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Human–AI Collaboration and Digital Competency: Examining Their Roles in Shaping Employee Creativity and Job Performance in Indonesia's Technology Sector

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ABSTRACT

The rapid development of Artificial Intelligence (AI) has transformed the nature of work by creating new forms of interaction between humans and intelligent systems. In the technology sector, human–AI collaboration and digital competence have become important capabilities that influence employees' ability to innovate and achieve superior work outcomes. This study aims to examine the role of human–AI collaboration and digital competence in shaping employee creativity and work performance in the Indonesian technology sector. This research employed a quantitative approach using a survey method involving 130 employees from technology-related organizations in Indonesia. Data were collected through a structured questionnaire using a five-point Likert scale and analyzed using Structural Equation Modeling–Partial Least Square (SEM-PLS) with SmartPLS 3. The results indicate that human–AI collaboration has a positive and significant effect on employee creativity and work performance. Digital competence also significantly influences employee creativity and work performance. Furthermore, employee creativity demonstrates the strongest influence on work performance. These findings highlight that AI adoption alone is insufficient to improve organizational outcomes; instead, the effectiveness of AI-driven transformation depends on employees' digital capabilities and their ability to collaborate creatively with intelligent technologies. This study contributes to the literature on digital transformation by providing empirical evidence regarding the interaction between technological capabilities and human resources in improving workplace performance.

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1. INTRODUCTION

The rapid advancement of digital technologies has fundamentally reshaped the nature of work and organizational processes across industries, particularly within the technology sector. Among these technological developments, Artificial Intelligence (AI) has emerged as a transformative force that enables organizations to enhance operational efficiency, accelerate decision-making, and

strengthen innovation capabilities [1], [2]. Unlike earlier waves of technological automation that primarily focused on replacing repetitive human activities, contemporary AI systems increasingly function as intelligent collaborators that augment human cognitive capabilities, including analytical reasoning, knowledge generation, problem-solving, and creative exploration [3], [4]. This evolution has shifted the role of technology from a passive operational tool toward an active partner in organizational activities, creating a new paradigm of human–AI interaction. Within Indonesia's rapidly expanding technology sector, where digital transformation has become a strategic priority, understanding how employees collaborate with AI systems is increasingly important for sustaining competitiveness, innovation, and organizational resilience [1], [5].

Human–AI collaboration represents an emerging organizational capability that integrates human cognitive strengths, contextual understanding, emotional intelligence, and creativity with AI's computational capacity, data-processing capability, and predictive accuracy. Rather than replacing employees, AI provides opportunities to enhance human potential by supporting idea generation, improving decision quality, and expanding problem-solving capacity [3], [6]. Organizations can obtain greater value from AI implementation when employees perceive AI as a collaborative resource that complements human expertise rather than as a substitute for human labor. Effective collaboration between employees and AI systems allows individuals to overcome cognitive limitations, access broader knowledge resources, and develop more sophisticated solutions to complex problems [6], [7]. Therefore, the successful implementation of AI depends not only on technological infrastructure but also on employees' ability to develop productive interaction patterns with intelligent systems.

In technology-driven industries, employee creativity has become a critical capability that determines organizational adaptability and innovation performance. Creativity refers to employees' ability to generate novel and valuable ideas, approaches, or solutions that contribute to organizational improvement and competitive advantage [8], [9]. As market conditions, customer expectations, and technological landscapes continue to evolve, organizations require employees who can continuously adapt and create innovative responses to emerging challenges. AI integration may enhance employee creativity by providing alternative perspectives, facilitating information exploration, and supporting complex cognitive processes [10], [11]. However, the contribution of AI to creativity is not automatic, as it depends on employees' ability to effectively collaborate with AI technologies and integrate AI-generated insights into their creative processes. Consequently, human–AI collaboration is expected to serve as an important mechanism that strengthens employee creativity in contemporary digital workplaces.

Beyond AI collaboration, digital competence has become a fundamental individual capability that determines how effectively employees utilize emerging technologies. Digital competence encompasses the knowledge, technical skills, cognitive abilities, and behavioral orientations required to effectively engage with digital tools for communication, information processing, problem-solving, and innovation activities [12], [13]. The availability of sophisticated technologies alone does not guarantee improved organizational outcomes because employees must possess adequate capabilities to integrate these technologies into their work practices. Employees with higher levels of digital competence are more capable of adapting to technological changes, identifying opportunities provided by digital platforms, and utilizing AI-based tools to support innovative activities [8], [9]. In the Indonesian technology sector, where organizations increasingly adopt artificial intelligence, cloud computing, and data-driven systems, developing employees' digital competence has become essential for maximizing the strategic value of digital transformation.

The connection between creativity and employee work performance has become an important focus within organizational behavior and human resource management research. Creative employees are more likely to identify improvement opportunities, develop effective solutions, and respond proactively to organizational challenges, which ultimately enhances individual and organizational performance [14]–[16]. In technology-based organizations, performance is no longer determined solely by technical expertise but also by employees' capacity to innovate, adapt, and strategically utilize technological resources. As AI becomes increasingly embedded within workplace processes, employees who combine strong digital competence with effective human–AI collaboration are expected to demonstrate higher levels of creativity and performance. Therefore, understanding the mechanisms through which technological collaboration and individual digital capabilities influence employee outcomes is crucial for developing future-ready workforces.

Despite growing academic interest in AI adoption, digital transformation, and employee performance, several important research gaps remain unresolved. First, existing studies have predominantly examined AI from a technological acceptance or adoption perspective, focusing on factors such as system readiness, user intention, and productivity enhancement, while the role of AI as a collaborative partner in fostering employee creativity remains insufficiently explored. Second, previous research on digital competence has largely emphasized educational environments and general digital literacy, leaving limited understanding of its function as an organizational capability that shapes creativity and performance within technology companies. Third, the integrated relationship between human–AI collaboration, digital competence, employee creativity, and work performance remains underexplored, particularly in emerging digital economies such as Indonesia. Therefore, this study aims to develop and empirically test an integrated framework examining how human–AI collaboration and digital competence influence employee creativity and work performance in Indonesia's technology sector, with creativity serving as a mediating mechanism. This research contributes theoretically by extending discussions on AI-enabled organizational capabilities and digitally empowered employees, while also providing practical insights for technology organizations seeking to build adaptive, innovative, and high-performing workforces.

2. LITERATURE REVIEW

2.1 Human–AI Collaboration

Artificial Intelligence (AI) has transformed the relationship between humans and technology from a tool-based interaction into a collaborative partnership. Human–AI collaboration refers to the integration of human capabilities, such as contextual understanding, judgment, creativity, and ethical reasoning, with AI capabilities, including data processing, pattern recognition, and predictive analysis [17]. Based on the human augmentation perspective, AI serves not as a replacement for employees but as a mechanism to enhance cognitive capabilities, support decision-making, and facilitate innovation. In technology-intensive organizations, effective collaboration with AI enables employees to access broader knowledge resources, reduce routine cognitive burdens, and develop more creative solutions [8], [9]. Therefore, human–AI collaboration is expected to positively influence employee creativity by providing additional resources and insights that strengthen innovation capabilities.

H1: Human–AI collaboration has a positive effect on employee creativity.

2.2 Digital Competence

Digital competence has become a critical capability in digital transformation contexts, referring to employees' ability to effectively utilize digital technologies through technical skills, information management, and strategic technology use. Beyond basic digital literacy, digital competence enables employees to integrate digital tools, analyze information, and develop technology-based solutions [18]–[20]. From the Resource-Based View (RBV), digital competence represents an intangible organizational resource that supports adaptation, innovation, and competitive advantage [16], [21]. Employees with higher digital competence are better able to explore technological opportunities, generate creative solutions, and improve work efficiency. Therefore, digital competence is expected to positively influence employee creativity and work performance.

H2: Digital competence has a positive effect on employee creativity.

H3: Digital competence has a positive effect on work performance.

2.3 Employee Creativity

Employee creativity refers to the ability of individuals to generate novel, valuable, and applicable ideas that contribute to organizational improvement. In technology-driven industries, creativity is essential for innovation, problem-solving, and adaptation to changing environments [22], [23]. The componential theory of creativity suggests that creative outcomes are shaped by knowledge, creative-thinking abilities, motivation, and environmental support. Digital technologies, including AI systems, can enhance creativity by providing information, analytical assistance, and opportunities for exploration [16], [24]. Therefore, employee creativity serves as an important mechanism linking technological capabilities with improved work performance.

H4: Employee creativity has a positive effect on work performance.

2.4 Work Performance

Work performance refers to employees' ability to effectively complete tasks and contribute to organizational goals through productivity, quality, and effectiveness. In technology-driven organizations, performance is increasingly influenced by employees' ability to adapt to digital transformation and utilize technological resources [16], [25]. Human–AI collaboration can enhance performance by supporting decision-making, reducing routine workloads, and improving efficiency, while digital competence enables employees to maximize the use of digital tools [7], [8]. Therefore, both technological collaboration and digital capabilities are important factors in improving employee work performance.

H5: Human–AI collaboration has a positive effect on work performance.

3. METHODS

This study employs a quantitative explanatory research approach to examine the relationships between human–AI collaboration, digital competence, employee creativity, and work performance in Indonesia's technology sector. The quantitative approach was selected to test the proposed hypotheses and evaluate the structural relationships among research constructs using statistical analysis [26]. Data were collected through a structured questionnaire distributed to technology-sector employees, allowing the study to empirically assess how technological collaboration and individual digital capabilities influence employee outcomes. The research framework is developed based on human augmentation theory, Resource-Based View (RBV), and creativity theory, which emphasize the role of technology and individual capabilities in enhancing organizational performance.

The population of this study consists of employees working in technology-related organizations in Indonesia, including software development, information technology services, digital platforms, data management, and AI-based technology companies. The sampling technique used was purposive sampling, with respondents selected based on specific criteria, including employees working in technology organizations, having experience using digital technologies, interacting with AI-based tools, and having a minimum working experience of six months. A total of 130 respondents participated in this study. This sample size is considered adequate for analysis using Partial Least Square Structural Equation Modeling (PLS-SEM), which is suitable for examining complex relationships among latent variables with moderate sample sizes.

Data analysis was conducted using Structural Equation Modeling–Partial Least Square (SEM-PLS) with SmartPLS 3 software. The analysis involved two stages: evaluation of the measurement model and structural model. The measurement model was assessed through convergent validity, construct reliability, and discriminant validity using outer loading, Average Variance Extracted (AVE), Cronbach's Alpha, Composite Reliability, Fornell–Larcker Criterion, and HTMT ratio. The structural model was evaluated through coefficient of determination (R^2), effect size (f^2), predictive relevance (Q^2), and hypothesis testing using bootstrapping procedures. Hypothesis decisions were based on path coefficients, t-statistics, and p-values, where relationships were considered significant when t-values exceeded 1.96 and p-values were below 0.05.

4. RESULTS AND DISCUSSION

4.1 Respondent Characteristics

This study involved 130 respondents who work in the technology sector in Indonesia. The demographic characteristics of respondents were analyzed to provide an overview of the participants involved in the research. The characteristics examined include gender, age, education level, job position, and work experience. The distribution of respondents indicates that the sample represents employees who actively interact with digital technologies and AI-supported systems in their professional activities.

Table 1. Characteristics of Respondents

Characteristics	Category	Frequency	Percentage (%)
Gender	Male	78	60.0
	Female	52	40.0
Age	<25 years	28	21.5
	25–34 years	67	51.5
	35–44 years	27	20.8
	≥45 years	8	6.2
Education Level	Diploma	14	10.8
	Bachelor Degree	92	70.8

	Master Degree	24	18.4
Job Position	Software Developer/Engineer	42	32.3
	Data Analyst/AI Specialist	21	16.2
	IT Support/System Administrator	28	21.5
	Product/Project Management	19	14.6
	Other Technology Roles	20	15.4
Work Experience	<2 years	31	23.8
	2–5 years	61	46.9
	6–10 years	27	20.8
	>10 years	11	8.5

Table 1 presents the demographic characteristics of the 130 respondents involved in this study. The majority of respondents were male (60.0%), while female respondents accounted for 40.0%, indicating a relatively higher representation of male employees in technology-related occupations. Regarding age distribution, most respondents were between 25–34 years old (51.5%), followed by those under 25 years (21.5%) and 35–44 years (20.8%), suggesting that the sample was dominated by early-career and digitally adaptive employees. In terms of educational background, the majority held a bachelor's degree (70.8%), followed by master's degree holders (18.4%), reflecting a highly educated workforce. Based on job position, software developers/engineers represented the largest group (32.3%), followed by IT support/system administrators (21.5%) and data analysts/AI specialists (16.2%), indicating that most respondents were directly involved with technology-based activities. Regarding work experience, respondents with 2–5 years of experience constituted the largest proportion (46.9%), followed by those with less than 2 years (23.8%). These characteristics indicate that the respondents possess relevant exposure to digital technologies and AI-supported work environments, making them appropriate for examining the relationships between human–AI collaboration, digital competence, creativity, and work performance.

4.2 Measurement Model Evaluation

The measurement model was evaluated to examine the reliability and validity of the constructs used in this study. The assessment includes indicator reliability, internal consistency reliability, convergent validity, and discriminant validity.

4.2.1 Convergent Validity and Reliability Testing

Convergent validity was assessed through outer loading values and Average Variance Extracted (AVE). Meanwhile, construct reliability was evaluated using Cronbach's Alpha and Composite Reliability (CR). The recommended threshold values are outer loading >0.70, AVE >0.50, and reliability values >0.70.

Table 2. Reliability and Convergent Validity Results

Construct	Code	Loading	Cronbach's Alpha	Composite Reliability	AVE
Human–AI Collaboration	HAC1	0.812	0.873	0.914	0.726
	HAC2	0.854			
	HAC3	0.889			
	HAC4	0.846			
Digital Competence	DC1	0.821	0.891	0.924	0.753
	DC2	0.876			
	DC3	0.902			
	DC4	0.861			
Employee Creativity	EC1	0.835	0.884	0.920	0.742
	EC2	0.881			
	EC3	0.873			

	EC4	0.856			
Work Performance	WP1	0.842	0.899	0.930	0.768
	WP2	0.912			
	WP3	0.884			
	WP4	0.875			

Table 2 presents the results of the measurement model evaluation regarding reliability and convergent validity of the research constructs. All indicators demonstrate acceptable factor loading values ranging from 0.812 to 0.912, exceeding the recommended threshold of 0.70, indicating that each indicator adequately represents its respective construct. The reliability assessment shows that all constructs achieve satisfactory internal consistency, with Cronbach's Alpha values ranging from 0.873 to 0.899 and Composite Reliability values between 0.914 and 0.930, which are above the minimum requirement of 0.70. Furthermore, the Average Variance Extracted (AVE) values for Human–AI Collaboration (0.726), Digital Competence (0.753), Employee Creativity (0.742), and Work Performance (0.768) exceed the recommended value of 0.50, confirming adequate convergent validity. These results indicate that the measurement instruments used in this study possess strong reliability and validity, allowing further evaluation of the structural model.

4.2.2 Discriminant Validity

Discriminant validity was evaluated using the Fornell–Larcker criterion. A construct should have a higher square root of AVE compared with its correlations with other constructs.

Table 3. Fornell–Larcker Criterion

Construct	HAC	DC	EC	WP
Human–AI Collaboration	0.852			
Digital Competence	0.641	0.868		
Employee Creativity	0.683	0.712	0.861	
Work Performance	0.624	0.685	0.748	0.876

Table 3 presents the results of the Fornell–Larcker criterion to evaluate discriminant validity among the research constructs. The diagonal values, representing the square root of AVE for each construct, are higher than the corresponding correlations with other constructs. Human–AI Collaboration shows a value of 0.852, Digital Competence 0.868, Employee Creativity 0.861, and Work Performance 0.876, all exceeding their inter-construct correlation values. These findings confirm that each construct has sufficient discriminant validity, indicating that Human–AI Collaboration, Digital Competence, Employee Creativity, and Work Performance represent distinct concepts within the research model. Therefore, the measurement model satisfies the required validity criteria for further structural model analysis.

4.3 Structural Model Evaluation

After confirming the reliability and validity of the measurement model, the structural model was assessed to examine explanatory power and hypothesis relationships.

4.3.1 Coefficient of Determination (R^2)

The R^2 value indicates the explanatory power of the structural model in predicting endogenous constructs. As presented in Table 4, human–AI collaboration and digital competence explain 61.2% of the variance in employee creativity, indicating a moderate level of predictive capability. Furthermore, human–AI collaboration, digital competence, and employee creativity explain 73.4% of the variance in work performance, demonstrating substantial explanatory power. These findings suggest that the

proposed model provides a strong explanation of how technological collaboration and individual digital capabilities contribute to employee creativity and performance outcomes in technology organizations.

4.3.2 Hypothesis Testing

Hypothesis testing was conducted using bootstrapping procedures with 5,000 resamples in SmartPLS 3.

Table 4. Path Coefficient and Hypothesis Testing Results

Relationship	β	t-value	p-value	Result
H1: Human–AI Collaboration → Employee Creativity	0.382	5.214	<0.001	Supported
H2: Digital Competence → Employee Creativity	0.451	6.378	<0.001	Supported
H3: Digital Competence → Work Performance	0.214	2.984	0.003	Supported
H4: Employee Creativity → Work Performance	0.523	8.126	<0.001	Supported
H5: Human–AI Collaboration → Work Performance	0.187	2.467	0.014	Supported

Table 4 presents the results of hypothesis testing using path coefficient analysis. The findings indicate that all proposed hypotheses are supported, with each relationship showing a significant positive effect. Human–AI Collaboration has a positive influence on Employee Creativity ($\beta = 0.382$, $t = 5.214$, $p < 0.001$), indicating that effective interaction between employees and AI systems enhances creative capabilities. Digital Competence demonstrates the strongest effect on Employee Creativity ($\beta = 0.451$, $t = 6.378$, $p < 0.001$), suggesting that employees with higher digital capabilities are more capable of utilizing technology to generate innovative ideas. Furthermore, Digital Competence positively influences Work Performance ($\beta = 0.214$, $t = 2.984$, $p = 0.003$), while Employee Creativity shows the strongest contribution toward Work Performance ($\beta = 0.523$, $t = 8.126$, $p < 0.001$). Human–AI Collaboration also has a significant positive effect on Work Performance ($\beta = 0.187$, $t = 2.467$, $p = 0.014$). These results confirm that technological collaboration, digital capability, and employee creativity are important determinants of performance outcomes in technology organizations.

Table 5. Indirect Effect Results

Relationship	β	t-value	p-value	Result
H6: Human–AI Collaboration → Employee Creativity → Work Performance	0.200	4.322	<0.001	Supported
H7: Digital Competence → Employee Creativity → Work Performance	0.236	5.021	<0.001	Supported

Table 5 presents the results of the indirect effect analysis examining the mediating role of employee creativity between technological capabilities and work performance. The findings indicate that employee creativity significantly mediates the relationship between Human–AI Collaboration and Work Performance ($\beta = 0.200$, $t = 4.322$, $p < 0.001$), as well as between Digital Competence and Work Performance ($\beta = 0.236$, $t = 5.021$, $p < 0.001$). These results demonstrate that technological capabilities contribute to improved performance not only through direct mechanisms but also by stimulating employees' creative abilities. Human–AI collaboration enables employees to utilize AI-supported insights to generate innovative solutions, which subsequently improves work outcomes. Similarly, digital competence strengthens employees' ability to explore and integrate digital resources into creative processes, leading to higher performance levels. Therefore, employee creativity functions as an important

mechanism that converts technological capabilities into improved employee performance within technology-sector organizations.

Discussion

The results demonstrate that human–AI collaboration has a positive and significant effect on employee creativity, supporting H1. This finding indicates that employees who effectively interact and collaborate with AI systems tend to develop stronger creative capabilities. The result aligns with the human augmentation perspective, which emphasizes that AI functions as a supportive mechanism that enhances human cognitive abilities rather than replacing human roles. Through AI-supported tools, employees can access broader information, obtain analytical assistance, and explore alternative perspectives that stimulate creative thinking. In technology organizations, effective collaboration with AI enables employees to generate new ideas, identify innovative solutions, and improve problem-solving processes [8], [9]. Therefore, organizations should focus not only on AI implementation but also on developing employees' ability to collaborate effectively with AI systems through appropriate training and knowledge development.

Digital competence was found to have a positive and significant influence on employee creativity, supporting H2. Among the examined predictors, digital competence demonstrates the strongest effect on employee creativity, indicating that employees with higher digital capabilities are more capable of utilizing technological resources to support innovation activities. Digital competence enables employees to effectively access digital information, operate advanced technologies, and integrate digital tools into creative problem-solving processes [18], [19], [28]. This finding supports the Resource-Based View (RBV), which considers employee digital capability as an intangible resource that contributes to organizational competitiveness [16]. Technology investments can generate greater value when employees possess sufficient competencies to utilize digital resources strategically and transform technological opportunities into creative outcomes.

The analysis shows that digital competence has a positive and significant effect on work performance, supporting H3. This finding indicates that employees with stronger digital capabilities are better able to utilize digital platforms, adapt to technological changes, and complete tasks more efficiently. Furthermore, employee creativity demonstrates the strongest direct effect on work performance, supporting H4. This result highlights that creativity is a key mechanism influencing employee effectiveness in technology organizations [22], [23], [29]. Creative employees are more capable of developing innovative solutions, improving work processes, and responding to complex challenges. Therefore, digital competence provides the technological foundation, while creativity transforms these capabilities into improved performance outcomes.

Human–AI collaboration also demonstrates a positive and significant effect on work performance, supporting H5. This finding suggests that AI-supported collaboration contributes to improved employee outcomes by assisting decision-making, reducing repetitive workloads, and increasing work efficiency. However, the relatively smaller coefficient compared with employee creativity indicates that AI does not independently determine performance improvement. Instead, AI generates greater value when employees possess the ability to collaborate with intelligent systems, apply creative thinking, and utilize digital capabilities effectively. Thus, organizations should view AI as a collaborative resource that strengthens human potential rather than merely as an automation technology.

5. CONCLUSION

This study examined the influence of human–AI collaboration and digital competence on employee creativity and work performance in Indonesia's technology sector. The findings show that human–AI

collaboration and digital competence positively enhance creativity and performance, with employee creativity serving as the strongest factor influencing work outcomes. The study highlights that organizations should develop AI literacy, digital skills, and creative capabilities to maximize AI utilization while maintaining human judgment and innovation. The research contributes to understanding AI-driven workplace transformation but is limited by its cross-sectional design and sample size of 130 respondents. Future studies should consider larger samples, longitudinal approaches, and additional factors such as AI readiness, organizational support, and technological trust.

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