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Prompt Engineering Competency Enhances Employee Productivity through Human AI Collaboration in Modern Organizations

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Abstract. This study aims to explore how Prompt Engineering Competency enhances employee productivity through Human–AI Collaboration in modern organizations. Employing a qualitative multiple case study approach, data were collected from 24 participants representing managers, HR professionals, educators, researchers, administrative staff, and information technology specialists who routinely utilized Generative AI in their daily work. Data were obtained through semi-structured interviews, workplace observations, and organizational document analysis and were analyzed using thematic analysis. The findings reveal three major themes. First, Prompt Engineering Competency emerged as a multidimensional strategic capability consisting of contextual prompt formulation, iterative prompt refinement, critical evaluation of AI-generated outputs, and ethical AI utilization. Second, Human–AI Collaboration significantly enhanced employee productivity through complementary intelligence, where AI accelerated routine cognitive processes while employees contributed contextual understanding, creativity, ethical judgment, and strategic decision-making. Third, organizational support including AI training, peer-learning communities, leadership commitment, and AI governance policies strengthened Prompt Engineering Competency and promoted sustainable Human–AI Collaboration across organizations. The study contributes to HRM literature by conceptualizing Prompt Engineering Competency as a distinct strategic capability that extends beyond digital competence and AI literacy. The findings provide guidance for organizations in designing competency development strategies that strengthen workforce readiness and sustainable competitive advantage in the era of Generative AI.

Keywords: Prompt Engineering Competency; Human–AI Collaboration; Employee Productivity; Generative Artificial Intelligence; Human Resource Management; Qualitative Study

1. Introduction

The rapid advancement of Generative Artificial Intelligence (Generative AI) has fundamentally transformed the nature of work and the strategic role of human resource management (HRM) in modern organizations (Bell & Bell, 2023; García-Peñalvo et al., 2024; Kalota, 2024; Kelly et al., 2023). AI-powered applications such as large language

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models are increasingly integrated into knowledge-intensive tasks, including content creation, data analysis, customer service, software development, and managerial decision-making. Rather than replacing human workers, contemporary organizations are shifting toward collaborative human–AI work systems in which employees and AI jointly perform cognitive and creative tasks (Berretta et al., 2023; Choudhary et al., 2025; Jain et al., 2023; Sowa et al., 2021). This transformation requires organizations to rethink the competencies that employees need to remain productive and competitive in digitally augmented workplaces. As highlighted by Chaturvedi et al. (2023), successful AI implementation depends not only on technological capability but also on the ability of employees to effectively integrate AI into their daily work processes. Likewise, Given (2015) argue that future organizational competitiveness will increasingly depend on complementary relationships between human intelligence and intelligent technologies.

Recent HRM literature has responded to this transformation by examining various AI-related competencies, including digital competence, AI literacy, digital skills, technology readiness, and AI acceptance. Studies have demonstrated that these competencies positively influence employee adaptability, organizational learning, innovation, and job performance (Venkatesh et al., 2003). Parallel to these developments, researchers have increasingly discussed AI-supported decision-making, digital transformation, and human-centered AI as strategic priorities for organizations navigating Industry 5.0 (Bakator et al., 2024; Nahavandi, 2019; Xu et al., 2021). Despite these advances, most studies continue to conceptualize AI competence from a general technological perspective without distinguishing the specific capabilities required to interact effectively with Generative AI systems through natural language instructions.

The emergence of Generative AI has introduced a new workplace reality in which the quality of AI-generated outputs depends substantially on the quality of prompts provided by users. Reports from industry and higher education indicate that employees who possess advanced prompting strategies are able to generate more accurate analyses, higher-quality reports, improved programming solutions, and more creative outputs compared with users who interact with AI using simple instructions (Cheng et al., 2022; Escrig-Tena et al., 2025). The 2024 Work Trend Index further reports that AI-assisted work has become a mainstream organizational practice and that employees increasingly require practical competencies for collaborating effectively with AI technologies (Lakhani K., 2026). These developments suggest that prompt formulation is no longer merely a technical skill but is evolving into an essential workplace capability influencing organizational productivity.

Although research on AI adoption has expanded rapidly, existing scholarly literature has largely focused on behavioral intention, technology acceptance, AI literacy, digital transformation, and ethical AI governance (Dwivedi et al., 2023; Jarrahi, 2018). Comparatively little attention has been devoted to Prompt Engineering Competency (PEC) as an independent human resource capability. Existing discussions of prompt engineering are predominantly situated within computer science, focusing on optimizing interactions with large language models, improving prompt design techniques, and enhancing AI output quality (White et al., 2023). Consequently, the HRM literature lacks a comprehensive conceptualization of prompt engineering as an employee competency capable of influencing collaboration quality and organizational outcomes.

This limitation reveals an important research gap. First, previous HRM studies have not established Prompt Engineering Competency as a distinct construct that differs conceptually from AI literacy, digital competence, or general technological proficiency.

Second, empirical evidence explaining how prompt engineering contributes to employee productivity through collaborative interactions with AI remains scarce. Third, existing research has largely emphasized technology adoption rather than the human competencies that determine the effectiveness of AI utilization after adoption. Addressing these gaps is increasingly important because organizations are investing heavily in AI technologies while often overlooking the strategic capabilities employees require to maximize AI-generated value. Without a robust competency framework, organizations may fail to realize the productivity gains promised by Generative AI.

The novelty of this study lies in introducing Prompt Engineering Competency as a new strategic human resource capability within the HRM discipline. Unlike previous studies that conceptualize AI competence in broad terms, this research positions Prompt Engineering Competency as an integrated capability encompassing effective prompt design, contextual instruction formulation, iterative refinement of AI interactions, critical evaluation of AI-generated outputs, and responsible AI utilization. Furthermore, this study proposes that the relationship between Prompt Engineering Competency and employee productivity is explained through the quality of Human–AI Collaboration, thereby extending the Resource-Based View (Barney, 1991) and Human Capital Theory (Auerbach & Green, 2025) into AI-augmented work environments. This perspective contributes a more comprehensive understanding of how emerging competencies generate sustainable organizational value.

The significance of this research extends to both theoretical and practical domains. Theoretically, it enriches HRM scholarship by expanding the concept of employee competency beyond conventional digital skills and introducing a competency framework specifically designed for Generative AI-enabled workplaces. It also contributes to the growing discourse on human-centered AI by emphasizing that organizational success depends not only on advanced AI technologies but also on employees' capabilities to collaborate effectively with intelligent systems (Shneiderman, 2021). Practically, the findings are expected to guide HR professionals, organizational leaders, and policymakers in designing competency development programs, AI training initiatives, recruitment strategies, and performance management systems that support sustainable productivity in modern organizations.

Based on these considerations, this study aims to explore how Prompt Engineering Competency enhances employee productivity through Human–AI Collaboration in modern organizations. Specifically, the study seeks to develop a conceptual understanding of Prompt Engineering Competency as an emerging strategic capability, identify the mechanisms through which this competency facilitates effective collaboration between employees and Generative AI systems, and explain how such collaboration contributes to improved productivity in AI-augmented workplaces. By providing a qualitative perspective on these emerging organizational phenomena, this research is expected to offer a meaningful contribution to the development of future-oriented human resource management theory and practice in the era of Generative Artificial Intelligence.

2. Methods

This study employed a qualitative multiple case study design to explore how Prompt Engineering Competency enhances employee productivity through Human–AI Collaboration in modern organizations. A qualitative approach was selected because the phenomenon remains relatively new in the field of Human Resource Management and requires an in-depth understanding of employees' experiences, perceptions, and practices

when interacting with Generative Artificial Intelligence (AI) in their daily work. The multiple case study approach enabled the researchers to examine the phenomenon across different organizational contexts while identifying common patterns and contextual variations. This design follows the recommendations of Ridder (2017), who emphasizes that case studies are particularly appropriate for investigating contemporary phenomena within real-life settings where the boundaries between context and phenomenon are not clearly defined.

Participants were selected using purposive sampling based on predefined criteria to ensure that informants possessed relevant experience with Generative AI technologies. The study involved 24 participants representing managers, HR professionals, administrative staff, educators, researchers, marketing specialists, and information technology personnel from organizations that had integrated AI tools such as ChatGPT, Microsoft Copilot, Google Gemini, or Claude into their work processes. Eligible participants had used Generative AI for at least six months and routinely relied on these technologies to perform knowledge-intensive tasks. Data were collected through semi-structured in-depth interviews, non-participant workplace observations, and analysis of organizational documents, including AI usage policies, digital transformation guidelines, and competency development materials. Interviews lasted between 45 and 90 minutes, were audio-recorded with participants' consent, and subsequently transcribed verbatim for analysis.

The collected data were analyzed using thematic analysis following the six-step framework proposed by Braun & Clarke (2006), including data familiarization, initial coding, theme generation, theme review, theme definition, and report development. Data analysis was supported by NVivo 14 to facilitate systematic coding, organization of qualitative evidence, and comparison across cases. Throughout the analysis, the researchers continuously compared emerging findings across participants and organizations to identify recurring themes explaining the relationships among Prompt Engineering Competency, Human–AI Collaboration, and Employee Productivity. The iterative analytical process enabled the refinement of conceptual categories while preserving the contextual richness of participants' experiences.

To ensure the trustworthiness of the findings, the study adopted the qualitative rigor criteria proposed by Lincoln et al. (1985), including credibility, transferability, dependability, and confirmability. Credibility was enhanced through methodological triangulation across interviews, observations, and document analysis, as well as member checking by allowing participants to verify interview summaries and preliminary interpretations. Transferability was supported by providing detailed descriptions of organizational contexts and participant characteristics. Dependability was strengthened through an audit trail documenting research decisions, coding procedures, and analytical processes, while confirmability was maintained through researcher reflexivity and peer debriefing to minimize subjective bias. Ethical approval was obtained prior to data collection, and all participants provided informed consent. Confidentiality and anonymity were preserved through the use of pseudonyms and secure management of research data throughout the study.

3. Results and Discussion

3.1. Prompt Engineering Competency Emerged as a New Strategic Capability in AI-Augmented Workplaces

The analysis of interview, observation, and organizational document data demonstrates that Prompt Engineering Competency (PEC) has evolved into a strategic capability that significantly shapes how employees interact with Generative Artificial Intelligence (AI) in modern organizations. Across the participating organizations, respondents consistently emphasized that employee productivity was no longer determined solely by digital literacy or familiarity with AI applications, but rather by the ability to communicate effectively with AI systems through well-structured prompts. Participants explained that the same AI platform often produced substantially different outputs depending on how instructions were formulated. Employees who demonstrated higher levels of Prompt Engineering Competency were able to provide contextual information, specify objectives, define expected output formats, and continuously refine prompts until the generated responses aligned with organizational requirements. Consequently, Prompt Engineering Competency emerged as an essential competency that transformed AI from a passive technological tool into an active collaborative partner capable of supporting complex knowledge work.

Interview findings further revealed that Prompt Engineering Competency consists of several interconnected practices performed during routine work activities. Participants described prompt engineering not as a single technical action but as an iterative cognitive process involving problem identification, contextualization, instruction design, output evaluation, verification of factual accuracy, and continuous refinement of prompts. Employees frequently reported that AI-generated responses rarely met organizational expectations after the first interaction. Instead, successful outcomes depended on repeated cycles of improving prompts based on previous AI responses. This iterative interaction enabled employees to obtain more accurate analyses, clearer reports, stronger strategic recommendations, and higher-quality creative outputs. As one participant explained:

"Initially I thought AI only needed a simple question. After learning how to structure prompts with context, objectives, and expected formats, the quality of the answers improved dramatically. I rarely accept the first response because refining prompts consistently produces much better results." (Participant 7, Marketing Specialist)

Similar perspectives were expressed by employees across different organizational functions. HR professionals explained that effective prompting accelerated policy drafting and competency mapping, while researchers reported improvements in literature synthesis and research planning. Administrative personnel indicated that prompt engineering reduced repetitive writing tasks and improved document consistency. Managers also emphasized that Prompt Engineering Competency facilitated faster strategic decision-making because AI-generated summaries and analyses became increasingly reliable when supported by carefully designed prompts. One manager stated:

"The difference between productive and less productive employees is no longer who has access to AI, but who knows how to communicate with AI effectively. Employees with better prompting skills consistently produce higher-quality work in less time." (Participant 15, Operations Manager)

Observational findings reinforced these interview results by demonstrating clear behavioral differences between employees with high and low levels of Prompt Engineering Competency. Employees with advanced competency systematically planned prompts before interacting with AI, incorporated organizational context, evaluated AI-generated outputs critically, and revised prompts whenever inconsistencies appeared. Conversely, employees with limited prompting skills tended to submit short and generic

instructions, relied heavily on initial AI responses, and spent considerable time manually correcting inaccurate outputs. Organizational documents further supported these observations by indicating that several participating organizations had begun integrating prompt engineering workshops, AI communication guidelines, and internal prompting templates into employee development programs. These initiatives reflected organizational recognition that Prompt Engineering Competency represents a strategic capability supporting digital transformation and AI-enabled productivity.

The findings suggest that Prompt Engineering Competency extends beyond traditional concepts of digital competence and AI literacy. Rather than merely understanding how AI technologies function, employees possessing high Prompt Engineering Competency demonstrate the capability to strategically design interactions with AI systems in ways that enhance work quality, decision-making effectiveness, creativity, and operational efficiency. This competency therefore represents a distinctive form of human capital required in AI-augmented workplaces, where organizational competitiveness increasingly depends on employees' ability to collaborate intelligently with Generative AI technologies. The emergence of Prompt Engineering Competency also indicates a broader transformation in Human Resource Management, shifting competency development from technology usage toward optimizing human–AI collaboration as a strategic organizational resource.

Table 1 Dimensions of Prompt Engineering Competency Identified from the Qualitative Findings

Dimension	Description	Representative Evidence
Problem Identification	Ability to clearly identify work objectives before interacting with AI.	Employees first defined the problem before requesting AI assistance.
Contextual Prompt Design	Ability to provide complete contextual information, organizational background, and task specifications.	Participants emphasized that richer context produced more accurate AI outputs.
Instruction Formulation	Ability to formulate structured, specific, and goal-oriented prompts.	Employees specified objectives, audience, tone, and expected output format.
Iterative Prompt Refinement	Ability to revise and improve prompts based on AI-generated responses.	Multiple prompt revisions consistently produced higher-quality outputs.
Critical Output Evaluation	Ability to verify factual accuracy, relevance, and consistency of AI-generated information.	Employees validated AI responses before organizational use.
Ethical and Responsible AI Use	Ability to consider confidentiality, ethical principles, and organizational policies during AI utilization.	Participants avoided uploading confidential organizational information into public AI platforms.

The qualitative evidence presented in Table 1 demonstrates that Prompt Engineering Competency comprises six interrelated dimensions rather than a single technical skill. Participants consistently described prompt engineering as an integrated cognitive capability involving analytical thinking, communication, critical evaluation, ethical

awareness, and continuous learning. Among these dimensions, Contextual Prompt Design, Iterative Prompt Refinement, and Critical Output Evaluation emerged as the most frequently discussed practices across all organizations, indicating that successful human–AI collaboration depends not only on giving instructions to AI but also on employees' ability to evaluate and continuously improve AI interactions. These findings provide empirical support for conceptualizing Prompt Engineering Competency as a multidimensional strategic capability within Human Resource Management.

3.2. Human–AI Collaboration Enhanced Employee Productivity through Complementary Intelligence

Human–AI Collaboration has become a fundamental mechanism through which employees enhance productivity in AI-augmented workplaces (Daly et al., 2025; Haupt et al., 2025; Puerta-Beldarrain et al., 2025). Across all participating organizations, respondents consistently described Generative AI not as a replacement for human workers but as an intelligent collaborator that complements human expertise during knowledge-intensive activities. Employees explained that AI substantially reduced the time required to perform routine cognitive tasks, including information retrieval, report drafting, content generation, language editing, brainstorming, meeting summarization, data organization, and preliminary analysis. However, participants emphasized that AI-generated outputs remained dependent on human interpretation, contextual understanding, professional judgment, and organizational experience before they could be implemented in actual work situations. Consequently, productivity improvements resulted from a collaborative partnership in which AI accelerated information processing while employees contributed critical thinking, ethical reasoning, creativity, and decision-making capabilities that AI could not independently provide.

Interview findings further demonstrate that Human–AI Collaboration follows a complementary workflow rather than an automated substitution process. Most participants described their interactions with AI as iterative cycles in which employees first defined work objectives, delegated repetitive analytical tasks to AI, evaluated generated outputs, refined AI responses, and ultimately integrated the information into organizational decision-making. Employees perceived AI as a cognitive assistant capable of rapidly processing large volumes of information, whereas humans remained responsible for verifying factual accuracy, assessing contextual relevance, interpreting organizational implications, and ensuring compliance with ethical and professional standards. One participant explained:

"AI helps me prepare the first draft in minutes, but the final quality still depends on my experience. I verify every statement, adjust the recommendations to organizational conditions, and ensure the report reflects our strategic priorities before submission." (Participant 9, Human Resource Officer)

This finding indicates that productivity gains emerged because AI reduced repetitive cognitive workloads, allowing employees to devote greater attention to higher-value activities requiring human expertise.

The study also found that Human–AI Collaboration significantly enhanced employees' creativity and problem-solving capabilities. Participants reported that AI frequently generated alternative perspectives, proposed innovative ideas, suggested different analytical frameworks, and identified information that employees had not previously considered. Rather than limiting human creativity, AI stimulated critical reflection and encouraged employees to explore broader solutions to organizational challenges.

Researchers and marketing specialists particularly emphasized that AI functioned as a brainstorming partner capable of expanding idea generation while employees retained responsibility for evaluating originality and strategic feasibility. As one participant noted:

"When I face a complex problem, AI gives me several possible approaches that I might never have considered. It does not replace my thinking; instead, it broadens my perspective and allows me to make better decisions." (Participant 18, Research and Development Specialist)

These findings suggest that Human–AI Collaboration enhances cognitive diversity by combining computational intelligence with human creativity and contextual reasoning. Observational data further confirmed substantial differences between employees who actively collaborated with AI and those who relied primarily on conventional work methods. Employees demonstrating effective Human–AI Collaboration completed reports, strategic documents, presentations, policy analyses, and research summaries considerably faster while maintaining higher levels of accuracy and consistency. They also exhibited greater confidence when solving unfamiliar problems because AI provided immediate access to relevant knowledge and alternative analytical perspectives. Conversely, employees who used AI merely as a search engine or copied AI-generated responses without critical evaluation experienced more frequent inaccuracies, inconsistent outputs, and longer revision processes. Organizational documents similarly revealed that departments actively integrating AI collaboration into daily workflows reported measurable improvements in operational efficiency, faster project completion, and enhanced cross-functional knowledge sharing. According to one senior manager:

"Our most productive teams are not those that depend entirely on AI, but those that understand how to combine AI efficiency with human judgment. The real advantage comes from collaboration rather than automation." (Participant 21, Senior Operations Manager)

Human–AI Collaboration enhances employee productivity through the principle of complementary intelligence, where human capabilities and artificial intelligence perform distinct yet mutually reinforcing functions. AI contributes computational speed, information processing capacity, and pattern recognition, whereas humans provide contextual understanding, ethical judgment, emotional intelligence, strategic thinking, and organizational experience. Productivity therefore emerges not from technological substitution but from the integration of complementary strengths that neither humans nor AI can achieve independently. This evidence supports the view that future organizational competitiveness depends on developing collaborative capabilities that enable employees to effectively orchestrate interactions with AI systems while maintaining human control over interpretation, evaluation, and final decision-making.

Table 2 Contributions of Human–AI Collaboration to Employee Productivity

Human–AI Collaboration Activity	AI Contribution	Human Contribution	Observed Productivity Outcome
Information Retrieval	Rapid collection and summarization of information	Verification of relevance and credibility	Faster access to reliable information
Report and Document Preparation	Draft generation, language improvement, structural organization	Contextual adaptation, editing, and final approval	Reduced report completion time
Strategic	Scenario generation,	Strategic judgment	Improved

Decision Support	analytical recommendations, trend identification	and organizational interpretation	decision quality
Creative Problem Solving	Idea generation, brainstorming, alternative solutions	Critical evaluation and innovation refinement	Increased creativity and solution diversity
Data Interpretation	Pattern recognition and preliminary analysis	Contextual explanation and practical implications	Higher analytical accuracy
Knowledge Management	Knowledge synthesis and documentation	Organizational learning and experience integration	Improved knowledge sharing and collaboration

The findings summarized in Table 2 illustrate that Human–AI Collaboration operates through a complementary distribution of responsibilities between AI systems and employees. Across all identified work activities, AI primarily contributed computational efficiency, rapid information processing, and automated content generation, while employees remained responsible for higher-order cognitive functions such as contextual interpretation, ethical judgment, strategic reasoning, and quality assurance. Participants consistently emphasized that the greatest productivity improvements occurred when both forms of intelligence were integrated rather than when either humans or AI worked independently. This complementary intelligence model demonstrates that employee productivity in AI-augmented workplaces is not solely a technological outcome but rather the result of effective collaboration between human expertise and artificial intelligence capabilities, reinforcing the strategic importance of Human–AI Collaboration within contemporary Human Resource Management.

3.3. Organizational Support Strengthened Prompt Engineering Competency and Sustainable Human–AI Collaboration

Organizational support serves as a critical enabling factor in developing Prompt Engineering Competency (PEC) and sustaining effective Human–AI Collaboration within modern organizations (Annapureddy et al., 2025). While employees acknowledged that individual motivation and technological curiosity contributed to AI adoption, they consistently emphasized that organizational commitment determined whether AI utilization evolved into a sustainable organizational capability. Across all participating organizations, respondents reported that structured institutional support including formal training programs, prompt engineering workshops, internal knowledge-sharing sessions, AI mentoring, managerial encouragement, and clear AI governance policies significantly increased employees' confidence and competence in integrating Generative AI into their daily work activities. Rather than treating AI as an optional technological tool, organizations that institutionalized competency development created environments in which employees continuously experimented with AI, exchanged prompting strategies, and collectively improved work processes. Consequently, Prompt Engineering Competency emerged not merely as an individual technical skill but as a strategically cultivated organizational capability embedded within human resource development practices.

Interview data further revealed that organizations investing in systematic AI competency development experienced more rapid and consistent improvements in employee productivity than organizations relying solely on self-directed learning. Participants explained that formal training programs provided practical guidance on prompt formulation, contextual instruction, iterative refinement, verification of AI-generated outputs, and ethical AI utilization. These structured learning opportunities reduced employees' uncertainty regarding AI applications and encouraged greater experimentation in solving workplace problems. One HR manager explained:

"When we first introduced Generative AI, employees were enthusiastic but unsure how to use it effectively. After conducting prompt engineering workshops and practical simulations, we observed significant improvements in both confidence and work quality. Employees no longer asked whether they should use AI, but how they could maximize its potential." (Participant 4, Human Resource Development Manager)

Similarly, employees reported that hands-on workshops were considerably more valuable than theoretical AI seminars because they directly demonstrated how prompt engineering techniques could improve report writing, planning, communication, and analytical tasks. These findings indicate that competency development programs transformed AI from an unfamiliar technology into a practical productivity resource.

Another important finding concerns the role of organizational learning culture in sustaining Human–AI Collaboration. Participants consistently described peer-learning communities, cross-functional knowledge sharing, and collaborative experimentation as essential mechanisms for continuously improving Prompt Engineering Competency. Employees frequently exchanged successful prompts, discussed AI-generated outputs, evaluated mistakes, and collectively developed organizational prompting standards that could be reused across departments. Such collaborative learning significantly accelerated organizational adaptation to Generative AI technologies while reducing individual learning barriers. One participant explained:

"Every week our team shares prompts that worked well during projects. We discuss why certain prompts produced better results and how they can be adapted for different tasks. Learning from colleagues is often faster than learning individually." (Participant 13, Business Analyst)

This collaborative learning environment contributed not only to technical competency but also to organizational knowledge creation, reinforcing the idea that Human–AI Collaboration is strengthened through collective learning rather than isolated individual experience.

The findings also underscore the importance of AI governance and ethical leadership in promoting responsible and sustainable AI utilization. Participants emphasized that organizational support extended beyond technical training to include ethical guidelines governing data privacy, confidentiality, transparency, intellectual property protection, and accountability for AI-assisted decision-making. Organizations implementing clear governance frameworks reported higher levels of employee trust because staff understood the acceptable boundaries of AI utilization and remained confident that AI-supported decisions complied with professional standards. Organizational documents further demonstrated that institutions possessing formal AI competency frameworks integrated Prompt Engineering Competency into recruitment criteria, performance evaluation systems, leadership development programs, and continuous professional development initiatives. One senior executive stated:

"Technology alone does not create organizational value. What matters is whether employees understand when to rely on AI, when to question AI, and how to use it responsibly. Governance gives employees confidence to collaborate with AI without compromising organizational integrity." (Participant 22, Director of Digital Transformation)

These findings indicate that ethical governance functions as a strategic mechanism for sustaining long-term Human–AI Collaboration while minimizing technological risks. Sustainable Human–AI Collaboration depends on a supportive organizational ecosystem rather than solely on individual employee capability. Organizations that invest in competency development, leadership support, collaborative learning, and AI governance create conditions that enable Prompt Engineering Competency to flourish across all organizational levels. Such institutional support transforms individual competencies into collective organizational capabilities that enhance productivity, stimulate continuous innovation, strengthen organizational resilience, and improve long-term competitive advantage. Therefore, Prompt Engineering Competency should be conceptualized not only as a personal skill but also as a strategic organizational resource developed through integrated Human Resource Management practices that align employee development, organizational learning, leadership commitment, and responsible AI governance.

Table 3 Organizational Support Mechanisms Strengthening Prompt Engineering Competency and Human–AI Collaboration

Organizational Support Mechanism	Implementation in Organizations	Impact on Employees	Contribution to Human–AI Collaboration
AI Training Programs	Structured training on Generative AI applications and prompt engineering techniques	Improved AI confidence and technical competency	Increased effectiveness of AI-assisted work
Prompt Engineering Workshops	Practical simulations using real organizational tasks	Enhanced ability to formulate, refine, and evaluate prompts	Higher quality AI-generated outputs
Peer-Learning Communities	Cross-functional discussions, prompt sharing, and collaborative learning sessions	Accelerated knowledge exchange and continuous learning	Stronger collaborative AI utilization across departments
Leadership Support	Managerial encouragement, mentoring, and strategic AI vision	Increased employee motivation and willingness to innovate	Greater organizational acceptance of Human–AI Collaboration
AI Governance Policies	Ethical guidelines, privacy regulations, and AI usage standards	Higher trust, accountability, and responsible AI utilization	Sustainable and secure AI implementation
HR Competency Framework	Integration of AI competencies into	Continuous competency	Institutionalization of Prompt Engineering

	recruitment, training, and performance management	development and career readiness	Competency as a strategic capability

The evidence presented in Table 3 demonstrates that organizational support encompasses multiple interconnected mechanisms operating at individual, team, leadership, and institutional levels. Among these mechanisms, AI training programs, peer-learning communities, and AI governance policies emerged as the most influential factors supporting the continuous development of Prompt Engineering Competency. Participants consistently reported that organizations implementing these integrated support systems experienced more consistent Human–AI Collaboration, higher employee confidence, and stronger productivity improvements than organizations relying solely on informal AI adoption. These findings reinforce the argument that Prompt Engineering Competency should be understood as a strategic organizational capability nurtured through Human Resource Management practices, organizational learning systems, and ethical AI governance rather than as an isolated individual competence.

3.4. Discussion: Prompt Engineering Competency as a Strategic Human Resource Capability for Sustainable Human–AI Collaboration

The findings of this study demonstrate that Prompt Engineering Competency (PEC) has emerged as a strategic capability that enhances employee productivity through effective Human–AI Collaboration in modern organizations. Unlike conventional digital competencies that primarily emphasize technological literacy, the present findings indicate that PEC encompasses a broader set of cognitive and communicative capabilities, including contextual prompt formulation, iterative refinement, critical evaluation of AI-generated outputs, and ethical AI utilization. These findings support the Resource-Based View (RBV) proposed by Barney (1991), which argues that organizations achieve sustainable competitive advantage by developing valuable, rare, inimitable, and organizationally embedded capabilities. In the context of Generative AI, Prompt Engineering Competency represents an emerging intangible human resource that enables employees to generate superior organizational outcomes despite using the same AI technologies as competing organizations. Therefore, competitive advantage is derived not from AI ownership itself but from employees' capability to collaborate intelligently with AI systems.

The study also extends Human Capital Theory (Auerbach & Green, 2025; Marginson, 2019) by demonstrating that investments in employee competency development continue to generate organizational value even in AI-augmented workplaces. Traditional Human Capital Theory emphasizes education, knowledge, and skills as productive assets that improve organizational performance. However, the emergence of Generative AI introduces a new form of human capital in which employees require competencies that allow them to communicate effectively with intelligent technologies rather than merely operate digital tools. The qualitative findings reveal that employees possessing advanced Prompt Engineering Competency consistently produced higher-quality reports, more accurate analyses, and faster decision-making processes than employees relying on conventional AI usage. This suggests that Prompt Engineering Competency constitutes a new dimension of human capital that complements rather than replaces existing professional expertise, thereby expanding the theoretical boundaries of Human Capital Theory within contemporary Human Resource Management.

Another important contribution of this study concerns the role of Human–AI Collaboration as a mechanism explaining productivity improvement. The findings indicate that employee productivity did not result solely from AI automation but from the complementary integration of computational intelligence and human judgment. This finding aligns closely with Jarrahi (2018), who argues that artificial intelligence should be understood as a collaborative decision-support system rather than an autonomous replacement for human expertise. Similarly, Shneiderman (2021) proposes the concept of Human-Centered AI, emphasizing that successful AI implementation depends on maintaining meaningful human control over interpretation, ethical reasoning, and final decision-making. The present study reinforces these theoretical perspectives by demonstrating that employees remained responsible for contextual understanding, creativity, ethical evaluation, and strategic judgment, while AI primarily enhanced information processing speed, knowledge retrieval, and analytical efficiency. Consequently, organizational productivity emerged from complementary intelligence rather than technological substitution.

The findings further support recent discussions surrounding Industry 5.0, which emphasize collaboration between advanced technologies and human capabilities instead of full automation. Longo et al. (2020) argue that Industry 5.0 prioritizes human-centered technological innovation, resilience, and sustainability by positioning humans at the center of digital transformation. The present findings strongly reflect this paradigm because employees consistently described AI as an intelligent partner that amplified rather than diminished human expertise. Furthermore, the observed improvements in creativity, innovation, and complex problem-solving demonstrate that Generative AI functions most effectively when integrated with uniquely human competencies such as critical thinking, contextual reasoning, emotional intelligence, and ethical responsibility. This evidence strengthens the argument that future organizational competitiveness depends on designing collaborative work systems rather than replacing human workers with intelligent technologies.

Another noteworthy finding concerns the strategic role of organizational support in developing Prompt Engineering Competency. The results indicate that structured AI training, prompt engineering workshops, peer-learning communities, leadership commitment, and AI governance policies significantly strengthened employees' competencies and confidence in collaborating with AI. These findings correspond with the Ability–Motivation–Opportunity (AMO) Theory by Alkhalaf & Al-Tabbaa (2024), which argues that employee performance depends on organizational practices that simultaneously develop employee abilities, encourage motivation, and create opportunities for effective performance. In this study, AI training enhanced employees' abilities, managerial encouragement increased motivation to experiment with AI technologies, while organizational AI policies and collaborative learning environments created opportunities for sustainable Human–AI Collaboration (Beltrán-Martín & Bou-Llusar, 2018). Consequently, Prompt Engineering Competency should not be viewed merely as an individual attribute but as a capability systematically developed through strategic Human Resource Management practices.

This study contributes to HRM literature by distinguishing Prompt Engineering Competency from related constructs such as digital competence, AI literacy, and technology acceptance. Previous studies have primarily conceptualized AI competence as employees' general understanding of AI technologies or willingness to adopt AI systems (Tu et al., 2025). In contrast, the present findings demonstrate that effective utilization of

Generative AI depends on a much more specialized competency involving prompt design, contextual communication, iterative interaction, critical verification, and ethical judgment. Accordingly, this study proposes that Prompt Engineering Competency represents a multidimensional strategic capability that directly facilitates Human–AI Collaboration and indirectly enhances employee productivity. This conceptual distinction contributes to the growing HRM literature by introducing a competency framework specifically designed for AI-augmented work environments, an area that remains underdeveloped despite the rapid global adoption of Generative AI.

The future of Human Resource Management will increasingly depend on organizations' ability to cultivate competencies that enable employees to collaborate effectively with intelligent technologies. The study demonstrates that productivity gains originate not from the implementation of AI alone but from the interaction between employee competencies, organizational support, and collaborative human–AI work practices. By integrating the Resource-Based View (Barney, 1991), Human Capital Theory (Auerbach & Green, 2025), Human-Centered AI (Shneiderman, 2021), Industry 5.0 (Longo et al., 2020), and Ability–Motivation–Opportunity Theory (Alkhalaf & Al-Tabbaa, 2024), this research proposes a comprehensive explanation of how Prompt Engineering Competency functions as a strategic organizational resource in the era of Generative AI. The findings therefore provide a foundation for future Human Resource Management research aimed at developing competency frameworks, organizational capability models, and talent management strategies that support sustainable productivity and long-term organizational competitiveness in AI-augmented workplaces.

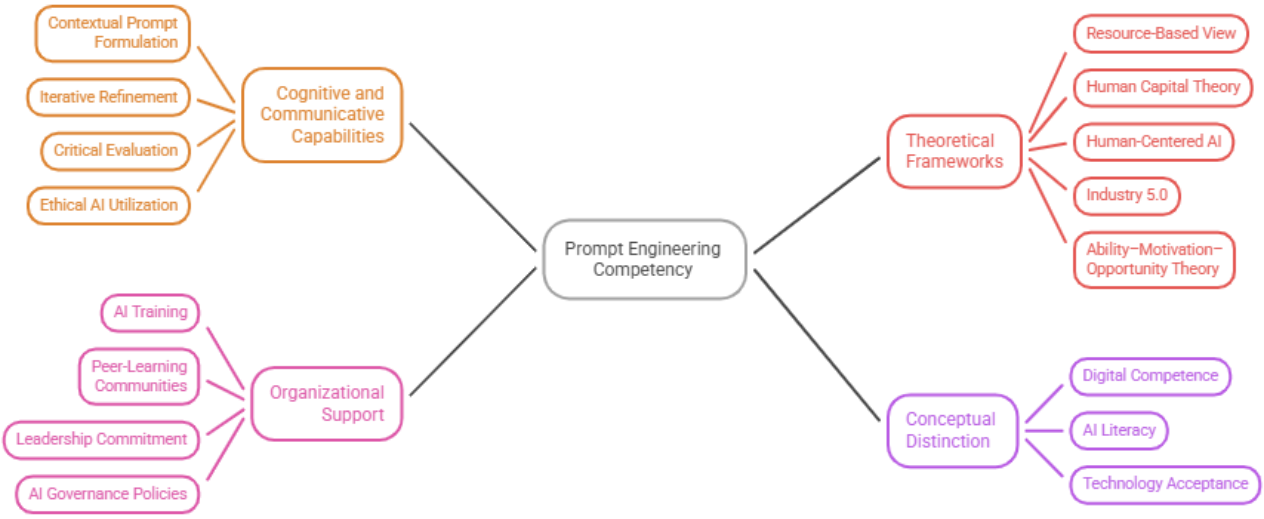

Figure 1 Prompt Engineering Competency: A Strategic HR Capability

Figure 1 illustrates the conceptual framework of Prompt Engineering Competency (PEC) as a strategic capability within Human Resource Management (HRM) that supports effective Human–AI collaboration in modern organizations. The framework positions Prompt Engineering Competency as the central construct, which is developed through two primary dimensions. The first dimension, Cognitive and Communicative Capabilities, comprises contextual prompt formulation, iterative prompt refinement, critical output evaluation, and ethical AI utilization, highlighting the competencies required for employees to interact effectively with Generative AI systems. The second dimension, Organizational Support, emphasizes the enabling role of AI training, peer-learning

communities, leadership commitment, and AI governance policies in fostering continuous competency development. The framework is theoretically grounded in the Resource-Based View, Human Capital Theory, Human-Centered AI, Industry 5.0, and the Ability–Motivation–Opportunity (AMO) Theory, which collectively explain how organizational resources, employee competencies, and supportive work environments enhance sustainable performance. Furthermore, the framework differentiates Prompt Engineering Competency from existing constructs such as digital competence, AI literacy, and technology acceptance, proposing it as a distinct strategic capability that enables employees to maximize the value of Generative AI. Overall, the model demonstrates that Prompt Engineering Competency is not merely an individual technical skill but an organizational capability that integrates human expertise, organizational support, and theoretical foundations to strengthen Human–AI collaboration and improve employee productivity in AI-augmented workplaces.

4. Conclusions

This study demonstrates that Prompt Engineering Competency (PEC) has emerged as a new strategic capability within Human Resource Management that enables employees to collaborate effectively with Generative Artificial Intelligence in modern organizations. The findings reveal three major contributions. First, Prompt Engineering Competency extends beyond conventional digital competence by encompassing contextual prompt formulation, iterative prompt refinement, critical evaluation of AI-generated outputs, and ethical AI utilization. Second, employee productivity is significantly enhanced through Human–AI Collaboration, where AI performs computational and information-processing tasks while employees contribute contextual interpretation, creativity, ethical reasoning, and strategic decision-making. Third, organizational support including AI training programs, peer-learning communities, leadership commitment, and AI governance policies plays a crucial role in strengthening Prompt Engineering Competency and sustaining collaborative AI utilization. Collectively, these findings indicate that organizational productivity depends not only on AI adoption but also on the capability of employees and organizations to develop effective human–AI collaboration.

The discussion extends several established theoretical perspectives by positioning Prompt Engineering Competency as a strategic organizational resource. Consistent with the Resource-Based View, Prompt Engineering Competency represents a valuable and difficult-to-imitate capability that contributes to sustainable competitive advantage. From the perspective of Human Capital Theory, the findings suggest that organizations must invest in emerging AI-related competencies that complement rather than replace existing professional expertise. Furthermore, the concepts of Human-Centered AI, Industry 5.0, and the Ability–Motivation–Opportunity Theory collectively explain how employee competencies, organizational support, and collaborative work systems create superior organizational performance. Accordingly, this study contributes to the HRM literature by introducing Prompt Engineering Competency as a distinct multidimensional construct that differs conceptually from AI literacy, digital competence, and technology acceptance while providing a comprehensive framework explaining productivity in AI-augmented workplaces.

Despite these contributions, this study has several limitations. The research employed a qualitative multiple case study with participants from knowledge-intensive organizations, limiting the generalizability of the findings across industries and cultural contexts. In addition, the proposed conceptual dimensions of Prompt Engineering

Competency have not yet been quantitatively validated, and the relationships among the identified constructs remain exploratory. Future research should develop and validate standardized measurement scales for Prompt Engineering Competency, examine its influence using Structural Equation Modeling (SEM) across different organizational sectors and countries, and investigate potential mediating or moderating variables such as AI self-efficacy, organizational learning, digital leadership, innovation capability, and employee well-being. Longitudinal and mixed-method studies are also recommended to examine how Prompt Engineering Competency evolves over time as Generative AI technologies continue to reshape organizational work practices and strategic human resource management.

Declaration of conflicting interests

All authors declare that they have no conflicts of interest.

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