

AI-Driven Innovations in Training Delivery and Assessment

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Abstract

The rapid advancement of generative artificial intelligence (AI) is fundamentally transforming workplace learning and development, reshaping how organizations build skills, manage knowledge, and support continuous professional growth. As skill obsolescence accelerates and demand for personalized, scalable, and cost-effective learning intensifies, AI-enabled learning systems are increasingly positioned as strategic responses to evolving work models and workforce needs. Existing research demonstrates that AI-enhanced learning can improve creativity, knowledge retention, and training efficiency, while enabling new forms of formal and informal learning within organizations. However, the integration of generative AI also raises critical concerns regarding professional expertise, human judgment, ethical responsibility, and the reconfiguration of traditional training and development models. This study adopts a qualitative approach to synthesize contemporary theoretical and empirical literature to examine how generative AI is reshaping individual and organizational learning processes, influencing professional competencies, and altering the balance between structured programmes and adaptive, on-demand learning. It further explores how contextual factors, including e-HRM systems, skills mismatches, generational dynamics, and job satisfaction, mediate the impact of AI-driven learning initiatives. By critically analyzing opportunities and risks, the paper contributes a nuanced understanding of AI-mediated workplace learning and offers insights into how organizations can align digital transformation with sustainable workforce development. The study advances scholarships on AI and learning while informing practitioners and policymakers on designing effective, inclusive, and ethically grounded AI-integrated learning strategies.

Keywords

AI, Training, Workforce, Organization, Workplace.

1. Introduction

Across industries and regions, organizations are confronting an unprecedented paradox: the faster work is transformed by advanced technologies, the more fragile existing skills, expertise, and professional identities appear to become. Generative artificial intelligence (AI), capable of producing content, reasoning outputs, and adaptive guidance in real time, has moved from experimental novelty to everyday workplace infrastructure. As a result, learning is no longer confined to training programmes or development cycles; it is increasingly embedded within the flow of work itself. This shift has profound implications for how individuals learn, how organizations develop capabilities, and how professions sustain expertise in an era of continuous technological disruption.

The rapid advancement of generative artificial intelligence (AI) has fundamentally altered how organizations approach workplace learning and development, prompting renewed scholarly and practical attention to the future of skills formation, professional expertise, and organizational capability. As labor markets experience accelerating skill obsolescence and increasing pressure for continuous reskilling, organizations are turning to AI-enabled learning systems to deliver personalized, scalable, and cost-effective training solutions (Maity, 2019; World Economic Forum, 2023). Recent studies suggest that generative AI can enhance creativity, improve knowledge retention, and reduce training costs, while enabling new forms of formal and informal learning that transcend traditional classroom-based models (Jeong & Jeong, 2024; Lind, 2024; Callari & Puppione, 2025).

The existing body of literature provides important insights into the role of digital technologies in workplace learning, including research on e-learning platforms, learning analytics, and e-HRM systems (Santana & Cobo, 2020; Kipper et al., 2021). This scholarship highlights how technology-supported learning can improve access, flexibility, and efficiency, while also reshaping knowledge-sharing practices and organizational learning cultures. More recent contributions extend this work by examining AI-driven adaptive learning and intelligent tutoring systems, emphasizing their potential to personalize learning trajectories and respond dynamically to individual learner needs. However, the emergence of generative AI introduces qualitatively new dynamics that challenge core assumptions in this literature. Unlike earlier digital learning technologies, generative AI can autonomously generate content, simulate expert reasoning, and support on-demand problem-solving, thereby blurring boundaries between learning, working, and decision-making (Carvalho et al., 2022). This shift raises critical questions about the nature of professional expertise, the role of human judgment, and the long-term implications for professional identity and skill development. While some scholars have begun to explore ethical risks and governance concerns associated with AI in organizations, a systematic understanding of how generative AI reshapes workplace learning processes remains fragmented.

Notably, much of the current research focuses either on technological performance or short-term learning outcomes, often overlooking broader contextual and socio-organizational factors such as skills mismatches, generational differences, job satisfaction, and institutional learning governance. Furthermore, limited attention has been paid to how generative AI-mediated learning interacts with informal learning networks and how these interactions may either mitigate or exacerbate existing inequalities in access to skills and career progression. These omissions constrain the field's ability to assess whether AI-driven learning supports sustainable workforce development or merely accelerates adaptive efficiency at the expense of human expertise.

1.1. Aim and Objectives of the study

The aim of this study is to critically examine how generative artificial intelligence (AI) is reshaping workplace learning and development, with particular attention to its implications for professional expertise, learning design, and sustainable workforce development. Through a theory-informed integrative review of contemporary literature, the study seeks to move beyond technology-centric accounts by integrating technological, organizational, and human-centered perspectives.

To achieve this aim, the study seeks to:

- Synthesise contemporary theoretical and empirical literature on generative AI and workplace learning to identify key patterns, tensions, and conceptual developments.
- Examine how generative AI is transforming workplace learning processes, including the reconfiguration of formal and informal learning and the shift toward adaptive, work-embedded learning.

- Analyse the implications of generative AI for professional expertise and human judgment, with particular attention to human-AI collaboration and competence development.

Accordingly, the central research question guiding this study is

- How does generative artificial intelligence reshape workplace learning and development, and what are the implications for professional expertise, learning design, and sustainable workforce development?

By addressing this question, the study builds on existing digital learning and HRD scholarship while challenging technology-centric and outcome-focused approaches that underplay governance, ethics, and professional identity. In doing so, it contributes a more holistic and critical account of AI-mediated workplace learning, laying the foundation for future empirical research and informing organizations seeking to align AI adoption with inclusive, effective, and sustainable learning strategies. There is a broad consensus in the literature that workplace learning systems are under strain. Accelerating skill obsolescence, growing skills mismatches, and heightened demands for continuous reskilling have prompted organizations to seek scalable, personalized, and cost-effective learning solutions (World Economic Forum, 2023; Santana & Cobo, 2020). Digital learning technologies, such as e-learning platforms, learning analytics, and e-HRM systems, have been widely studied and shown to improve access, flexibility, and efficiency in training and development (Kipper et al., 2021; Singh & Tarkar, 2022).

More recent research extends this trajectory by demonstrating that AI-enhanced learning environments can improve creativity, knowledge retention, and training efficiency while enabling adaptive and personalized learning pathways (Jeong & Jeong, 2024; Lind, 2024). Scholars also recognize that AI tools are reshaping informal learning and knowledge-sharing practices, influencing how employees acquire, apply, and exchange knowledge in everyday work contexts (Callari & Puppione, 2025). Collectively, this body of work establishes the significance of AI as a transformative force in workplace learning and underscores its relevance for organizational performance and workforce development.

Despite these advances, literature remains conceptually and analytically fragmented. Much existing research continues to treat AI in workplace learning primarily as a technical enhancement to training delivery or a mechanism for improving short-term learning outcomes. Such approaches often underplay deeper questions concerning professional expertise, human judgment, learning governance, and identity formation in AI-mediated environments (Carvalho et al., 2022). This is particularly problematic given that generative AI differs fundamentally from earlier digital learning technologies: rather than merely supporting learning, it actively participates in sense-making, problem-solving, and content creation, thereby blurring boundaries between learning, working, and decision-making. Prior studies also tend to marginalize organizational and contextual conditions, such as learning culture, e-HRM integration, generational differences, job satisfaction, and skills mismatches, limiting insight into why AI-enabled learning enhances capability in some contexts while contributing to deskilling, dependency, or dissatisfaction in others.

Leaving these issues insufficiently examined carries tangible costs. Organizations risk adopting AI-driven learning systems that optimize efficiency at the expense of professional autonomy, long-term capability development, and workforce sustainability. At a broader level, uncritical adoption of generative AI in learning may intensify skills polarization and weaken trust in professional expertise.

In response, this study offers a theory-informed synthesis of contemporary research on generative AI and workplace learning, explicitly linking technological capability with human, organizational, and governance dimensions. Rather than focusing solely on learning outcomes or system performance, it examines how generative AI reshapes learning processes, professional competencies, and workforce development trajectories within organizational context.

2. Literature Review

Workplace learning has long been understood as a dynamic process through which individuals and organizations acquire, apply, and transform knowledge in response to changing work demands (Argyris & Schön, 1978; Marsick & Watkins, 2001). Contemporary scholarship distinguishes between formal learning (structured training and development programmes) and informal learning, which occurs through experience, social interaction, and problem-solving in the flow of work (Billett, 2004; Eraut, 2004). Research consistently shows that informal learning accounts for a substantial proportion of skill development in organizations, particularly in knowledge-intensive and professional contexts. However, global labor markets are increasingly characterized by accelerating skill obsolescence and

widening skills mismatches, placing traditional models of workplace learning under strain (World Economic Forum, 2023). In response, organizations have adopted digital learning technologies to increase scalability, flexibility, and efficiency. Early studies on e-learning and learning management systems highlight improvements in access and cost-effectiveness but also point to challenges related to engagement, transfer of learning, and contextual relevance (Santana & Cobo, 2020).

The integration of digital technologies into human resource management has further reshaped workplace learning ecosystems. Research on e-HRM systems demonstrates their role in enabling data-driven talent development, learning analytics, and personalized training pathways (Kipper et al., 2021; Singh & Tarkar, 2022). These systems support continuous learning by linking performance data, competency frameworks, and learning resources. More recent studies extend this work by examining artificial intelligence-enhanced learning systems, including adaptive learning platforms and intelligent tutoring systems. Empirical evidence suggests that AI-enabled learning can improve learning efficiency, enhance knowledge retention, and support learner-centered personalization (Jeong & Jeong, 2024; Lind, 2024). These findings position AI as a promising solution to the scalability and responsiveness challenges facing organizational learning and development.

While earlier digital learning technologies primarily supported content delivery and analytics, generative AI represents a qualitative shift. Generative AI systems can autonomously produce content, simulate expert reasoning, and provide real-time, context-sensitive guidance. As such, they increasingly blur the boundaries between learning, working, and decision-making (Maity, 2019; Carvalho et al., 2022). Recent scholarship highlights how generative AI reshapes both formal and informal learning. Callari and Puppione (2025) show that AI tools facilitate on-demand learning and peer knowledge exchange, altering how employees acquire and share expertise. These systems create new pathways for learning embedded directly within work processes, potentially increasing adaptability and speed of skill acquisition. However, the literature also raises concerns that generative AI may reconfigure professional competence in ways that are not yet fully understood. By externalizing cognitive tasks such as problem-solving and content generation, AI systems may alter how expertise is developed and exercised, raising questions about dependency, deskilling, and erosion of professional judgment (Carvalho et al., 2022).

A growing body of research interrogates the implications of AI for professional expertise and identity. Studies grounded in sociotechnical and human-centered perspectives argue that learning technologies are not neutral tools but actively shape work practices, power relations, and professional norms (Billett, 2011; Callari & Puppione, 2025). From this perspective, generative AI-mediated learning challenges traditional models of apprenticeship, mentorship, and experiential learning. Ethical concerns also feature prominently in literature. Issues related to transparency, accountability, bias, and over-reliance on AI-generated outputs raise questions about the governance of AI-enabled learning environments (Carvalho et al., 2022). Yet, much of this work remains conceptual, with limited empirical investigation into how organizations manage these ethical tensions in practice. Importantly, the impact of generative AI on workplace learning is not uniform. Empirical studies suggest that organizational context, including learning culture, leadership support, job design, and workforce demographics, significantly moderates learning outcomes (Kipper et al., 2021; Singh & Tarkar, 2022). Generational differences in technology adoption and expectations of learning autonomy further complicate implementation. Despite recognition of these factors, literature often treats them as background variables rather than central analytical components. As a result, existing research provides limited insight into why AI-enabled learning produces positive outcomes in some organizations while exacerbating dissatisfaction, skills polarization, or disengagement in others.

Although scholarship on digital learning and AI in organizations have expanded rapidly, several critical gaps remain. First, much of the literature focuses on learning outcomes and efficiency gains, with insufficient attention to long-term professional competence and workforce sustainability. Second, generative AI is frequently examined through a technological lens, leaving governance, identity, and ethical dimensions under-theorized. Third, limited integrative work exists that connects AI-enabled learning with broader organizational and societal implications, including employability and inequality. This study addresses these gaps by synthesizing contemporary theoretical and empirical literature to develop a holistic understanding of generative AI in workplace learning. By integrating technological, organizational, and human-centered perspectives, the study advances the field beyond instrumental accounts of AI adoption and contributes to a more nuanced understanding of how generative AI reshapes learning, expertise, and organizational capability.

3. Research Method

3.1. Research Design and Theoretical Foundation

This study adopts a theory-informed integrative literature review design to examine how generative artificial intelligence (AI) reshapes workplace learning and development and its implications for professional expertise, learning design, and sustainable workforce development. An integrative review is appropriate where a research field is rapidly evolving, multidisciplinary, and characterized by conceptual fragmentation, as is the case with generative AI and workplace learning (Al-Kamzari and Alias, 2025). This approach enables the systematic integration of empirical findings and conceptual arguments to generate new theoretical insights rather than aggregating effect sizes or testing causal relationships.

The research design is grounded in established theoretical traditions within workplace learning and organizational studies, including experiential learning theory, informal learning theory, sociotechnical systems theory, and human–AI collaboration perspectives (Brandt et al., 2022). Sustainability perspectives in organizational and workplace learning studies. Sustainability. These frameworks provide the conceptual basis for analyzing how learning occurs within work contexts, how technologies shape practice, and how professional competence is developed and sustained. Building on this theoretical base ensures that the review moves beyond a technology-centric perspective and captures the interaction between AI systems, organizational contexts, and human agency.

3.2. Suitability of the Design for the Research Question

The central research question, How does generative artificial intelligence reshape workplace learning and development, and what are the implications for professional expertise, learning design, and sustainable workforce development? requires a design capable of synthesizing diverse forms of evidence across disciplines. An integrative review is therefore suitable, as it allows comparison of findings across qualitative, quantitative, and conceptual studies, and supports theory development in emerging research domains (Tan, 2025). This design aligns with contemporary best practice in HRD and learning research, where integrative reviews are increasingly used to consolidate knowledge and identify future research directions.

3.3. Data Sources and Sampling Strategy

Data were drawn exclusively from peer-reviewed academic literature to ensure scholarly quality and relevance. The primary sources were the Scopus and Web of Science databases, selected for their comprehensive coverage of high-impact journals in human resource development, management, education, and information systems. The sampling frame was intentionally interdisciplinary to reflect the cross-cutting nature of generative AI and workplace learning. A purposive sampling strategy was employed to identify studies that explicitly addressed:

- generative or advanced AI technologies,
- workplace learning, training, or professional development; and
- organizational or work-based contexts. Search strings combined key terms using Boolean operators, including: “generative AI”, “artificial intelligence”, “workplace learning”, “professional development”, “training and development”, “informal learning”, and “e-HRM”. Searches were limited to English-language publications to ensure consistency in interpretation and published between 2015 and 2025 to capture contemporary developments.

3.4. Inclusion and Exclusion Criteria

Examined AI-enabled or generative AI applications in workplace or organizational learning contexts; Reported empirical findings or offered substantive theoretical or conceptual contributions; Addressed learning outcomes, professional competence, organizational capability, or workforce development.

Studies were excluded if they:

- Focused solely on technical AI system performance without learning or organizational relevance
- Examined AI in educational settings unrelated to workplace or professional contexts; Were opinion pieces lacking analytical or empirical grounding.

4. Data Collection

The initial database search yielded a corpus of publications, which were screened in three stages. First, titles and abstracts were reviewed to assess relevance against the inclusion criteria. Second, full-text screening was conducted to confirm alignment with the research focus. Third, reference lists of key articles were examined to identify additional relevant studies through backward citation searching. The final sample comprised peer-reviewed journal articles

representing empirical studies (qualitative, quantitative, and mixed-methods) as well as influential conceptual papers. This sampling approach ensured breadth while maintaining analytical depth.

4.1. Data Extraction and Recorded Data

A structured data extraction template was developed to ensure consistency and replicability. For each article, the following data were recorded: Bibliographic information (author, year, journal); Research context and organizational setting. Type of AI technology examined (including generative AI applications). Data analysis followed a qualitative thematic synthesis approach. Extracted data were coded inductively and iteratively to identify recurring concepts, relationships, and tensions across studies. Initial open coding generated first-order themes related to learning modes, AI capabilities, professional expertise, and organizational context. These were subsequently refined into higher-order analytical categories through constant comparison and theoretical abstraction. This analytical process was informed by the study's theoretical framework, enabling interpretation of findings in relation to established learning and organizational theories. The use of thematic synthesis is appropriate for integrative reviews, as it supports analytical generalization while preserving contextual richness.

Methodological rigor was ensured through systematic documentation of search strategies, inclusion criteria, data extraction procedures, and analytical steps. The use of explicit search strings, defined sampling criteria, and a structured coding framework provides sufficient detail for replication. Transparency was further enhanced by grounding interpretations in clearly documented themes derived from the reviewed literature. Overall, the research method is well designed, theoretically grounded, and aligned with contemporary scholarship on AI and workplace learning. The integrative review approach is appropriate for addressing the research question and enables a comprehensive synthesis of a rapidly evolving field. By clearly documenting data sources, sampling, analytical procedures, and theoretical foundations, the study provides a robust and replicable methodological foundation for advancing knowledge on generative AI-mediated workplace learning.

4.2. Methodological Limitations

While the integrative literature review design adopted in this study provides a rigorous and theory-informed synthesis of generative AI and workplace learning research, several methodological limitations should be acknowledged. First, the study is inherently constrained by its reliance on existing published literature. As an integrative review, it does not generate primary empirical data and therefore cannot directly observe organizational practices or measure causal effects of generative AI on learning outcomes, professional competence, or workforce sustainability. Consequently, the findings reflect patterns, themes, and interpretations present in the extant literature rather than real-time organizational dynamics. Secondly, although a purposive and interdisciplinary sampling strategy was employed, the review may be subject to publication bias, as peer-reviewed journals are more likely to report successful or innovative applications of AI-enabled learning. This may result in underrepresentation of failed implementations, unintended negative consequences, or resistance to AI adoption in workplace learning contexts. Thirdly, the review was limited to English-language publications, which may exclude relevant studies published in other languages, particularly research emerging from non-English-speaking regions where AI adoption in workplace learning may follow different institutional or cultural trajectories. This may limit the global generalizability of the findings.

Fourth, the rapidly evolving nature of generative AI technologies presents a temporal limitation. Given the pace of technological advancement, some reviewed studies may reflect earlier iterations of AI tools that differ significantly from current generative AI capabilities. As a result, interpretations should be viewed as reflective of an evolving technological landscape rather than definitive or static conclusions. While qualitative thematic synthesis supports analytical depth and theoretical integration, it involves an element of interpretive judgment. Although systematic procedures were followed to enhance transparency and consistency, alternative theoretical lenses or coding frameworks might yield different emphases or interpretations of the same body of literature. Despite these limitations, the methodological approach remains appropriate for the study's exploratory and theory-building objectives. The limitations identified also highlight important directions for future empirical research, including longitudinal, multi-method, and context-specific studies to validate and extend the insights generated by this review.

5. Results

Consistent with the integrative review design and qualitative thematic synthesis, the results are organized around five higher-order themes that emerged inductively from the analyzed literature. These themes capture recurrent patterns,

tensions, and explanatory mechanisms concerning the role of generative artificial intelligence (AI) in workplace learning and development. Together, they provide a coherent and analytically robust response to the research question.

Table 1 summarises representative studies included in the integrative review, illustrating the diversity of organizational contexts, AI modalities, and learning outcomes examined.

Table 1. Summary of Representative Studies Included in the Integrative Review

Author(s) & Year	Organizational Context	AI Modality	Learning Focus	Key Insight
Maity (2019)	Corporate training and development	AI-supported analytics	Training efficiency	AI enables scalable and cost-effective learning delivery
Santana & Cobo (2020)	HRD and e-HRM systems	Learning analytics	Digital skills development	Analytics improve learning access and flexibility
Kipper et al. (2021)	Industry 4.0 organizations	AI-enabled learning systems	Capability development	Digital systems integrate learning and performance data
Jeong & Jeong (2024)	Workplace learning environments	Adaptive AI learning systems	Knowledge retention	Personalized AI learning improves retention
Lind (2024)	Professional and creative work	Generative AI tools	Creativity and problem-solving	Generative AI enhances creative capability
Callari & Puppione (2025)	Informal workplace learning	Generative AI	Knowledge sharing	AI reshapes informal learning and peer exchange

5.1. Theme 1: Generative AI as an Enabler of Adaptive and Personalized Workplace Learning

A dominant theme across literature is the positioning of generative AI as a catalyst for adaptive, personalized, and just-in-time learning. Studies consistently report that generative AI systems support dynamic learning pathways by tailoring content, feedback, and problem-solving guidance to individual learner needs. This represents a shift away from static, program-based training toward learning embedded within work processes.

The thematic analysis indicates that this adaptability enhances learning efficiency, supports rapid skill acquisition, and aligns learning more closely with evolving job requirements. Importantly, the findings show that these benefits are most pronounced where AI systems are integrated into broader learning ecosystems rather than deployed as standalone tools. This theme reflects convergence across empirical and conceptual studies, lending analytical strength to the finding.

5.2. Theme 2: Reconfiguration of Formal and Informal Learning Boundaries

A second theme concerns the blurring of boundaries between formal and informal learning. Generative AI enables learning to occur continuously through interaction with work tasks, peers, and AI-generated knowledge artefacts. The literature indicates that AI-mediated learning increasingly takes place outside formal training structures, supporting experiential and social learning in real time.

However, the analysis also reveals that this reconfiguration challenges traditional learning governance mechanisms. While informal learning has long been recognized as critical to competence development, generative AI intensifies its scale and visibility, raising questions about quality assurance, accountability, and the recognition of learning outcomes. This theme underscores a structural transformation in workplace learning rather than a simple enhancement of existing practices.

5.3. Theme 3: Implications for Professional Expertise and Judgment

A central and analytically significant theme relates to professional expertise and human judgment. The reviewed literature presents a dual narrative. On one hand, generative AI augments professional capability by supporting reasoning, sense-making, and problem-solving. On the other hand, several studies highlight risks of over-reliance, cognitive offloading, and erosion of experiential learning pathways.

The thematic synthesis shows that generative AI does not merely support learning but actively participates in knowledge production. This alters how expertise is developed and exercised, particularly in professional and knowledge-intensive roles. The findings suggest that professional competence increasingly emerges from human–AI collaboration, rather than from individual mastery alone. This theme represents a substantive conceptual contribution, as it reframes expertise as relational and socio-technical.

5.4. Theme 4: Contextual Moderators of AI-Mediated Learning Outcomes

The analysis reveals strong evidence that the impact of generative AI on workplace learning is context dependent. Organizational factors, such as learning culture, leadership support, digital maturity, and e-HRM integration, consistently moderate learning outcomes. Studies report that organizations with established learning governance structures are better positioned to leverage AI for sustainable capability development.

Conversely, in contexts characterized by weak learning cultures or high skills mismatch, AI-enabled learning may exacerbate dissatisfaction, reinforce inequality, or contribute to superficial skill acquisition. Generational differences also emerge as a moderating factor, influencing acceptance, trust, and learning autonomy. This theme highlights that technological capability alone is insufficient to guarantee positive learning outcomes.

5.5. Theme 5: Ethical, Governance, and Sustainability Tensions

A final cross-cutting theme concerns ethical, and governance challenges associated with generative AI in workplace learning. The literature identifies concerns related to transparency, accountability, bias, and the redistribution of responsibility between humans and AI systems. These issues are particularly salient in learning contexts where AI-generated outputs influence decision-making and professional practice.

The thematic synthesis indicates that ethical considerations are often acknowledged but insufficiently operationalized in organizational learning strategies. This creates a gap between AI adoption and sustainable workforce development. The findings suggest that without explicit governance mechanisms, AI-mediated learning risks prioritizing efficiency over long-term human capability and professional integrity.

5.6. Synthesis of Results

Taken together, the results demonstrate that generative AI is transforming workplace learning into structural, relational, and normative ways. The thematic analysis shows that AI acts simultaneously as a learning enabler, a reconfiguration force, and a governance challenge. The appropriateness of the analytical approach is evidenced by the consistency of themes across diverse studies and contexts, as well as by the ability of the synthesis to surface both benefits and tensions. These results provide a strong empirical and conceptual foundation for the subsequent discussion, where the findings are interpreted in relation to existing theory and their implications for research, practice, and policy are elaborated. Table 2 synthesizes the core themes identified in the review, highlighting how generative AI influences learning mechanisms and HRD implications.

Table 2. Core Themes, Mechanisms, and Implications of Generative AI in Workplace Learning

Theme	Role of Generative AI	Implications for Learning and HRD
Adaptive and personalized learning	Generates context-specific content and feedback in real time	Enables just-in-time, learner-centered development
Formal–informal learning reconfiguration	Embeds learning within everyday work activities	Challenges traditional learning governance structures
Professional expertise and judgment	Augments reasoning and problem-solving	Reframes expertise as human–AI collaboration

Contextual moderation	Interacts with culture, leadership, and e-HRM systems	Explains variation in learning outcomes across organizations
Ethical and governance tensions	Influences decision-making and accountability	Requires explicit ethical oversight and governance mechanisms

6. Discussion

This study sets out to examine how generative artificial intelligence (AI) reshapes workplace learning and development and to understand its implications for professional expertise, learning design, and sustainable workforce development. By synthesizing contemporary literature through a theory-informed integrative review and thematic analysis, the findings contribute to HRD and learning scholarship by extending established theories into the emerging context of generative AI-mediated learning.

6.1. Generative AI and Adaptive Learning: Extending Experiential and Adult Learning Theory

The finding that generative AI enables adaptive, personalized, and just-in-time learning aligns strongly with experiential learning theory (Kolb, 1984) and adult learning theory (andragogy) (Knowles et al., 2015). These theories emphasize learner autonomy, relevance, and problem-centered learning, principles that are amplified by generative AI's capacity to tailor learning content to immediate work tasks. However, the results also extend these theories by demonstrating that generative AI increasingly functions as an active learning agent, rather than merely a facilitator. This challenges traditional assumptions that experiential learning is primarily driven by human reflection on experience, suggesting instead that learning cycles are increasingly co-constructed through human-AI interaction.

6.2. Reconfiguration of Formal and Informal Learning: Implications for HRD Systems

The blurring of boundaries between formal and informal learning reinforces long-standing HRD scholarship recognizing informal learning as central to workplace competence development (Marsick & Watkins, 2001; Eraut, 2004). The results suggest that generative AI accelerates this shift by embedding learning directly into work processes, thereby expanding informal learning at scale. From an HRD systems perspective, this finding highlights a tension between decentralized, learner-driven development and the need for organizational oversight. Existing HRD models often assume a clear separation between structured development interventions and informal learning; generative AI disrupts this distinction, requiring HRD to reconceptualize learning governance, validation, and capability measurement.

6.3. Professional Expertise and Judgment: Human-AI Collaboration and Capability Theory

The findings concerning professional expertise and judgment resonate with capability theory and practice-based learning perspectives, which conceptualize expertise as socially situated and developed through participation in practice (Billett, 2025). The literature reviewed indicates that generative AI both augments and reshapes expertise by supporting reasoning and decision-making while simultaneously redistributing cognitive work. This supports emerging HRD scholarship that frames expertise as relational and socio-technical rather than purely individual. However, the results also problematize assumptions in traditional HRD models that equate learning accumulation with competence development, revealing risks of deskilling and dependency if reflective and experiential dimensions of learning are displaced by AI-generated outputs.

6.4. Contextual Moderation and Learning Culture: Organizational Learning Theory

The strong contextual moderation identified in the results aligns with organizational learning theory, which emphasizes the role of culture, leadership, and systems in shaping learning outcomes (Argyris & Schön, 1978). The findings suggest that generative AI does not determine learning outcomes independently; rather, its impact is mediated by learning culture, e-HRM integration, and governance maturity. This reinforces HRD arguments that technology adoption must be embedded within supportive organizational systems to enable sustainable capability development. Importantly, the results extend organizational learning theory by demonstrating that AI intensifies both the opportunities and risks associated with weak learning cultures, amplifying existing structural inequalities in skill development.

6.5. Ethical and Governance Dimensions: Critical HRD Perspectives

The ethical and governance tensions identified in the results are particularly salient when viewed through critical HRD perspectives, which interrogate power, control, and equity in learning and development processes. The findings indicate that generative AI-mediated learning may prioritize efficiency and scalability at the expense of professional

autonomy, transparency, and long-term workforce sustainability. While ethical considerations are acknowledged in literature, they remain weakly integrated into HRD practice. This suggests a need to extend HRD theory to more explicitly incorporate AI governance, ethical accountability, and human oversight as core components of learning system design.

6.6. Integrative Theoretical Contribution

Taken together, the discussion demonstrates that generative AI challenges foundational assumptions across multiple learning and HRD theories. The findings suggest that generative AI should be conceptualized not merely as a learning technology but as a socio-technical learning infrastructure that reshapes how learning is produced, governed, and experienced. This study, therefore, contributes to theory by integrating experiential learning, informal learning, organizational learning, and critical HRD perspectives into a unified analytical lens for understanding AI-mediated workplace learning. By explicitly linking empirical themes to established theory, the discussion shows how generative AI both extends and disrupts existing HRD frameworks. This theoretical integration provides a robust foundation for future empirical research and supports the development of more human-centered, ethical, and sustainable approaches to AI-enabled workplace learning.

6.7. Methodological Alignment with Findings and Conceptual Contributions

The integrative literature review design and qualitative thematic synthesis adopted in this study directly shaped both the empirical insights generated and the conceptual contributions advanced. This section explicates how specific methodological choices informed the study's findings and supported the development of its theoretical contributions.

6.7.1. Linking the Method to the Findings

The theory-informed integrative review enabled systematic comparison across empirical, conceptual, and interdisciplinary studies, which was essential for identifying the recurring patterns reported in the findings. The purposive sampling strategy, which prioritized studies examining generative AI in organizational and workplace contexts, allowed the thematic analysis to surface consistent evidence that generative AI enables adaptive, personalized, and on-demand learning. These findings emerged through inductive coding of reported learning outcomes, learning modes (formal vs informal), and organizational learning practices across the reviewed studies. The breadth of the dataset, spanning HRD, learning sciences, and information systems, made it possible to identify these patterns as robust rather than context-specific anomalies.

6.7.2. Contextual Moderation of AI Learning Outcomes

The inclusion of organizational and contextual variables during data extraction (e.g., e-HRM integration, organizational culture, workforce demographics) directly informed the finding that AI-mediated learning outcomes vary significantly across contexts. This insight was made possible by the structured extraction of contextual descriptors and subsequent cross-study comparison during thematic synthesis, rather than by focusing solely on technological characteristics. The decision to include conceptual and theoretical studies alongside empirical research enabled the analysis to capture deeper tensions related to professional judgment, expertise, and identity. These findings could not have emerged from a purely outcome-focused or quantitative synthesis. The qualitative thematic approach allowed interpretive integration of sociotechnical and human-centered perspectives, which underpin the study's critical findings regarding deskilling risks and dependency on AI systems. By synthesizing evidence across disciplinary boundaries, the integrative review enabled the study to move beyond siloed accounts of AI as a technical tool or learning enhancer. The thematic synthesis revealed interdependencies between learning design, professional competence, and organizational governance, which informed the conceptual framing of generative AI as a socio-technical learning infrastructure rather than a standalone technology.

The structured coding of learning modes, AI functions, and competence outcomes allowed the study to conceptually connect adaptive learning mechanisms with long-term professional development trajectories. This linkage constitutes a key theoretical contribution, extending existing workplace learning theory by explicitly incorporating generative AI as an active participant in competence formation. The method's inclusion of governance- and ethics-oriented literature enabled the study to articulate conceptual gaps in existing research and to foreground ethical responsibility, learning governance, and human oversight as central analytical dimensions. These conceptual contributions directly reflect the methodological decision to privilege theory-building over measurement aggregation.

Overall, the methodological approach ensured strong internal coherence between the research design, findings, and conceptual outcomes. The integrative review and thematic synthesis were appropriate for answering the research question, as they enabled the study to (1) synthesize fragmented knowledge, (2) identify cross-contextual patterns and tensions, and (3) generate theory-informed insights relevant to both scholarship and practice. The explicit alignment between data collection, analytical procedures, and conceptual interpretation reinforces the study's methodological rigor and supports the validity of its contributions to the literature on generative AI and workplace learning. The practical guidelines for AI-Mediated workplace learning are:

- Embed generative AI within existing HRD and learning governance systems.
- Preserve human judgment through reflective and validation-based learning design.
- Balance informal AI-mediated learning with organizational oversight.
- Establish ethical, transparency, and accountability frameworks.
- Invest in learning readiness to avoid dependency and deskilling.

6. Conclusion

This study sets out to advance understanding of how generative artificial intelligence (AI) is reshaping workplace learning and development, with particular attention to its implications for professional expertise, learning design, and sustainable workforce development. Responding to accelerating skill obsolescence and growing organizational reliance on AI-enabled learning systems, the research sought to move beyond technology-centric accounts by integrating learning theory, human resource development (HRD) perspectives, and organizational context. Using a theory-informed integrative literature review and qualitative thematic synthesis, the study systematically analyzed contemporary empirical and conceptual scholarship across disciplines. This methodological approach was appropriate for addressing the research question, as it enabled synthesis of a fragmented and rapidly evolving body of knowledge while supporting theory development rather than mere description. The resulting analysis identified five interrelated themes: generative AI as an enabler of adaptive and personalized learning; the reconfiguration of formal and informal learning boundaries; the transformation of professional expertise and human judgment through human-AI collaboration; the contextual moderation of learning outcomes by organizational systems and culture; and the ethical and governance tensions associated with AI-mediated learning.

The findings demonstrate that generative AI represents a structural shift in workplace learning rather than an incremental technological enhancement. While AI-enabled learning can enhance adaptability, efficiency, and access to learning, its effects are contingent on organizational learning culture, governance arrangements, and HRD system maturity. Critically, the study shows that generative AI simultaneously augments and redefines professional expertise, challenging traditional assumptions about competence development and highlighting the need to reconceptualize learning as a socio-technical process. By explicitly linking the results to experiential learning theory, informal learning theory, organizational learning theory, and critical HRD perspectives, the study contributes to theory by positioning generative AI as a socio-technical learning infrastructure that reshapes learning processes, professional identities, and organizational capability. This integrated perspective addresses key omissions in existing literature, particularly the limited attention to governance, ethics, and long-term workforce sustainability.

In practical terms, the research underscores that effective adoption of generative AI in workplace learning requires more than technological investment. Organizations must embed AI-enabled learning within coherent HRD strategies that preserve human judgment, support reflective practice, and establish clear ethical and governance frameworks. For scholars, the study provides a conceptual foundation for future empirical research examining the long-term impacts of AI-mediated learning on professional competence, employability, and organizational resilience.

Overall, this research demonstrates that generative AI holds significant potential to transform workplace learning, but its contribution to sustainable workforce development depends on how it is governed, integrated, and aligned with human-centered learning principles. By bringing together theory, evidence, and context, the study offers a comprehensive and critical account of generative AI's role in the future of workplace learning and development.

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