (2021). *Transformation of the Personnel Management System in the Conditions of Digitalization of HR Processes*.
- Kim, S., Wang, Y., & Boon, C. (2021). Sixty years of research on technology and human resource management: Looking back and looking forward. *Human Resource Management*, 60(1), 229–247.
- *Ključnikov, A., Popkova, E. G., & Sergi, B. S. (2023). Global labour markets and workplaces in the age of intelligent machines. *Journal of Innovation & Knowledge*, 8(4), Article 100407.
- *Kmecová, I., Stuchlý, J., Sagapova, N., & Tlustý, M. (2021). Sme human resources management digitization: Evaluation of the level of digitization and estimation of future developments. *Polish Journal of Management Studies*, 23(2), 232–248.
- *Kong, H., Yuan, Y., Baruch, Y., Bu, N., Jiang, X., & Wang, K. (2021). Influences of artificial intelligence (AI) awareness on career competency and job burnout. *International Journal of Contemporary Hospitality Management*, 33(2), 717–734.
- *Kuchciak, I., & Warwas, I. (2021). Designing a roadmap for human resource management in the banking 4.0. *Journal of Risk and Financial Management*, 14(12), 615.
- *Kumar, A., Shankar, A., Kumar, R., & Vadakki Veetil, A. K. (2025). Metaverse meetings: Fantasy or sustainable future of work? *International Journal of Manpower*, 46(4), 770–791.
- *Lai, Z., & Luo, H. (2022). How does intelligent technology investment affect employment compensation and firm value in Chinese financial institutions? *International Journal of Emerging Markets*, 17(4), 945–966.
- Lewis, A. C., Cardy, R. L., & Huang, L. S. (2019). Institutional theory and HRM: A new look. *Human Resource Management Review*, 29(3), 316–335.
- *Li, X., Seah, R. Y. T., & Yuen, K. F. (2025). Mental wellbeing in digital workplaces: The role of digital resources, technostress, and burnout. *Technology in Society*, 81, Article 102844.
- *Liu, A., & Wang, S. (2024). Generative artificial intelligence (GenAI) and entrepreneurial performance: Implications for entrepreneurs. *The Journal of Technology Transfer*, 49(6), 2389–2412.
- *Liu, N., De Winne, S., De Cooman, R., Smet, M., & Lattanzi, N. (2025). Unraveling the relationship between algorithmic management, leader's social distance, and employee engagement: An exchange perspective. *The International Journal of Human Resource Management*, 1–34.
- Liu, W., Ni, R., & Hu, G. (2024). Web of Science core collection's coverage expansion: The forgotten arts & humanities citation index? *Scientometrics*, 129(2), 933–955.
- *Liu, X., Lin, Z., Fang, S., & Zhang, L. (2025). No man is an island: Will service robots reduce employee loneliness? *Tourism Management*, 109, Article 105151.
- *Maisiri, W., & Van Dyk, L. (2021). Industry 4.0 skills: A perspective of the South African manufacturing industry. *SA Journal of Human Resource Management*, 19, 1416.
- Malik, A., Budhwar, P., Patel, C., & Srikanth, N. R. (2022). May the bots be with you! Delivering HR cost-effectiveness and individualised employee experiences in an MNE. *The International Journal of Human Resource Management*, 33(6), 1148–1178.
- *Malik, A., Nguyen, M., Budhwar, P., Chowdhury, S., & Guignani, R. (2024). Leveraging high performance HRM practices and knowledge sharing for managing technological and social change in emerging market healthcare providers. *Technological Forecasting and Social Change*, 205, Article 123463.
- Malik, A., Pereira, V., & Budhwar, P. (2021). HRM in the global information technology (IT) industry: Towards multivergent configurations in strategic business partnerships. *Human Resource Management Review*, 31(3), Article 100743.
- *Martin, L. (2020). How to retain motivated employees in their jobs? *Economic and Industrial Democracy*, 41(4), 910–953.
- Meijerink, J., Keegan, A., & Bondarouk, T. (2021). Having their cake and eating it too? Online labour platforms and human resource management as a case of institutional complexity. *The International Journal of Human Resource Management*, 32(19), 4016–4052.
- *Menshikova, M., Bonacci, L., Scarozza, D., & Zifaro, M. (2025). The employee satisfaction with the new normal ways of working: A cluster analysis. *Journal of Asia Business Studies*, 19(3), 863–892.
- *Mishra, H., & Venkatesan, M. (2021). Blockchain in human resource management of organizations: An empirical assessment to gauge HR and non-HR perspective. *Journal of Organizational Change Management*, 34(2), 525–542.

- *Mo, Z., Liu, M. T., Chark, R., Zeng, S., & Song, X. (2025). How AI adoption in human resource management practices can enhance tourism employees' organizational commitment. *Journal of Hospitality and Tourism Management*, 63, 54–67.
- *Mohiya, M. (2025). Exploring the Role and Influence of Leadership on Employees in HR Blog. *International Journal of Human Capital and Information Technology Professionals (IJHCITP)*, 16(1), 1–15.
- Mongeon, P., & Paul-Hus, A. (2016). The journal coverage of Web of Science and Scopus: A comparative analysis. *Scientometrics*, 106(1), 213–228.
- *Mothe, C., & Nguyen-Thi, T. U. (2021). Does age diversity boost technological innovation? Exploring the moderating role of HR practices. *European Management Journal*, 39(6), 829–843.
- *Moulaï, K., Islam, G., Manning, S., & Terlinden, L. (2022). "All too human" or the emergence of a techno-induced feeling of being less-able: Identity work, ableism and new service technologies. *The International Journal of Human Resource Management*, 33(22), 4499–4531.
- Mukhuty, S., Upadhyay, A., & Rothwell, H. (2022). Strategic sustainable development of Industry 4.0 through the lens of social responsibility: The role of human resource practices. *Business Strategy and the Environment*, 31(5), 2068–2081.
- *Mutsuddi, I., & Sinha, R. (2022). Role of leadership skills for developing digital acumen in information technology employees. *Vision*, 26(2), 243–253.
- Nankervis, A., Connell, J., Cameron, R., Montague, A., & Prikshat, V. (2021). 'Are we there yet?' Australian HR professionals and the Fourth Industrial Revolution. *Asia Pacific Journal of Human Resources*, 59(1), 3–19.
- Narzary, S., Makhecha, U. P., Budhwar, P., Malik, A., & Kumar, S. (2025). A temporal evolution of human resource management and technology research: A retrospective bibliometric analysis. *Personnel Review*, 54(3), 800–823.
- Nayak, S., Budhwar, P., & Malik, A. (2025). Technostress of HR professionals: The darker implication of remote work transformations. *The International Journal of Human Resource Management*, 36(10), 1–46.
- *Nayak, S., Budhwar, P., Pereira, V., & Malik, A. (2022). Exploring the dark-side of E-HRM: A study of social networking sites and deviant workplace behavior. *International Journal of Manpower*, 43(1), 89–115.
- *Newman, S. A., & Gopalkrishnan, S. (2023). The prospect of digital human communication for organizational purposes. *Frontiers in Communication*, 8, Article 1200985.
- *Noerman, T., Riyadi Yulijai, E. S., & Natasha, C. A. M. (2025). The impacts of social influence and hedonic motivation on experience and continuance intention of using AI in SMEs HRM. *Cogent Business & Management*, 12(1), Article 2542422.
- *Nørskov, S., Damholdt, M. F., Ulhøi, J. P., Jensen, M. B., Mathiasen, M. K., Ess, C. M., & Seibt, J. (2022). Employers' and applicants' fairness perceptions in job interviews: Using a teleoperated robot as a fair proxy. *Technological Forecasting and Social Change*, 179, Article 121641.
- *Nyamubarwa, W., & Chipunza, C. (2021). Formalising human resource practices in family owned accommodation Small and Medium-sized Enterprises (SMEs): Integrating owner manager's personal characteristics with aspects of the UTAUT model. *SA Journal of Human Resource Management*, 19, 11.
- O'Connor, C., & Joffe, H. (2020). Intercooder reliability in qualitative research: Debates and practical guidelines. *International Journal of Qualitative Methods*, 19, 1609406919899220.
- *de Oliveira, L. P., & de Barros Neto, J. P. (2022). Generation Z's perception of artificial intelligence used in selection processes. *Journal on Innovation and Sustainability RISUS*, 13(4), 11–17.
- Oravec, J. A. (2022). The emergence of "truth machines": Artificial intelligence approaches to lie detection. *Ethics and Information Technology*, 24(1), 6.
- *Ore, O., & Sposato, M. (2022). Opportunities and risks of artificial intelligence in recruitment and selection. *International Journal of Organizational Analysis*, 30(6), 1771–1782.
- *Ortiz-Lozano, J. M., Martínez-Morán, P. C., & de Nicolás, V. L. (2022). Teleworking in the public administration: An analysis based on Spanish civil servants' perspectives during the pandemic. *SAGE Open*, 12(1), 21582440221079843.
- Özer, M., Perc, M., & Suna, H. E. (2024). Artificial intelligence bias and the amplification of inequalities in the labor market. *Journal of Economy Culture and Society*, 69, 159–168.
- *Ozkan-Ozen, Y. D., & Kazancoglu, Y. (2022). Analysing workforce development challenges in the Industry 4.0. *International Journal of Manpower*, 43(2), 310–333.
- Paaauwe, J., & Boon, C. (2018). Strategic HRM: A critical review. *Human Resource Management*, 49–73.
- Parker, S. K., & Grote, G. (2022). Automation, algorithms, and beyond: Why work design matters more than ever in a digital world. *Applied Psychology*, 71(4), 1171–1204.
- *Peeters, M. C., Ybema, J. F., Le Blanc, P. M., & Plomp, J. (2025). Exploring the delicate relation between technological innovations and work quality: A study among civil servants. *Economic and Industrial Democracy*, 46(3), 851–873.
- *Pekkala, K., & Erkkilä, T. (2024). Organizational voicing architecture in the age of social media – A case study in professional service organizations. *International Journal of Strategic Communication*, 18(4), 366–381.
- Pham, M. T., Rajić, A., Greig, J. D., Sargeant, J. M., Papadopoulos, A., & McEwen, S. A. (2014). A scoping review of scoping reviews: Advancing the approach and enhancing the consistency. *Research Synthesis Methods*, 5(4), 371–385.
- *Pillai, R., & Srivastava, K. B. (2024). Smart HRM 4.0 practices for organizational performance: The role of dynamic capabilities. *Benchmarking: An International Journal*, 31(10), 3884–3908.
- *Pocatiu, P., Enăchescu, M. I., & Diță, A. (2020). Assessing a candidate's seniority level in computer science field by integrating semantic web technologies with augmented reality. *Economic Computation and Economic Cybernetics Studies and Research*, 3, 231–248.
- *Popescu, R. I., Sabie, O. M., & Truşcă, M. I. (2023). The contribution of artificial intelligence to stimulating the innovation of educational services and university programs in public administration. *Transylvanian Review of Administrative Sciences*, 19(70), 85–108.
- *Radonjić, A., Duarte, H., & Pereira, N. (2024). Artificial intelligence and HRM: HR managers' perspective on decisiveness and challenges. *European Management Journal*, 42(1), 57–66.
- Ratnam, D. S., & Devi, V. R. (2024). Addressing impediments to HR analytics adoption: Guide to HRD professionals. *Human Resource Development International*, 27(1), 142–151.
- *Rebelo, G., Almeida, A., & Pedra, J. (2024). Telework and work intensity: Insights from an exploratory study in Portugal during the COVID-19 pandemic. *Administrative Sciences*, 14(1), 14.
- Renkema, M., Meijerink, J., & Bondarouk, T. (2017). Advancing multilevel thinking in human resource management research: Applications and guidelines. *Human Resource Management Review*, 27(3), 397–415.
- *Ribeiro, V. B., Melo, J. C., Muniz, J., Jr., de Souza, F. B., & Canever, R. C. (2025). Envisioning Industry 4.0 to 5.0: The Brazilian glass workplace. *The Learning Organization*, 32(3), 373–390.
- *Robinson, A. P., Jarrahi, M. H., Keegan, A., & Meijerink, J. (2025). Algorithmic management in limbo: Task-driven interweaving of hierarchy and market management. *Human Resource Management*, 0, 1–15.
- *Rogiers, P., Viaene, S., & Leyens, J. (2020). The digital future of internal staffing: A vision for transformational electronic human resource management. *Intelligent Systems in Accounting, Finance and Management*, 27(4), 182–196.
- Roodbari, H., Mirfakhkar, A. S., Trullen, J., Valverde, M., & Ogbonnaya, C. (2025). What works for whom in which circumstances in successful HRM implementation? A realist synthesis. *Journal of Business Research*, 188, Article 115115.
- Rossato, C., Pluchino, P., Cellini, N., Jacucci, G., Spagnoli, A., & Gamberini, L. (2021). Facing with collaborative robots: The subjective experience in senior and younger workers. *Cyberpsychology, Behavior, and Social Networking*, 24(5), 349–356.
- *Rubel, M. R. B., Kee, D. M. H., & Rimi, N. N. (2023). Promoting technology innovation performance through high involvement HRM, technology adaptation and innovativeness. *Business Process Management Journal*, 29(5), 1277–1302.
- *Rukadikar, A., & Khandelwal, K. (2024). Navigating change: A qualitative exploration of chatbot adoption in recruitment. *Cogent Business & Management*, 11(1), Article 2345759.
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55(1), 68–78.

- Sadagharn, P. (2022). Acceptance of robots as co-workers: Hotel employees' perspective. *International Journal of Engineering Business Management*, 14, 18479790221113621.
- *Safrankova, J. M., Sikyr, M., & Skypalova, R. (2020). Innovations in workforce management: Challenges in the Fourth Industrial Revolution. *Marketing in Management Innovations*, 2.
- *Salvadorinho, J., Ferreira, C., & Teixeira, L. (2024). A technology-based framework to foster the lean human resource 4.0 and prevent the great resignation: The talent management lift. *Technology in Society*, 77, Article 102510.
- *Sani, K. F., Adisa, T. A., Adekoya, O. D., & Oruh, E. S. (2023). Digital onboarding and employee outcomes: Empirical evidence from the UK. *Management Decision*, 61(3), 637–654.
- *Santoso, W., Sitorus, P. M., Batunanggar, S., Krisanti, F. T., Anggadwita, G., & Alamsyah, A. (2021). Talent mapping: A strategic approach toward digitalization initiatives in the banking and financial technology (FinTech) industry in Indonesia. *Journal of Science and Technology Policy Management*, 12(3), 399–420.
- *Sarabdeen, M., & Alofaysan, H. (2023). Investigating the impact of digital transformation on the labor market in the era of changing digital transformation dynamics in Saudi Arabia. *Economies*, 11(1), 12.
- *Shankar, A., & Nigam, A. (2022). Explaining resistance intention towards mobile HRM application: The dark side of technology adoption. *International Journal of Manpower*, 43(1), 206–225.
- *Sharma, M., Luthra, S., Joshi, S., & Kumar, A. (2022). Analysing the impact of sustainable human resource management practices and industry 4.0 technologies adoption on employability skills. *International Journal of Manpower*, 43(2), 463–485.
- Shipton, H., Biron, M., Fu, N., & Do, H. (2024). HRM for the greater good: Mapping the field and envisioning the future. *Human Resource Management Review*. Retrieved from: Human Resource Management Review | HRM for the greater good: Mapping the field and envisioning the future | ScienceDirect.com by Elsevier.
- *Silue, F., & Aguirre-Urreta, M. I. (2025). Videoconferencing and remote workers: A technology acceptance study. *AIS Transactions on Human-ComputerInteraction*, 17(2), 261–286.
- *Sithambaram, R. A., & Tajudeen, F. P. (2023). Impact of artificial intelligence in human resource management: A qualitative study in the Malaysian context. *Asia Pacific Journal of Human Resources*, 61(4), 821–844.
- *Sotnikova, Y. V., Nazarova, G. V., Nazarov, N. K., & Bilokononko, H. V. (2020). Digital technologies in HR management. *Management Theory and Studies for Rural Business and Infrastructure Development*, 42(4), 527–535.
- *Stacho, Z., Lizbetinova, L., Stachova, K., & Starecek, A. (2022). The application of progressive HR tools in the environment of Slovak enterprises. *Journal of Competitiveness*, 14(3), 173–190.
- *Stehnei, M., Irtyshcheva, I., Kramarenko, I., Ishchenko, O., & Irtyshchev, O. (2025). Innovation oriented HR strategy transformation and business model reengineering: Empirical insights from Ukrainian agribusiness. *Marketing and Management of Innovations*, 16(2).
- Stein, V., & Scholz, T. M. (2020). Manufacturing revolution boosts people issues: The evolutionary need for 'human-automation resource management' in smart factories. *European Management Review*, 17(2), 391–406.
- *Sucharita, K., & Roopalatha, N. (2025). Exploring the impact of AI in training and development: An analysis using the UTAUT model among IT professionals. *Pacific Business Review International*, 17(12).
- *Swapna, H., Madaan, G., Singh, A., Sood, K., & Grima, S. (2023). Factors causing the Indian information technology Industry's human resource management to change to gig contracts. *Sosyoekonomi*, 31(57), 77–99.
- *Sweiss, M. I. K., & Yamin, M. A. Y. (2024). The role of AI-enabled human resource practices towards task satisfaction and employee creative willingness. *SAGE Open*, 14(3), Article 21582440241281618.
- Tandon, A., Dhir, A., Malik, A., Budhwar, P., & Kaur, P. (2025). Exploring the duality of perceptions: Insights into uncertainties, aversion and appreciation towards algorithmic HRM. *Human Resource Management*, 64(2), 583–616.
- *Tari, S. D., & Nirmala, R. (2025). Analyze the relationship between green human resource management practices and environmental outcomes in the information technology sector. *Social Responsibility Journal*, 21(7), 1421–1439.
- Todoif-Signes, A. (2019). Algorithms, artificial intelligence and automated decisions concerning workers and the risks of discrimination: the necessary collective governance of data protection. *Transfer: European Review of Labour and Research*, 25(4), 465–481.
- Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K. K., Colquhoun, H., Levac, D., ... Straus, S. E. (2018). PRISMA extension for scoping reviews (PRISMA-ScR): Checklist and explanation. *Annals of Internal Medicine*, 169(7), 467–473.
- Trullen, J., Bos-Nehles, A., & Valverde, M. (2020). From intended to actual and beyond: A cross-disciplinary view of (human resource management) implementation. *International Journal of Management Reviews*, 22(2), 150–176.
- Trullen, J., Hassan, N., Morley, M. J., & Valverde, M. (2024). The devolution of human resource management responsibilities to line managers: A multi-level analysis of contextual influences. *The International Journal of Human Resource Management*, 35(8), 1547–1576.
- *Uppal, A., Awasthi, Y., & Srivastava, A. (2025). Machine learningbased approaches for enhancing human resource management using automated employee performance prediction systems. *International Journal of Organizational Analysis*, 33(8), 2307–2346.
- *Val Núñez, M. T. D., Lucas Ancillo, A. D., Gavrila Gavrila, S., & Gómez Gandía, J. A. (2024). Technological transformation in HRM through knowledge and training: Innovative business decision making. *Technological Forecasting and Social Change*, 200.
- Van Beurden, J., Bauwens, R., Van de Voorde, K., Fijneman-Ghielen, S., Kilroy, S., Li, M., Suhail, A., De Meulenaere, K., Ghazzawi, R., Sahakian, T., & Kooij, D. (2025). Multilevel theorizing in strategic human resource management research: A systematic and critical review. *Human Relations*. <https://doi.org/10.1177/00187267251392079>
- Van Beurden, J., Borghouts, I., van den Groenendaal, S. M. E., & Freese, C. (2024). How Dutch higher HRM education prepares future HR professionals for the impact of technological developments. *The International Journal of Management Education*, 22(1), Article 100916.
- Van Beurden, J., Van De Voorde, K., & Van Veldhoven, M. (2021). The employee perspective on HR practices: A systematic literature review, integration and outlook. *The International Journal of Human Resource Management*, 32(2), 359–393.
- Van de Schoot, R., De Bruin, J., Schram, R., Zahedi, P., De Boer, J., Weijdem, F., & Oberski, D. (2021). An open-source machine learning framework for efficient and transparent systematic reviews. *Nature Machine Intelligence*, 3(2), 125–133.
- Van den Berg, M. J., Stander, M. W., & Van der Vaart, L. (2020). An exploration of key human resource practitioner competencies in a digitally transformed organisation. *SA Journal of Human Resource Management*, 18, 13.
- Van den Groenendaal, S. M., Freese, C., & Van Veldhoven, M. (2020). Een integraal contextueel perspectief op werkintensivering van beroepen [An integrative contextual perspective on work intensification of occupations]. *Tijdschrift voor HRM*, 23(3), 40–65.
- Van Vuuren, T., Peeters, M., Diaz, S. P., & Van Veen, B. (2020). Het verband tussen technostress en duurzame inzetbaarheid: Doet leeftijd ertoe? [The link between technostress and sustainable employability: Does age matter?]. *Gedrag en Organisatie*, 33(4), 300–323.
- Vega, G., & Brennan, L. (2000). Isolation and technology: The human disconnect. *Journal of Organizational Change Management*, 13(5), 468–481.
- Vereycken, Y., Ramioul, M., & Hermans, M. (2021). Old wine in new bottles? Revisiting employee participation in Industry 4.0. *New Technology, Work and Employment*, 36(1), 44–73.
- *Wahyuningtyas, R., Disastra, G., & Rismayani, R. (2023). Toward cooperative competitiveness for community development in Economic Society 5.0. *Journal of Enterprising Communities: People and Places in the Global Economy*, 17(3), 594–620.
- *Waldkirch, M., Bucher, E., Kalum Schou, P., & Grünwald, E. (2021). Controlled by the algorithm, coached by the crowd – how HRM activities take shape on digital work platforms in the gig economy. *The International Journal of Human Resource Management*, 32(1), 2643–2684.
- Walkowiak, E. (2024). Digitalization and inclusiveness of HRM practices: The example of neurodiversity initiatives. *Human Resource Management Journal*, 34(3), 578–598.
- *Wang, G., Mansor, Z. D., & Leong, Y. C. (2024). Linking digital leadership and employee digital performance in SMEs in China: The chain-mediating role of high-involvement human resource management practice and employee dynamic capability. *Heliyon*, 10(16).

- Wastell, D. G., & Cooper, C. L. (2008). Stress and technological innovation: A comparative study of design practices and implementation strategies. *European Journal of Work and Organizational Psychology*, 5(3), 377–397.
- *Weber, P. (2023). Unrealistic optimism regarding artificial intelligence opportunities in human resource management. *International Journal of Knowledge Management (IJKM)*, 19(1), 1–19.
- *Wei, K., Kimura, C., Shimura, M., Shimomura, Y., Zhao, X., Tamura, T., & Sakamoto, S. (2025). Predicting task performance in robot-assisted surgery using physiological stress and subjective workload: A case study with interpretable machine learning. *Frontiers in Human Neuroscience*, 19, Article 1611524.
- *Werens, S., & von Garrel, J. (2023). Implementation of artificial intelligence at the workplace, considering the work ability of employees. *TATuP–Journal for Technology Assessment in Theory and Practice*, 32(2), 43–49.
- *Williams, P., McDonald, P., & Mayes, R. (2023). Recruitment in the gig economy: Attraction and selection on digital platforms. *International Journal of Human Resource Management*, 32(19), 4136–4162.
- *Wohleber, R. W., Matthews, G., Lin, J., Szalma, J. L., Calhoun, G. L., Funke, G. J., ... Ruff, H. A. (2019). Vigilance and automation dependence in operation of multiple unmanned aerial systems (UAS): A simulation study. *Human Factors*, 61(3), 488–505.
- Wright, P. M., & Boswell, W. R. (2002). Desegregating HRM: A review and synthesis of micro and macro human resource management research. *Journal of Management*, 28(3), 247–276.
- Wright, P. M., & Nishii, L. H. (2013). Strategic HRM and organizational behaviour: Integrating multiple levels of analysis. In J. Paauwe, D. E. Guest, & P. M. Wright (Eds.), *HRM and performance: Achievements and challenges* (pp. 97–111). London: Wiley.
- Xiao, Y., & Watson, M. (2019). Guidance on conducting a systematic literature review. *Journal of Planning Education and Research*, 39(1), 93–112.
- *Xu, S., Stienmetz, J., & Ashton, M. (2020). How will service robots redefine leadership in hotel management? A Delphi approach. *International Journal of Contemporary Hospitality Management*, 32(6), 2217–2237.
- *Yıldırım Saatçi, E. S., & Ovaci, C. (2022). Ready or not, here comes the Digitalization: Assessment of workforce readiness and change perception. *Istanbul Business Research*, 51(2), 607–626.
- *Yoo, J. W., Roh, S., Tripathi, S., & Jang, H. (2025). Digital leadership within large South Korean firms. *Asia Pacific Business Review*, 31(1), 15–37.
- *Yuan, S., Zhou, R., Li, M., & Lv, C. (2023). Investigating the influence of digital technology application on employee compensation. *Technological Forecasting and Social Change*, 195, Article 122787.
- *Zahrani, A. A. (2024). Impact of work environment, leadership, human resources practices and technology on organizations performance. *Journal of Entrepreneurship & Sustainability Issues*, 12(1).
- *Zeshan, M., Rasool, S., Cerchione, R., Centobelli, P., & Morelli, M. (2025). The impact of digitalization on CSR commitment: The role of human resource management system and employee autonomy. *Corporate Social Responsibility and Environmental Management*, 32(2), 1618–1630.
- *Zhang, Q. (2025). Checks and balances: Leveraging artificial intelligence for tri-balance personnel selection systems. *The International Journal of Human Resource Management*, 36(14), 1–35.
- *Zhang, X., Chen, X., Huo, B., Liu, C., Zhu, X., Zu, Y., ... Sun, Q. (2023). An integrated evaluation approach of wearable lower limb exoskeletons for human performance augmentation. *Scientific Reports*, 13(1), 4251.
- *Zheng, J., Zhang, J. Z., Kamal, M. M., Liang, X., & Alzeiby, E. A. (2025). Unpacking human-AI interaction: Exploring unintended consequences on employee Well-being in entrepreneurial firms through an in-depth analysis. *Journal of Business Research*, 196, Article 115406.
- *Zhu, H., Zhang, X., & Yu, B. (2024). The impact of the industrial robots on the employment rate and wages: Prospects of circular economy and sustainable development. *Management Decision*, 62(9), 2855–2874.