

Human Resource Development in the Digital Era: A Transformation and Competence Adaptation

Human Resource
Development in the
Digital Era

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ABSTRACT

Digital transformation has become a key catalyst in reshaping human resource management practices, requiring organizations to continuously adapt employee competencies in response to rapid technological change. This study aims to examine the relationships between digital transformation, competency adaptation, and human resource development in contemporary organizational settings. The research adopts a qualitative design using a systematic literature review approach, synthesizing evidence from 50 reputable peer-reviewed journal articles published between 2020 and 2025. The findings indicate that organizational agility, leadership, and technological readiness serve as major antecedents enabling effective digital adaptation in human resource development. The results further show that digital transformation contributes to improved employee competencies, stronger innovation capability, and more sustainable workforce performance. However, the review also identifies several challenges, including technostress, digital fatigue, and job insecurity, particularly when digital initiatives are implemented without sufficient human-centered strategies. Overall, the findings highlight that successful human resource development in the digital era depends on a balanced integration of technological advancement, human capabilities, and ethical digital governance. This study offers a theoretical contribution by proposing an integrated framework linking digital transformation, competency adaptation, and human resource development, while also providing practical insights for organizations in designing adaptive, inclusive, and sustainable digital transformation strategies.

Keywords: Competency Adaptation, Digital Transformation, Human Resource Development, Organizational Agility, Technological Readiness.

INTRODUCTION

The rapid development of digital technology has brought substantial changes to many aspects of life, including Human Resource (HR) management within organizations. The digital era is characterized by the growing use of information technology, automation, and artificial intelligence, which have fundamentally transformed organizational work patterns and employment relationships (Mann & Mann, 2025). These changes have encouraged organizations to undertake continuous digital transformation in order to remain competitive in an increasingly dynamic business environment. In this context, human resources play a strategic role as a key factor in responding to and managing technological change. Adaptive and competent human resources represent a strategic asset that determines an organization's ability to innovate and sustain competitive advantage amid ongoing technological disruption (Dessler, 2023).

Digital transformation also requires a paradigm shift in Human Resource Development (HRD). Development processes that previously focused mainly on improving conventional technical skills must now be expanded to include digital

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technology mastery, analytical thinking, and data literacy. Armstrong and Taylor (2023) explain that HR development in the digital era is not only intended to enhance individual performance but also to foster a culture of continuous learning that supports organizational agility. Therefore, Upadhyay (2024) explains that organizations are required to adopt digitally based development approaches, such as e-learning, Learning Management Systems (LMS), and simulation-based training, to ensure alignment with future organizational needs.

In addition to technical competencies, the success of HR development in the digital era is strongly influenced by the ability to adapt to increasingly dynamic work environments. Marler and Boudreau (2017) argue that digital transformation has reshaped traditional employment relationships, making them more flexible, collaborative, and data-driven. This shift requires organizations to embed digital mindsets and innovation values into every learning and development process. In this regard, reskilling and upskilling programs are essential to ensure that the workforce possesses competencies aligned with the demands of the digital labor market. The World Economic Forum (2023) estimates that more than 60% of the global workforce will need to upgrade their skills to remain relevant amid rapid technological advancement.

Furthermore, strategic leadership becomes increasingly critical for guiding digital transformation and HR development initiatives. Kampoowale et al. (2025) emphasize that the success of digital transformation depends largely on leadership capability in managing change and integrating technology with human development. Organizational leaders are expected to act as digital leaders who possess clear vision, empathy, and the ability to leverage technology to enhance both productivity and employee well-being. According to Parry and Battista (2023), successful digital transformation consistently involves leadership that balances technological innovation with human development. Zhang and Chen (2024) argue that technology primarily serves as a tool, while human resource development is the main driver of value creation within organizations.

Based on the discussion above, HR development in the digital era represents a strategic necessity for organizations seeking to survive and grow amid intense global competition. Accordingly, this study aims to systematically review the relationship between digital transformation, competency adaptation, and HR development using the Systematic Literature Review (SLR) method following the PRISMA framework. Through this approach, the study is expected to provide both theoretical and empirical insights that strengthen the HR management literature in the digital era, while also serving as a foundation for organizations to design sustainable and future-oriented competency development strategies aligned with technological advancement and organizational transformation.

LITERATURE REVIEW

Learning Organization Theory

The Learning Organization theory introduced by Liu et al. (2025) describes how an organization can continuously adapt, grow, and innovate through ongoing learning processes at the individual, team, and organizational levels. In the context of Human Resource Development (HRD) in the digital era, this theory is highly relevant, as it emphasizes fostering a dynamic learning culture to respond to rapid, complex technological change. Senge identifies five core disciplines of a learning organization: personal mastery, mental models, shared vision, team learning, and systems thinking. These five components serve as the foundation for organizations to develop new competencies aligned with the challenges of the digital era.

According to Rony et al. (2025), a learning organization enables everyone within the organization not only to adapt to change but also to create change through reflective and collaborative learning. In the digital era, where technologies such as artificial intelligence, big data, and automation continue to evolve, the ability to learn and adapt becomes central to HR development. Employees today require not only technical skills but also systemic thinking, cross-disciplinary collaboration, and continuous innovation. In other

words, this theory underscores that learning is a strategic process for maintaining organizational competitiveness in the digital age.

Learning Organization and HR Development in the Digital Era

HRD in the digital era requires a fundamental shift in how organizations build competencies, manage talent, and stimulate innovation. Learning organization theory is highly relevant in this context, as it provides a conceptual framework for creating an environment that supports continuous learning amid ongoing digital disruption (Rony et al., 2025). In a rapidly changing technological landscape, organizations must ensure that employee competencies are continuously updated to match industry demands. The concept of personal mastery within learning organization theory highlights individuals' commitment to lifelong learning and self-development, which aligns with the growing need for digital literacy, data analytics capabilities, and adaptive thinking skills in modern workplaces. A strong learning culture enables organizations to maintain workforce relevance and competitiveness as technology evolves (Liu et al., 2025).

In addition, learning organizations emphasize team learning, referring to the collective ability of teams to think, learn, and solve problems together. Within HR development, this principle supports the creation of collaborative environments that encourage knowledge sharing and idea exchange. In the digital era, innovation increasingly arises from cross-functional collaboration and virtual teamwork. As a result, learning organization principles enhance organizational capacity to foster collective innovation and strengthen competitive performance (Sakti et al., 2025)

Furthermore, systems thinking, one of the core disciplines, allows organizations to recognize the interdependence between technology, people, and work processes. This perspective is essential in digital contexts, where digitalization can influence organizational structures, culture, and working patterns. Consequently, HR development should address not only technical skill enhancement but also employees' mental and cultural readiness for digital transformation (Wulandari et al., 2025). The discipline of shared vision further emphasizes the importance of developing collective goals that are embraced across the organization. In digital HR development, a shared vision encourages commitment to building digital competencies and supports active participation in organizational transformation. Therefore, learning organization theory offers a strong conceptual foundation for understanding HR competency adaptation in the digital era.

Human Resource Development in the Digital Era

HRD in the digital era plays a crucial role in shaping individuals and organizations that can respond to technological advancement and globalization. The rapid development of the digital environment has significantly transformed how people think, work, and interact, leading HRD to focus on enhancing digital competencies, analytical thinking, creativity, technology-based communication, and emotional intelligence (Zhang & Chen, 2024). This process encourages individuals to utilize technology to improve productivity, expand knowledge, and generate innovation across various fields. HRD is implemented through digital training programs, online learning platforms, and data-driven work systems, supported by an adaptive organizational culture that enables active participation in digital transformation. Competency adaptation is therefore essential to ensure workforce relevance amid rapidly changing industry demands, while also supporting the development of a resilient and flexible workforce capable of creating organizational value.

HRD in the digital era is influenced by a range of interconnected internal and external factors, particularly technological advancement, which reshapes work systems, learning methods, and communication patterns (Zhang & Chen, 2024). Education and training initiatives, organizational policies, a clear digital vision, and strong managerial support through training facilities, incentives, and career development opportunities significantly determine workforce readiness for digital transformation. Innovative and creative approaches are required to support HRD in an environment characterized by rapid technological change. Innovation involves continuous improvement of management

practices and digital-based work processes, including the adoption of artificial intelligence to enhance efficiency and innovation capacity. Digital transformation in HR management has become a strategic necessity, emphasizing the development of digital competence, adaptive learning systems, and creative work cultures that support collaboration. Nevertheless, HRD faces challenges such as competency gaps, limited digital literacy, resistance to change, and inadequate technological infrastructure, while global dynamics further demand high workforce adaptability (Nawaz et al., 2025).

RESEARCH METHODS

This study employs a Systematic Literature Review (SLR) approach to examine and synthesize the relationship between Digital Transformation (DT), Competency Adaptation (CA), and Human Resource Development (HRD) as discussed in prior research. The SLR method was selected because it enables a structured and comprehensive mapping of the existing literature, allowing for the identification of key themes, research trends, and knowledge gaps related to HR development in the digital era (Snyder, 2019). In addition, this approach facilitates the integration of empirical and conceptual findings, thereby strengthening both theoretical understanding and practical insights in digital HR management. The data were collected from peer-reviewed journal articles published between 2020 and 2025 and sourced from reputable academic databases, including Scopus, ScienceDirect, Emerald Insight, SpringerLink, Web of Science, and Google Scholar. The literature search employed relevant keywords such as “digital transformation,” “competency adaptation,” “human resource development,” “digital hrm”, and “workforce capability in the digital era,” combined using Boolean operators (AND, OR) to ensure comprehensive coverage.

The inclusion criteria comprised English-language, full-text journal articles published in reputable outlets that explicitly addressed DT, CA, or HRD and provided clear methodological explanations. Studies that were non-scientific, irrelevant to the core variables, or published before 2020 were excluded. The selection process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 framework, consisting of identification, screening, and inclusion stages. Articles were reviewed based on titles, abstracts, and full texts, and their methodological quality was assessed by two independent reviewers.

The selected studies were then analyzed thematically to identify key antecedents and outcomes of HR development in the digital era. The findings were synthesized using a coding matrix to provide an integrated understanding of how digital transformation drives competency adaptation and HR development, while also highlighting directions for future research.

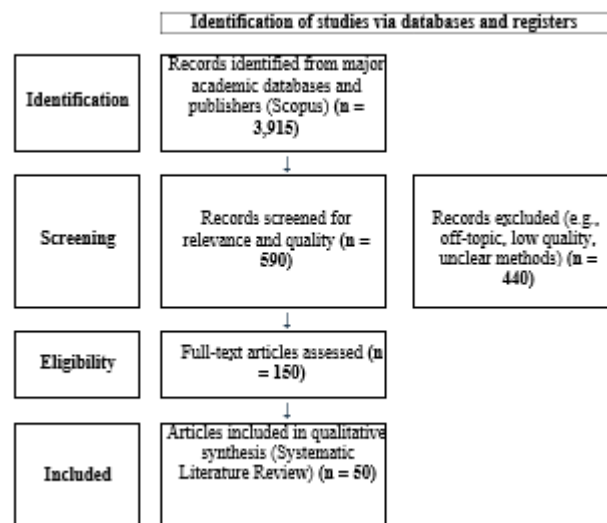


Figure 1. Summary of the Selection Process using the Prisma Framework

Figure 1 shows the journal selection process in this study, systematically conducted using the PRISMA framework to ensure transparency, rigor, and accuracy in identifying and evaluating relevant literature. This approach ensured that only recent, relevant, and scientifically credible studies were included. The selection focused on research examining the relationship between DT, CA, and HRD within the context of organizational development in the digital era.

The initial search across reputable databases, including Scopus, Web of Science, and Google Scholar, yielded 3,915 articles. Applying filters for document type, publication stage, language, and the business, management, and accounting subject area reduced the number to 590. After removing duplicates and irrelevant studies, 312 articles remained for title and abstract screening. 162 were excluded due to off-topic content, low methodological quality, or conceptual ambiguity. The remaining 150 full-text articles were thoroughly reviewed, resulting in 50 high-quality studies included in the qualitative synthesis.

Data analysis was conducted in two stages. The first involved thematic analysis to identify key antecedents (technological readiness, digital infrastructure, leadership support, learning culture, organizational agility, employee adaptability) and consequences (innovation capability, employee performance, digital competence, organizational effectiveness, sustainable workforce transformation) of HR development. The second stage employed trend analysis to map research development by publication year, industry context, methodology, geographical scope, and respondent profiles. This two-stage framework enabled a comprehensive synthesis of trends and highlighted both theoretical and practical implications for sustainable HR development strategies in the digital era.

RESULTS

The studies analyzed in this research comprise 50 scientific articles published in the last five years (2020–2025). These articles were selected using established inclusion and exclusion criteria, focusing on research that examines the relationships among Digital Transformation (DT), Competency Adaptation (CA), and Human Resource Development (HRD) in the context of organizational development in the digital era. To better understand the scope and focus of the analyzed studies, the selected articles were classified according to three main characteristics: publisher, to identify the dominant academic sources of publication; industry sector, to determine the contextual application of DT, CA, and HRD across various fields such as technology, manufacturing, education, and public services; and research method, to categorize whether the studies employed quantitative, qualitative, or mixed-method approaches.

Table 1. Characteristics Based on Publisher

Publisher	Frequency
Springer Nature	9
MDPI (Multidisciplinary Digital Publishing Institute)	8
Science Publishing Corporation Inc.	6
Emerald Publishing	3
Cambridge University Press	2
Small Business Institute	2
Brazilian Journal of Operations and Production Management (ABEPRO)	2
Asian Research Association	2
Qubahan Academic Journal (Qubahan Foundation)	2
Growing Science (Canada)	1
Fondazione Cueim	1
Mukachevo State University	1
Fundação Escola de Comércio Álvares Penteado (FECAP)	1
EconJournals (International Review of Management and Marketing)	1
Vilnius Gediminas Technical University Press	1
Total	50

Table 1 shows that the final dataset comprises 50 academic articles drawn from leading publishers in the fields of digital transformation, competency adaptation, and human resource development. Springer Nature (9) and MDPI (8) remain the dominant sources, indicating their consistent contribution to scholarly dialogues on organizational transformation and digital capability building. Science Publishing Corporation (6) and Emerald Publishing (3) follow closely, reflecting the strong presence of empirical HR and performance-based research in open-access and Scopus-indexed journals. Publishers such as Cambridge University Press, Small Business Institute, and ABEPRO contribute valuable regional and sectoral perspectives linking leadership, digital skills, and sustainability to organizational learning. Together, these sources illustrate the global distribution and multidisciplinary breadth of research in digital-era HR development.

Table 2 shows that the 50 analyzed studies span multiple industry sectors, reflecting the wide applicability of DT, CA, and HRD in both public and private contexts. The manufacturing and industrial technology sector (9 studies) dominates the dataset, indicating its pivotal role in implementing digital transformation to improve productivity, innovation capability, and workforce agility. The education and academic sector (7) follows closely, highlighting research interest in digital pedagogy, e-learning, and human capital development.

The banking and financial services sector (6) contributes significant insights into fintech, blockchain integration, and digital HRM practices in finance. Meanwhile, the public sector (5) and SMEs (5) reflect a growing recognition of the need for digital capacity-building across governance and entrepreneurship. Emerging fields such as agriculture, sustainability, and healthcare demonstrate how digital transformation reshapes traditional industries, integrating human capital development into strategic innovation. The sectoral distribution underscores that digital transformation and HR development are increasingly viewed as cross-industry imperatives for competitiveness and sustainable growth in the digital era.

Table 2. Characteristics of Research on Digital Transformation, Competency Adaptation, and HRD

Industry Sector	Frequency
Manufacturing and Industrial Technology	9
Education and Academic Institutions	7
Banking and Financial Services (Fintech, Digital Banking)	6
Public Sector and Government Administration	5
Small and Medium Enterprises (SMEs)	5
Healthcare and Hospital Management	4
Information Technology (IT) and Software Development	4
Agriculture and Rural Development (AgriTech)	3
Energy, Environment, and Sustainability	3
Hospitality and Tourism	2
Non-Governmental Organizations (NGOs) and Nonprofits	2
Total	50

Table 3 presents the methodological distribution of the analyzed studies, showing that quantitative approaches (28 studies) dominate the research on DT, CA, and HRD, reflecting the field's strong reliance on empirical measurement and model testing using techniques such as SEM-PLS, regression, and correlation analysis. A substantial number of studies employed SLR and conceptual analyses (12), emphasizing theoretical synthesis and framework development on digital capability, learning agility, and organizational adaptation. Qualitative approaches (7), often utilizing interviews or case studies, provide deeper contextual insights into leadership, digital HR strategies, and employee experience. Meanwhile, mixed-method designs (3) indicate a growing integration of quantitative validation and qualitative interpretation to produce more comprehensive conclusions. The methodological landscape demonstrates that digital transformation and HR development research are becoming increasingly multidisciplinary, with quantitative rigor complemented by conceptual and exploratory insights.

Table 3. Characteristics based on Research Method

Research Method	Frequency
Quantitative	28
Systematic Literature Review / Conceptual Study	12
Qualitative	7
Mixed Methods (Quantitative–Qualitative)	3
Total	50

Table 4 shows the antecedents identified across the 50 reviewed articles emphasize that organizational factors such as leadership, digital culture, and HRM strategy are the most dominant drivers of digital transformation and HR development. Technological enablers, including AI, HRIS, fintech, and data analytics, emerge as key mediators facilitating competency adaptation and workforce agility. Meanwhile, individual-level antecedents like adaptability, digital competence, and engagement reflect how personal attributes underpin effective transformation initiatives. Lastly, socio-demographic dimensions, particularly gender inclusion, generational shifts, and educational disparities, highlight contextual nuances shaping how organizations implement and sustain HR digitalization efforts.

Table 4. Classification of Antecedents of DT, CA, and HRD

Main Category	Example Sub-Factors	Sample Articles
Organizational Factors	Leadership style, learning culture, HRM strategy, change management, organizational agility, innovation climate, strategic alignment, sustainable HR practices	Ajith et al. (2024); Krajcsák & Bakacsi (2025); Annosi et al. (2025); Sacavém et al. (2025); Khan & Emon (2025); Nawaz et al. (2025); Gentile (2025); Al-Hmesat et al. (2025); Rony et al. (2025); Ahmić & Ćosić (2025)
Technological Factors	Digital literacy, AI and automation adoption, HRIS, metaverse learning, fintech and blockchain, data analytics, Industry 4.0 integration	Liu et al. (2025); Garg et al. (2025); Tedyono et al. (2025); Mamanazarov et al. (2025); Caiado et al. (2025); Sakti et al. (2025); Bian et al. (2025); Ungratwar et al. (2025); Khan et al. (2025); Li et al. (2025)
Individual Factors	Competence development, adaptability, digital skills, psychological resilience, motivation, job satisfaction, empowerment, employee engagement	Veith et al. (2025); Aldossari (2025); Stachová et al. (2025); Minciu et al. (2025); Prabandari et al. (2025); Veltman & Majoor-Kozlinska (2025); Wulandari et al. (2025); Salameh-Ayanian et al. (2025); Wang et al. (2025); Nascimento et al. (2025)
Socio-Demographic Factors	Gender, generational differences, cultural values, employee background, sectoral context, education level, and social empowerment	Aldossari (2025); Saraiva & Nogueiro (2025); Avallone et al. (2025); Shcherban et al. (2025); Alshammari (2025); Olowofela et al. (2025); Nascimento et al. (2025); Mamanazarov et al. (2025); da Silva et al. (2025); Zolak Poljašević et al. (2025)

Based on Table 5, the positive consequences are reflected in the improvement of organizational performance, the enhancement of employee competencies, and the strengthening of psychological well-being and job satisfaction (Alokshe et al., 2025; Minciu et al., 2025; Annosi et al., 2025; Liu et al., 2025). Numerous studies indicate that digital transformation, when combined with effective competency development strategies, fosters productivity, creativity, and adaptability in increasingly dynamic business environments. Additionally, digital adoption and human resource capability development have been shown to enhance loyalty, engagement, and organizational commitment (Zervas & Stiakakis, 2025; Nascimento et al., 2025). Some studies further emphasize that digital transformation also promotes gender equality and women’s empowerment in the workplace, while reinforcing sustainability-oriented HRM practices (Aldossari, 2025; Silvestre et al., 2025; Nogueiro & Saraiva, 2025).

Table 5. Classification of Positive Consequences

Positive Consequences	Example Sub-Factors	Sample Articles
Enhanced Organizational Performance	Increased productivity, efficiency, innovation, and competitiveness	Alokshe et al. (2025); Khan & Emon (2025); Huynh Thi Thu et al. (2025); Nawaz et al. (2025)
Employee Competence and Career Growth	Skills upgrading, lifelong learning, career advancement, and capability enhancement	Prabandari et al. (2025); Al-Hmesat et al. (2025); Wulandari et al. (2025); Gentile (2025)
Psychological Well-Being and Job Satisfaction	Work engagement, motivation, emotional well-being, and reduced burnout	Minciu et al. (2025); Veith et al. (2025); Veltman & Majoor-Kozlinska (2025); Salameh-Ayanian et al. (2025); Liu et al. (2025)
Employee Retention and Commitment	Organizational loyalty, affective commitment, and reduced turnover intention	Annosi et al. (2025); Zervas & Stiakakis (2025); Nascimento et al. (2025); Stachová et al. (2025)
Innovation and Agility	Digital innovation, adaptability, creativity, agile responsiveness	Caiado et al. (2025); Mamanazarov et al. (2025); Rubio-Andrés et al. (2024); Avallone et al. (2025)
Gender Equality and Empowerment	Women's participation, empowerment, and inclusive decision-making	Aldossari (2025); Alshammari (2025); Saraiva & Nogueiro (2025); Zolak Poljašević et al. (2025)
Sustainability and Social Responsibility	Sustainable HR practices, green innovation, ethical behavior, ESG alignment	Silvestre et al. (2025); da Silva et al. (2025); Olowofela et al. (2025); Nascimento et al. (2025); Bian et al. (2025)

Table 6 presents several articles that also identify negative consequences, particularly when digital transformation and competency adaptation are implemented without sufficient institutional support or individual readiness. These adverse effects include digital fatigue, technostress, job insecurity, and social isolation, which arise from high adaptation demands and continuous technology exposure (Veith et al., 2025; Bian et al., 2025; Zolak Poljašević et al., 2025; Saraiva & Nogueiro, 2025; Salameh-Ayanian et al., 2025). In many cases, constant digital connectivity leads to emotional exhaustion and challenges in maintaining work-life balance. Moreover, several studies highlight ethical and psychological tensions, particularly regarding data privacy and digital surveillance in the workplace (Mamanazarov et al., 2025).

Table 6. Classification of Negative Consequences

Negative Consequences	Example Sub-Factors	Sample Articles
Digital Fatigue and Burnout	Cognitive overload, emotional exhaustion, digital fatigue, and information stress	Veith et al. (2025); Saraiva & Nogueiro (2025); Minciu et al. (2025); Salameh-Ayanian et al. (2025)
Technostress and Work Overload	Role ambiguity, job strain, and pressure to adapt to new systems	Bian et al. (2025); Gentile (2025); Alshammari (2025); Caiado et al. (2025)
Job Insecurity and Anxiety	Fear of automation, uncertainty of roles, and digital skill mismatch	Zolak Poljašević et al. (2025); Annosi et al. (2025); Gelencsér et al. (2025); Wang et al. (2025)
Social Isolation and Disengagement	Reduced interpersonal communication and weakened team cohesion	Veith et al. (2025); Saraiva & Nogueiro (2025); Aldossari (2025); Nawaz et al. (2025)
Ethical and Psychological Tensions	Data privacy concerns, ethical dilemmas, emotional detachment	Bian et al. (2025); Silvestre et al. (2025); Mamanazarov et al. (2025)

DISCUSSION

The systematic review of fifty peer-reviewed studies indicates that the success of Digital Transformation (DT), Competency Adaptation (CA), and Human Resource Development (HRD) is largely influenced by the dynamic interplay among organizational, individual, technological, and socio-demographic factors. From an organizational perspective, leadership, digital learning culture, and strategic agility serve as key enablers that drive effective transformation (Khan & Emon, 2025; Annosi et al., 2025). Organizations that promote continuous learning and empower employees through

structured HRD initiatives tend to achieve higher adaptability and innovation. These findings extend earlier conceptualizations (Marler & Boudreau, 2017; Parry & Battista, 2023) by demonstrating that post-2020 digital acceleration has intensified the mediating role of organizational agility and learning culture in converting technological investments into sustainable human capital advantages. Conversely, digital strategies that lack clear direction or are misaligned with employee needs often result in pseudo-agility, manifesting as work overload, technostress, or digital fatigue (Veith et al., 2025; Liu et al., 2025).

At the individual level, digital competence, psychological readiness, and adaptive resilience are critical capabilities shaping employees' responses to digital transformation (Prabandari et al., 2025; Stachová et al., 2025). Inadequate digital literacy or emotional regulation increases vulnerability to burnout, job insecurity, and reduced motivation, particularly in high-demand technological environments (Zolak Poljašević et al., 2025; Saraiva & Nogueiro, 2025). Competency adaptation is thus both a technical and psychological process, requiring continuous support, feedback, and reinforcement from organizational leadership and HR systems. Technology, while enabling flexibility and performance enhancement, also introduces pressures associated with an "always-on" digital culture. Constant connectivity often blurs work-life boundaries, increasing emotional strain and digital fatigue (Salameh-Ayanian et al., 2025; Mamanazarov et al., 2025). Socio-demographic factors, such as gender, generation, and professional background, further influence digital adaptation experiences. Younger employees and women in emerging markets often face disproportionate challenges in digital upskilling and access to leadership roles, despite technology's democratizing potential (Aldossari, 2025).

Taken together, these results reinforce and extend dynamic capability theory by positioning competency adaptation as a crucial micro-foundation of sensing, seizing, and transforming capabilities in digital contexts, while also supporting socio-technical systems theory through evidence that technological subsystems must be continuously realigned with social subsystems to prevent negative outcomes (Annosi et al., 2025). The findings confirm that DT and HRD represent a holistic evolution of the organization rather than mere technological upgrades. Success depends on harmonizing technological innovation, human capability development, and ethical digital governance. Organizations that invest in employee well-being, empowerment, and inclusive digital ecosystems tend to cultivate sustainable, high-performing workforces (Zervas & Stiakakis, 2025).

Despite these insights, research gaps remain. Most empirical studies focus on large organizations in developed economies, leaving SMEs and public institutions in emerging markets underexplored (Khan & Emon, 2025; Olowofela et al., 2025). Cognitive and cultural dimensions of digital adaptation, ethical concerns around algorithmic bias in HR systems, and the long-term effects of hybrid/remote work arrangements remain insufficiently examined, with limited longitudinal evidence on HRD outcomes overall.

Theoretically, this review contributes an integrated multi-level framework that can guide future extensions of dynamic capability and socio-technical theories in digital HR contexts. Practically, organizations should (1) implement regular digital wellness audits and protected "tech-free" periods to reduce fatigue, (2) design personalized upskilling pathways that combine technical training with psychological resilience programs, (3) appoint digital champions at all hierarchical levels to bridge generational and gender gaps, and (4) embed ethical AI governance into HR policies from the outset. When these human-centered measures are prioritized alongside technological rollout, digital transformation becomes a source of sustained competitive advantage rather than a trigger for employee exhaustion.

CONCLUSION

This systematic review indicates that DT, CA, and HRD are interconnected strategic imperatives that shape organizational sustainability and competitiveness. The findings reveal that successful digital transformation relies not only on technological readiness but

also on the continuous alignment of human capabilities, organizational culture, and ethical digital governance. Effective implementation of DT and CA enhances innovation, productivity, and employee well-being by creating an adaptive workforce, whereas poorly managed digitalization can lead to burnout, technostress, and job insecurity, highlighting the need for balanced digital ecosystems.

Organizations should develop clear and inclusive digital work policies, provide continuous learning opportunities, and strengthen leadership roles in guiding digital adaptation. Investments in digital literacy, psychological resilience, and ethical awareness are essential for supporting employees in managing change while maintaining well-being. Regular evaluation of workload distribution, combined with mentoring and psychological support, can mitigate digital fatigue and sustain long-term engagement. The review also identifies limitations, including the predominance of studies focused on large organizations in developed economies, with limited evidence from SMEs, public institutions, and developing regions. Moreover, the long-term effects of digital transformation, as well as cognitive and cultural dimensions of adaptation, remain underexplored.

Future research is recommended to employ longitudinal and mixed-method designs, examine diverse cultural and industrial contexts, and integrate interdisciplinary perspectives from psychology, technology management, and human resource studies. Such approaches can provide a more holistic understanding of digital-era work and guide organizations in implementing human-centered, inclusive, and sustainable HRD strategies. This integrated approach ensures that digital transformation promotes both organizational performance and employee well-being in the long term.

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