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Review

Digital Maturity in Transforming Human Resource Management in the Post-COVID Era: A Thematic Analysis

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Abstract: The digital maturity of Human Resource Management (HRM) is a critical determinant of organisational success in today's digital age. This paper aims to contribute to the limited literature on the "digital maturity" of HRM by identifying emerging themes and success factors of HRM in the digital age. Drawing on data from 190 journal articles for 2017–2024, this paper identifies three motor themes shaping contemporary HRM: (1) Digital Transformation and Competition, (2) Innovation and Performance Management, and (3) COVID-19 Adaptive Human Resource Management. These findings indicate the multidimensionality of HR digital maturity—from focusing on technology and people to fostering innovation and crisis management. Several factors require attention to improve the digital maturity of HR, including HR strategy and governance; talent management, diversity, and safety; employee adoption and competencies; conflict resolution and stakeholder engagement; and HR practitioners' competencies. Strategic investment in these pillars is necessary not only to facilitate organisational adaptation to digital transformation but also for harnessing the benefits of emerging technologies to drive innovation and long-term success in the post-COVID era.

Keywords: digital maturity; human resource management; COVID-19

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1. Introduction

Advances in digital technologies are impacting every aspect of business operations, including human resource management (HRM) activities. Cutting-edge technologies, such as artificial intelligence (AI), machine learning, big data, and human resource (HR) analytics, are deeply challenging how employees are recruited, managed, and evaluated, while enhancing efficiency and productivity. However, digital transformation also incurs costs and introduces challenges related to capability development, managing talent, skilling and re-skilling the workforce, ensuring diversity and well-being, securing data, and navigating crisis (Akter et al., 2024; Levenson, 2018; Veile et al., 2020). As HRM focuses on managing human capital in an organisation while supporting digital transformation and business strategy, understanding the interplay between humans and technology remains critical from both researchers' and practitioners' points of view.

The changes to HRM are that digital technologies are "all pervasive and omni-directional throughout every company" (Larkin, 2017, p. 55). Digitalisation of HRM is required to be efficient and, stay relevant and competitive (Bansal et al., 2023). The transformation roles of human resources to sustain competitive advantage have been widely noted in the literature. The resource-based view (RBV) postulates the critical strategic importance of human resources to achieve business success (Colbert, 2004; Gerhart & Feng, 2021). According to RBV, organisations can achieve extraordinary success by employing unique and inimitable human resources. However, many organisations face challenges in

terms of recruitment and retention of high-quality labour. Meanwhile, COVID-19 has further refined work practises, characterised by workplace flexibility, innovation, and recovery, thereby making HRM strategically critical, but inherently complex (Gerhart & Feng, 2021).

This paper aims to contribute to the limited literature on the "digital maturity" of HR by identifying emerging themes and success factors in HRM-related digital transformation. This research seeks to identify the valuable HR digital capabilities essential for gaining a competitive edge. While previous studies have examined the research themes of digital transformation (e.g., Jain & Sharma, 2024), the scope of the present review is distinct. We use the concept of "digital maturity" to identify the motor themes influencing HRM in the digital age and the post-COVID era. Digital transformation refers to a process of integrating digital technologies to change business operations. In contrast, the concept of digital maturity refers to the quality of the process and identifies the key capabilities to move from one stage of maturity to the next. Digital maturity is, therefore, more of a "learning journey" aimed at optimising the use of technology and achieving competitive advantage in the long run, as opposed to merely integrating technology into business operations (Rader, 2019).

The structure of the paper is as follows: Section 2 provides a brief overview of the key models of HRM digital maturity. Section 3 presents the research methodology, followed by findings and discussion in Section 4. Section 5 presents the conclusion, future directions, and limitations.

2. From HRM to Digital HRM Maturity Model

2.1. HRM Maturity Models

The Digital Maturity Model for HRM builds on the HRM Maturity Model by incorporating digital technology into all aspects of HR functions. The origin of the HRM Maturity Model lies in the Capability Maturity Model (CMM), developed to optimise the software development processes, from ad hoc practises to formally defined steps (Paulk, 2009). In 1995, the Software Engineering Institute in the United States released a version of the maturity model—popularly known as the People Capability Maturity Model or People CMM—which was subsequently updated in 2001 (Curtis et al., 2009). The idea of People CMM is to develop a tool to help successfully address the critical people issues in an organisation. People CMM provides a "best practice for managing and developing an organisation's workforce" (Curtis et al., 2009, p. iv). Workforce capability can be defined as the level of knowledge, skills, and process abilities to perform an organisation's business activities. Table 1 shows the process areas of People CMM, where organisations improve the human capital management process from the initial ad hoc stage to optimising. At the highest level of digital maturity, innovative workforce management is tied to continuous capability development and organisational performance alignment.

The subsequent literature has discussed the application of People CMM in the knowledge economy and a human resource management context (Chen & Wang, 2018; Khatibian et al., 2010; Wademan et al., 2007). Chen and Wang (2018) studied the application of the People CMM in the organisational management of a case company using interview data. They found that the company had achieved the second level of maturity. Several dimensions require improvement, including recruitment standards, assessment indicators for the work environment, and reward policies. Furthermore, significant gaps were identified in human resource planning, occupational development, work-team environment, and workforce innovation (Chen & Wang, 2018).

Table 1. Process Areas of People CMM. Source: Curtis et al. (2009).

Maturity Level		Dimensions
5	Optimising	Continuous Workforce Innovation Organisational Performance Alignment Continuous Capability Improvement
4	Predictable	Mentoring Organisational Capability Management Quantitative Performance Management Competency-Based Assets Empowered Workgroups Competency Integration
3	Defined	Participatory culture Workgroup Development Competency-Based Practises Career Development Competency Development Workforce Planning Competency Analysis
2	Managed	Compensation Training and Development Performance Management Work Environment Communication and Coordination Staffing
1	Initial	Inconsistent and Ritualistic Human Capital Management Process

2.2. HRM in the Digital Age

The rise in digital technologies, combined with the impacts of COVID-19, has significantly altered traditional HRM practises. With digital technology being an enabler of change, employees will become more informed (through personalised intranets and channels of information), more engaged (through crowd-curated content and more natural communication technologies), and more career-focused (maintaining a line of sight into their career and development) (Larkin, 2017). Additionally, COVID-19 has lifted social acceptance of technology, laying the foundation for a more adaptive, flexible, and innovative approach to HRM that aligns with the demands of a rapidly changing work environment (García-Fernández et al., 2024).

Conceptually, digital transformation or digitalisation is an organisational phenomenon; therefore, the typology of digital HR should be interpreted with caution (Strohmeier, 2020). For example, digital strategy in HR should be designed as part of an organisational digital strategy or organisational strategy in general. Similarly, a counterpart of organisational operation is HR practises—a set of HR activities to support organisational goals (Strohmeier, 2020). Figure 1 presents a typology of digital HRM as proposed by Strohmeier (2020). There are three important characteristics in this typology. First, there is a difference between "digitalisation" and "digital transformation". Digitalisation is the process of moving from "analogue" to "digital", starting from non-application to application of technology in operation and strategic integration. This is a technology component and can be conceptualised as a technology-based HRM. Digital Transformation, on the other hand, is related to strategic alignment and strategic integration. At a higher level of digitalisation, it is not the technologies, but humans bring about the digital transformation.

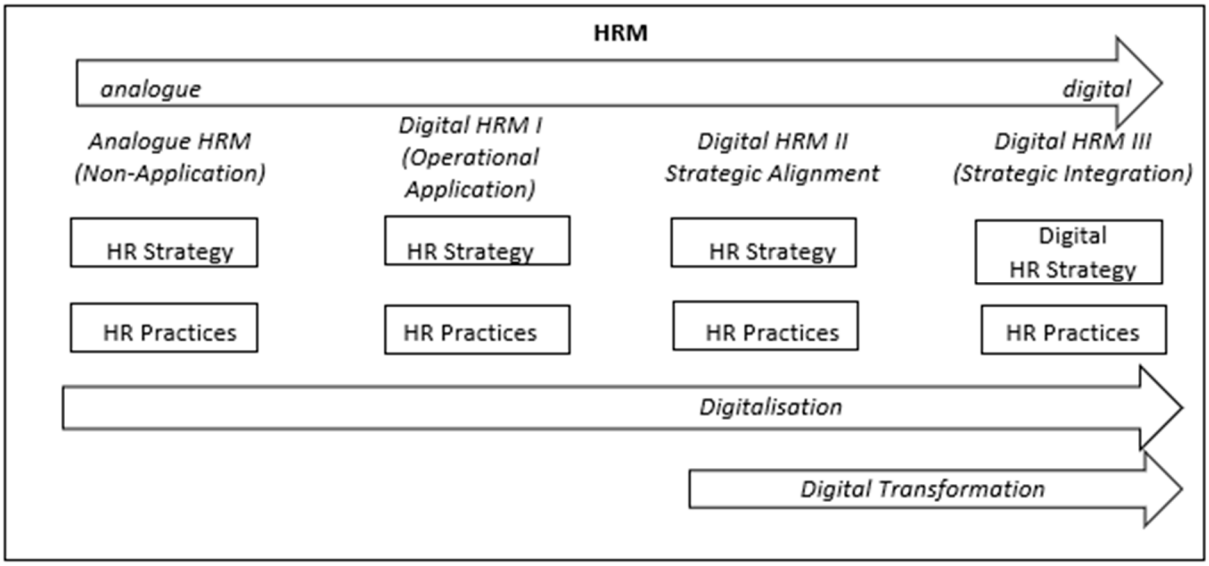

Figure 1. Typology of digital HRM. Source: Strohmeier (2020).

Research on the interaction between digital technology and HRM remains a compelling area of interest. Jain and Sharma (2024) conducted a bibliometric analysis of the existing studies of digital transformation. Using Scopus data, their findings highlight the integration of Industry 4.0 technologies to promote organisational adaptation to digital transformation, the role of digital HRM within strategic management, the importance of enhancing employee participation and engagement, and the growing significance of HR analytics for informed decision making and optimisation. However, more holistic research is needed to identify the success factors of digital transformation, particularly in light of COVID-19, to better inform and refine HR practises. The present study aims to address the gaps in the literature.

3. Research Methodology

3.1. Identification

The methodology used in this paper involves a bibliographic literature review on the topic of digital maturity within the HRM literature. The primary focus of the study is to explore the key internal and external factors shaping the digital maturity of HRM. Information for this review was collected from peer-reviewed journal articles gathered from Scopus and Web of Science. Following a preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines and two stages screening process (title/abstract screening and full-text screening), relevant peer-reviewed journal articles were selected. The key items and Boolean Operations used to retrieve relevant literature were:

("Digital maturity" OR "Digital readiness" OR "Digital capability" OR "Digital transformation" OR "Digital evolution") AND ("Human Resource Management" OR "HRM practices" OR "HR activities" OR "People management" OR "People capability" OR "Technology management" OR "Workforce management" OR "Talent management"). We limit our search to "Business, Management and Accounting" and "Economics, Econometrics and Finance" in Scopus, and "Business, Economics, Management and Operations Research Management Science Journals" in Web of Science. The search was conducted on 11 December 2024 and included only articles in English. Review articles and bibliographic analyses were excluded to avoid double counting. Articles entirely focusing on processes, products, or services in Engineering Management, Information Systems, Construction, Architecture Management, Education, or any other economic sectors were also excluded.

3.2. Data Screening

The first step of data collection involves conducting research using the key terms. The initial search resulted in 159 journal articles from Scopus and 181 articles from Web of Science. In the next step, the "bibliometrix" library in R was used to combine results and remove duplicates. A total of 54 duplicated articles were removed, leaving 286 articles. In the next step, title and abstracts were read and an additional 97 articles were removed based on the exclusion criteria. As a final screening, two articles were removed due to missing information (Table 2).

Table 2. PRISMA flow diagram of literature search and document selection.

Identification	Records identified through initial database search Database Scopus Web of Science Total	 # Articles 159 181 340
Screening	289 Records after removing duplicates	A total of 54 duplicated articles have been removed.
Eligibility	192 Articles after removing	A total of 97 articles were removed after qualitative assessment.
Included	190 Articles included in the analysis	Two articles were removed due to missing information.

3.3. Sample Characteristics

Figure 2 shows the overview of the data. The sample consists of 190 articles published in 113 journals by 557 authors from 2017 to 2024. Figure 3 shows the exponential growth of articles per year, with the greatest number of publications in 2024 (75 articles). Figure 4 shows the most relevant sources. A total of 15 articles have been published in the Journal of Manufacturing Technology Management (JMTM), followed by 12 papers in the International Journal of Innovation and Technology Management and 8 papers in the Research-Technology Management. The prominent role of JMTM aligns with its focus on the origins of the maturity models in the manufacturing sector and their application to Industry 4.0.

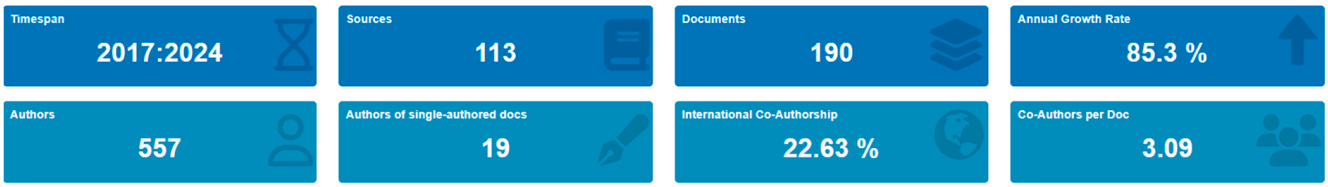

Figure 2. Overview of the Sample. Source: Bibliomatrix.

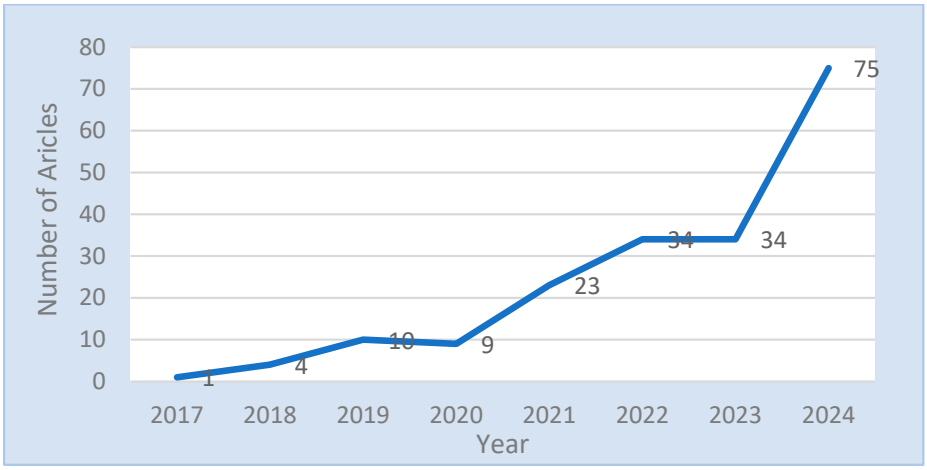

Figure 3. Annual Scientific Production Per-year. Source: Author's own elaboration.

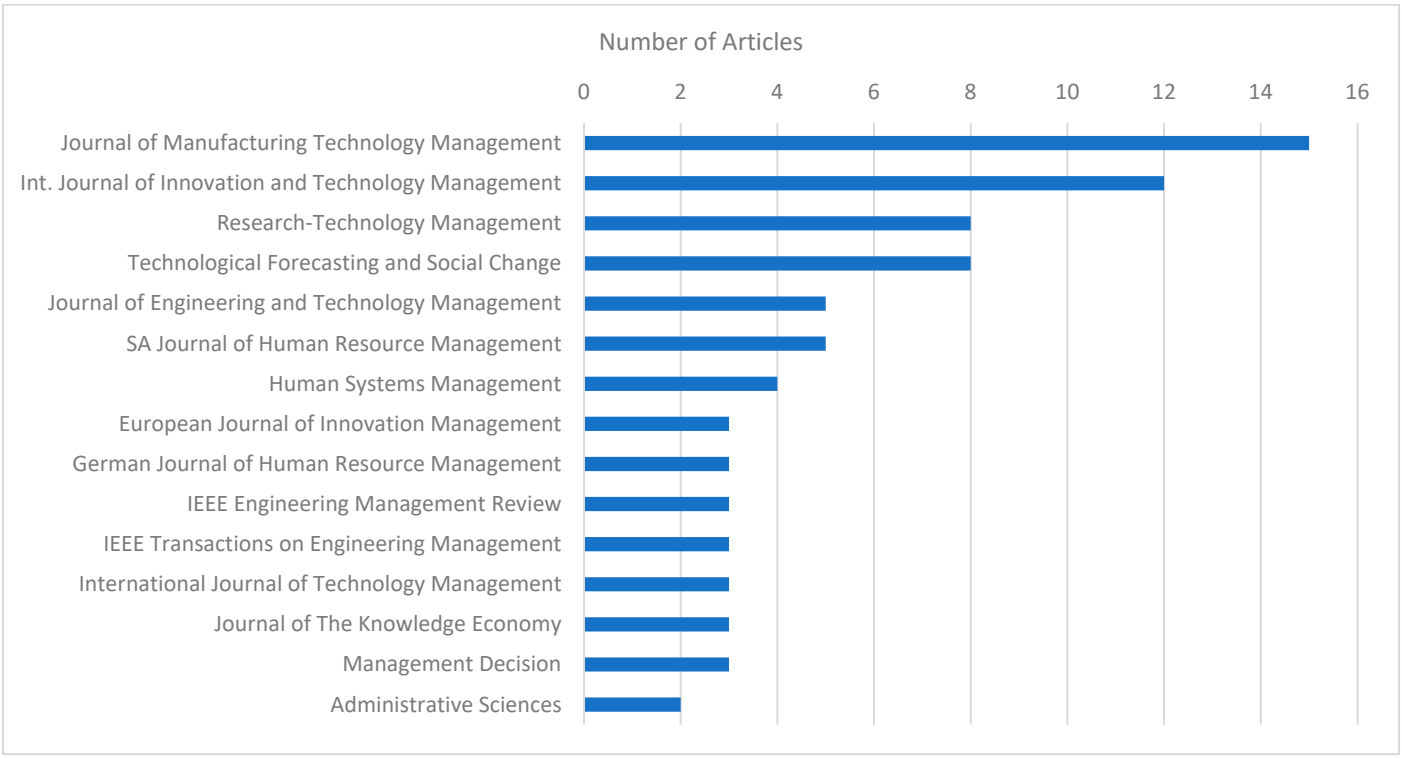

Figure 4. Most Relevant Sources. Source: Author's own elaboration.

3.4. Thematic Mapping

Figure 5 shows a metadata visual plot and thematic mapping using Biblioshiny (the web interface for Bibliomatrix programme, in R). The thematic mapping was conducted using data from all 190 articles. We selected the default "Keywords Plus" option and applied the "Walktrap" clustering approach for the analysis. The thematic analysis discovers three motor themes (upper-right quadrant) emerging in the area of HRM digital maturity: Digital transformation of HRM and Competition, COVID-19 Adaptive Human Resource Management, and Innovation Performance Management. In the next section, we discuss each of these thematic areas and their implications for the digital maturity of HRM.

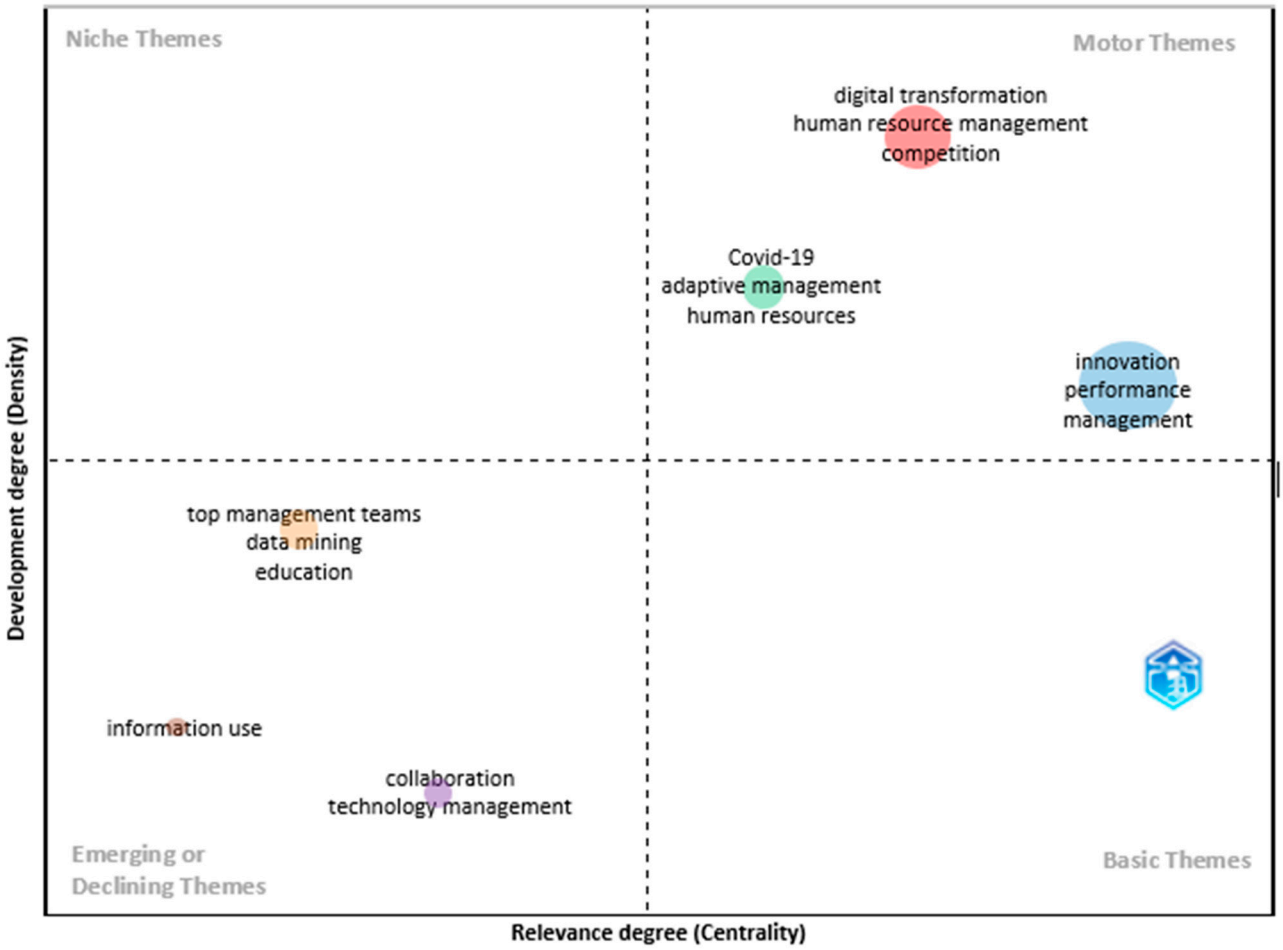

Figure 5. Thematic Mapping of the Data. Source: Bibliomatrix.

4. Results and Discussion

4.1. Digital Transformation of HRM and Competition

The process, challenges, and demands of HRM digital transformation have been discussed in greater detail in the literature. Existing studies have focused on IT systems and governance (Ceipek et al., 2021), strategy (Dohale et al., 2022), *employee adoption and competencies* (Shiau et al., 2024), management demands (Veile et al., 2020), HR practitioners' competencies (Van den Berg et al., 2020), diversity and safety (Walkowiak, 2021), and conflict resolution and stakeholder engagement (Tsai et al., 2023). Gregory et al. (2018) find that the IT system in an organisation is governed by how consumers use IT in everyday life. As such, IT consumerization, the way consumers use IT in their personal lives, influences organisations' digital transformation. Ceipek et al. (2021) argue that an over-representation of family members in the top management could hinder digital transformation. Dohale et al. (2022) highlight the importance of aligning corporate strategy with business and operational level strategy.

Talent management has emerged as a key theme of digital transformation, while there is an emerging group of literature focusing on diversity, safety, and inclusion issues. Veile et al. (2020) discuss the key managerial demands arising from digital transformation and brand key managerial activities as (1) driving business change, (2) mastering fluid and loose organisational structure, (3) mastering talent complexity, and (4) prioritising learning. Shiau et al. (2024) explore the employee adoption of technology and suggest that switching benefits, job insecurity, colleague options, top management support, and inertia determine

the adoption of facial recognition payment technology. Hansen et al. (2024) highlight that worker competencies play a critical role in the success of digital transformation.

Van den Berg et al. (2020) suggest that human resource practitioners require different sets of competencies in the context of digitally transformed organisations. These competencies include, among others, the ability to design, extract, understand, analyse, interpret, and apply information (data), continuous learning, stakeholder relationship management, and cultivating positive organisational practises (Van den Berg et al., 2020). Tsai et al. (2023) underscore the importance of conflict resolution for the success of the digital transformation process. They suggest a tailored approach to conflict resolution based on the type of the conflict, rather than a one-size-fits-all approach. Coplan (2024) highlights the importance of stakeholder engagement for the success of the digital transformation process. Mueller et al. (2024) explore the challenges faced by IT project managers when transitioning from traditional systems to agile teams, which rely on self-management and autonomy. The study highlights specific strategies to resolve the challenge and design of an effective agile team.

Rocha et al. (2024) argue that the meaning of digital transformation is not fully understood by most firms, limiting digital maturity. The study suggests four important areas to focus on: (1) Industry 4.0, (2) Competition, (3) Decision Making, and (4) Data Analytics. Industry 4.0 has been a recurring theme of digital maturity and digital transformation. Industry 4.0 or the "Fourth Industrial Revolution refers to the technological revolution, such as Artificial Intelligence (AI), big data, Robotics, Augmented and Virtual Reality, Blockchain, and other emerging technologies. These technologies remain highly relevant to meet emerging challenges of human resource practises in the digital age (Nicolás-Agustín et al., 2022). Conte and Siano (2023) discuss the adoption of big data analytics for internal and recruitment communication and argue that the development of HR analytics is hindered by workers' skills, data quality, and short-term perspectives. AI is now encompassing technology in all areas of HR operations, including recruitment, training, employee engagement, and employee retention (Mohamad et al., 2022). However, sustained benefits of AI can only be realised when the technology adoption becomes part of the organisational strategy (Kaushal et al., 2023).

4.2. Innovation Management

Innovation is the key to firm's success, and digital transformation can influence the innovation behaviour of firms (Lu et al., 2023). The thematic mapping and co-occurrence network derived in this review identifies innovation management as a key theme (Figures 5 and 6). Innovation refers to improvements in process and/or outcome (product or service) (Koster & Benda, 2020). Innovative HR practises in the digital age need to be data-driven. Strategic adoption of advanced technologies (e.g., AI, machine learning, cloud-based platforms, and analytics) can enhance efficiency in all areas of HR operation, e.g., recruitment and talent acquisition, training and development, employee learning and engagement, data-driven performance management, workforce flexibility, and strategic decision making (Bondarouk & Brewster, 2016; Vrontis et al., 2021). While investment in these technologies will keep the HR department relevant and competitive, they cannot be alone as a source of competitive advantage in the medium to long run (Alam et al., 2022; McCartney & Fu, 2022; Shahiduzzaman et al., 2018).

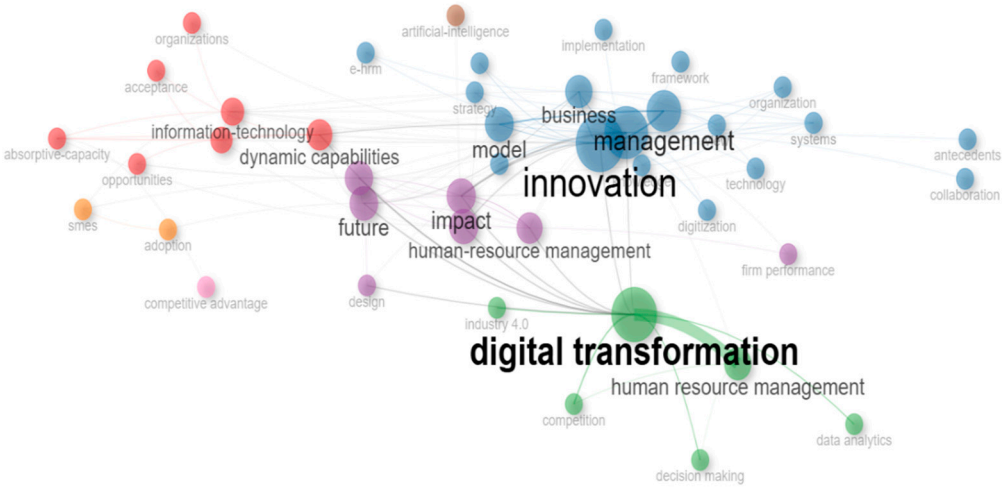

Figure 6. Co-occurrence Network. Source: Bibliomatrix.

Several factors moderate the relationship, particularly in the context of technology–human capital interaction. Using the business-focused work personality data of 4758 human resources engaged in 72 high-tech European firms, Caputo et al. (2019) find evidence of a significant relationship between work motivation and social competencies and the firms' economic performance. In addition, firms' investment in big data mediates the relationship between the organisational behaviour of human resources and firms' economic performance (Caputo et al., 2019). However, the effects of digitalisation on the firm performance of an organisation in the short, medium, or long run depend on its product life cycle and industry (Lichtenthaler, 2020). For example, the information technology industry has a shorter product life cycle, which means rapid technology adoption. For other sectors, such as construction, services, agriculture, or public administration, the uptake would be slower.

Innovative HRM can be a predictor of organisational innovation and a source of competitive advantage. Achieving this requires a fundamental paradigm shift in the way employees work and become innovative. In the new economy, the innovative process of an organisation is increasingly driven by digital talent, who demand more autonomy, purpose, ownership, and flexibility" (Veile et al., 2020, p. 36). A study by Kar et al. (2021) highlights the talent management behaviour of firms, suggesting that as finding new talent becomes challenging in supporting digital transformation, organisations prioritise in-house talent development to meet upcoming needs. Successful digital transformation requires building innovative digital teams characterised by various team-based levers, such as diverse and targeted team composition, iterative goal setting, continuous learning, and talent management (Guinan et al., 2019). Additionally, communication competencies and digital competencies play a significant role in shaping employee readiness for the future of work (David et al., 2024).

Diversity management is one of the key pillars of HRM. Walkowiak (2021) finds that digital technologies support HR practice for better inclusion of neuro-diverse workers. Management team characteristics, such as diversity and the average education level of the top management team (TMT), affect firms' digital orientation positively (Walkowiak, 2021). Walkowiak (2021) focuses on the importance of safety and suggests that the working condition of employees influences innovation practises. A new and emerging area of research on HR digitalisation focuses on green innovation. El-Kassar and Singh (2019) highlight that integrating big datawith HR practises enhances the environmental performance of firms. Based on 1750 listed industrial enterprises for 2011–2020, Wang et al. (2024) find that digital transformation significantly improves the green innovation of companies. Digital transformation has the potential to influence all areas of green innovation, including green

technology innovation (GTI), green process innovation (GPI), and green management innovation (Wang et al., 2024).

4.3. COVID-19 Adaptive Human Resource Management

COVID-19 has profoundly shaken the HRM landscape, offering new insights into crisis management, handling furloughs and layoffs, supporting remote work and collaboration, and addressing employee welfare (Hamouche, 2023). Digital technologies have emerged as a central lever to cope with this "grand challenge", driving a new wave of innovation, resilience, and adaptability in human resource practises (Carnevale & Hatak, 2020).

A key lesson learned from COVID-19 is the necessity of continuously learning and fostering creativity to adapt to uncertain external conditions. In the early twentieth century, Joseph Schumpeter alluded to the concept of "Creative destruction", which describes a process in which "old fashioned means of doing things to be buried in tandem with emerging creativity–this is to make sure that human ways of doing things in the of new technologies supersede that of preceding innovations, through the ingenuity of human creativity" (Jackson, 2021, p. 11). COVID-19 exemplifies this disruptive power. During the pandemic, as remote work and virtual collaboration became a norm, widespread adoption and acceptance of digital technologies speeded up. However, challenges persisted in boosting workers' productivity, collaboration, and innovation. Remote work and flexibility remain an integral part of business in the post-COVID era, with studies showing evidence that emerging technologies are helping companies to recover from COVID-19 shock, delivering strategic advantage (Cumba et al., 2024). Employee productivity increases with the increase in work flexibility, enabled by digital technologies. As technologies continue to disrupt the way people work, adaptation to these technologies requires skilling and reskilling workers to align with the changing roles. Overall, COVID-19 has not only transformed work practises but also laid the foundation for a more agile, productive, and technology-driven human resource management system (García-Fernández et al., 2024).

5. Conclusions, Future Directions, and Limitations

Typical models of digital maturity, such as CMM, focus on human-centric approach to digital transformation. However, there is limited application of maturity models in the HRM context. The literature review above indicates that HR departments are increasingly using different types of technology to recover from the COVID-19 crisis. Emerging technologies, such as AI, machine learning, blockchain (Yi et al., 2020), big data and predictive analytics (Al-Shammari et al., 2024), Virtual and Augmented reality (Krithika et al., 2019), and robots (Vrontis et al., 2021), are being adopted in the HR system. There are significant benefits of AI analytics and machine learning tools in HRM, including the efficiency of the HR process, reducing mistakes, prediction of future behaviour, and promotion of creativity and innovation (Budhwar et al., 2023; Chowdhury et al., 2023). While the value of these technologies can be significant in terms of improving efficiency, there is a need to improve people's capability surrounding the technologies (Park et al., 2021). A recent review by Palos-Sánchez et al. (2022) indicates that AI is increasingly used in recruitment and selection, while innovative use of this technology remains underexplored. There is a lack of an inclusive technology execution framework in HRM (Kaushal et al., 2023).

The analysis in the preceding section highlights three motor themes influencing the digital maturity of HR. They are: (1) Digital Transformation and Competition, (2) Innovation and Performance Management, and (3) COVID-19 Adaptive Human Resource Management. These findings underscore the multi-dimensionality of the digital maturity of HR. Therefore, just building technology capabilities is not enough. HR departments need to embrace a

comprehensive approach, fostering innovation and enhancing capabilities of adaptive management practises to sustain HR's competitive advantage.

Improving the digital maturity of HR requires attention to several critical factors. These include HR strategy and governance; talent management, diversity, and safety; employee adoption and competencies; conflict resolution and stakeholder engagement; and HR practitioners' competencies. Building capabilities in these areas will help the HR departments to navigate the complexities of a digitally transformed workplace and realise the benefits of HR digital transformation. Strategic investment in these pillars is essential not only to facilitate organisational adaptation to digital transformation but also for harnessing the benefits of emerging technologies to drive innovation and long-term success in the post-COVID era. These efforts are vital to future-proof the success of HRM in the increasingly volatile and competitive environment.

Finally, the current study is not without limitations. This paper relies on published journal articles from Scopus and Web of Science. As of now, academic literature directly focusing on the digital maturity of HR remains limited. Digital maturity is an applied concept, and it has been used widely in practice. Therefore, consideration of other sources of data, for example, Google Scholar, EBSCOhost, industry reports, books and book chapters, and conference proceedings, could potentially provide valuable insights. These issues can be addressed in future research.

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