

Digital Literacy and Adaptive Capability as Key Drivers of Employee Performance in the Era of Automation and Artificial Intelligence

Lanudia Ananda^{1*}, Fitry Nur Hidayanti², Aep Saefullah³

¹⁻³ Sekolah Tinggi Ilmu Ekonomi Ganesha, Indonesia

Email: [1lanudiaananda167@gmail.com](mailto:lanudiaananda167@gmail.com) , [2fitrinurhidayanti20@gmail.com](mailto:fitrinurhidayanti20@gmail.com)

*) Corresponding Author

Abstract

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This study offers a novel contribution by integrating digital literacy and adaptive capability as complementary determinants of employee performance within the context of automation and Artificial Intelligence (AI), an area that remains underexplored in prior literature. The objective of this research is to analyze how digital literacy and adaptability interact to influence workforce performance in rapidly evolving technological environments. The study employs a structured literature review method, synthesizing findings from recent national and international scholarly publications over the past decade. The empirical synthesis indicates that digital literacy enhances employees' ability to utilize advanced technologies, leading to improved efficiency, accuracy in decision-making, and task execution. Meanwhile, adaptive capability enables individuals to respond proactively to continuous technological and organizational changes. Importantly, the findings demonstrate that the synergy between technological competence and adaptability significantly determines sustained productivity and performance consistency. The implications of this study suggest that organizations should not only prioritize continuous digital skills development but also foster adaptive work cultures to maintain competitiveness and resilience in an increasingly automated and AI-driven workplace.

Keywords:

Adaptability, Artificial Intelligence, Automation, Digital Literacy, Employee Performance

INTRODUCTION

Digital technological transformation, particularly driven by the rapid penetration of automation and artificial intelligence (AI), has profoundly reshaped contemporary work environments. This transformation affects not only task execution mechanisms but also patterns of interaction, decision-making processes, and organizational structures. Consequently, employees are required to develop new competencies to remain competitive and productive amid increasingly dynamic industrial changes (ningsih et al., 2024). In this context, digital literacy has emerged as a fundamental capability, encompassing individuals' ability to understand technological workflows and effectively utilize digital tools to generate practical solutions in professional settings.

Beyond digital literacy, adaptive capability has become a critical determinant of employee success in responding to the accelerated changes brought about by automation and AI. Employees with high adaptability tend to demonstrate greater flexibility, openness to change, and resilience when facing evolving job demands. Prior studies indicate that insufficient digital literacy and low adaptive capability are major barriers to optimizing employee performance and achieving organizational effectiveness, particularly in technology-intensive work environments (Rizal et al., 2022).

Although existing research has extensively examined digital literacy and employee performance, the literature remains limited in addressing the simultaneous roles of digital literacy and adaptive capability, especially within the context of large-scale transitions toward AI- and automation-based work systems. Most studies tend to investigate these variables independently, leaving a theoretical gap in understanding their combined influence on employee performance under conditions of technological disruption. Addressing this gap is essential, as the integration of advanced technologies increasingly requires not only technical competence but also behavioral and cognitive flexibility (Muharram et al., 2025).

Moreover, technological mastery alone is insufficient to ensure sustainable performance outcomes. The rapid pace of technological evolution demands a high level of adaptability from human resources, as organizational systems, workflows, and policies may change unpredictably in response to technological advancements. Employees with strong adaptive capabilities are better equipped to manage uncertainty and maintain stable performance quality despite systemic transitions and operational pressures (Mula & Ristiani, 2025).

In practice, many organizations continue to face challenges related to workforce readiness. A persistent gap exists between the speed of technological advancement and individuals' capacity to adapt, which may ultimately undermine performance targets and organizational competitiveness. This condition underscores the urgency of examining how digital literacy and adaptive capability jointly influence employee performance in the era of automation and artificial intelligence (Rachman et al., 2024).

Therefore, this study aims to analyze the effects of digital literacy and adaptive capability on employee performance within AI- and automation-driven work environments. By integrating these two critical dimensions, this research seeks to contribute to the theoretical development of human resource and performance literature while offering practical insights for organizational leaders in formulating effective human capital strategies amid ongoing digital transformation.

Digital literacy refers to an individual's ability to understand, evaluate, and utilize information obtained from various digital formats through computers and other electronic devices (Gilster, n.d.) defines digital literacy as more than technical proficiency; it encompasses critical thinking skills required to assess, select, and responsibly use digital information. In a broader conceptualization, digital literacy represents personal capability in optimally employing technological instruments for information acquisition, management, validation, and production (Cardoso & Gonçalves, 2022).

From a terminological perspective, digital literacy includes individuals' competencies in interacting with digital media to process data productively and ethically. (Spante et al., 2018) argue that digital literacy significantly enhances work efficiency by enabling individuals to filter information effectively and operate complex digital systems. As organizations increasingly rely on digital infrastructures such as artificial intelligence (AI), big data analytics, and the Internet of Things (IoT), employees with high levels of digital literacy are better positioned to leverage these technologies to achieve work targets, process information rapidly, and collaborate across digital platforms (Lusiyanti & Mangunwihardjo, 2018), (Nugroho & Tambunan, 2025).

In the era of automation and artificial intelligence, digital literacy has become indispensable, as technology functions as a primary tool in decision-making and task execution. Employees with low digital literacy are more likely to experience difficulties in adapting to technological advancements, which may negatively affect their performance. Scholars commonly conceptualize digital literacy as a multidimensional construct, comprising technical skills, information literacy, and digital communication capabilities. Employees with strong digital literacy are able to support task completion, enhance work efficiency, and adapt to digitally driven work systems.

Adaptive capability refers to an individual's flexibility in responding to changing task demands and technological developments. This capability enables employees to remain relevant through a flexible mindset and a continuous learning orientation. Adaptability to environmental change plays a crucial role in competitive strategy processes aimed at improving organizational performance (Lusiyanti & Mangunwihardjo, 2018). In AI-driven work environments, adaptive performance has been identified as a stronger predictor of long-term employee success than static technical skills (Liang et al., 2025).

In modern workplaces, change frequently manifests in the form of technological system upgrades, organizational policy shifts, or external disruptions such as economic crises, pandemics, and digital transformation. Adaptive employees not only accept these changes but are also capable of adjusting rapidly and identifying new ways to remain productive (Marhandrie et al., 2024). Within the context of automation and AI, adaptability becomes particularly critical, as technological implementation often reshapes workflows and job responsibilities. Employees with high adaptive capability are more proficient in learning AI-based systems, innovating with new digital tools, and managing stress associated with organizational change (Lestary & Chaniago, 2017).

As digital disruption intensifies, adaptability is no longer viewed as a supplementary skill but as a core competency. Adaptive employees are not only able to realign work processes with new systems but also demonstrate psychological resilience when facing complex technical challenges. Consequently, adaptive capability serves as a fundamental determinant of an

individual's capacity to consistently generate performance outcomes in dynamic work environments.

Employee performance refers to the extent to which individuals successfully achieve work targets and fulfill responsibilities established by the organization. Performance outcomes are not solely determined by technical skills but are also significantly influenced by digital literacy and adaptive capability in responding to evolving work systems. In contemporary organizational contexts, these competencies have become increasingly critical due to the extensive integration of automation and artificial intelligence in the workplace (Silaen et al., 2021). In automation- and AI-intensive environments, the concept of employee performance has expanded beyond traditional measures of manual output. Performance now encompasses the ability to effectively utilize digital systems, collaborate within virtual teams, and innovate through technological tools (Mujtahidin et al., 2025). Employee performance is influenced by multiple factors, including competence, motivation, work environment, and individuals' capacity to cope with change. In modern organizations, performance is evaluated not only in terms of output quantity but also quality, timeliness, and innovative capability.

Relationship between Digital Literacy, Adaptive Capability, and Employee Performance

The interaction between digital literacy and adaptive capability demonstrates a significant relationship with individual performance outcomes in modern work environments. Digital literacy functions as an instrumental competence that enables employees to optimize the use of technological tools to achieve task efficiency. Meanwhile, adaptive capability serves as a prerequisite for maintaining resilience amid the dynamic evolution of automation and artificial intelligence.

Collectively, these two variables enhance human resource readiness in transforming technological challenges into opportunities for improving service quality and work outcomes. Employees who possess strong digital literacy and high adaptive capability are better equipped to sustain and improve performance despite rapid technological change. Therefore, digital literacy and adaptive capability are widely regarded as key drivers of employee performance in the era of automation and artificial intelligence.

METHOD

This study employs a quantitative approach with a causal-associative research design to investigate the cause-and-effect relationships among variables. This approach is selected to ensure that the phenomena under investigation can be measured objectively and analyzed using statistical techniques, thereby producing valid and reliable conclusions.

The study identifies two independent variables, namely digital literacy (X_1) and adaptive capability (X_2), and examines their influence on employee performance (Y) as the dependent variable. The research locus is situated within organizations that have adopted advanced technological transformations, particularly those implementing automation and artificial intelligence (AI) in their operational systems.

The population of this study consists of employees working in digitally driven and automation-based organizations. The sampling strategy is determined by the size of the population. For relatively small populations (fewer than 100 respondents), a total sampling

(census) technique is applied. In contrast, for larger populations, proportionate stratified random sampling is employed to ensure representative data collection across different organizational levels.

Stratification is conducted based on job position or departmental affiliation to minimize perceptual bias related to performance assessment and to enhance the representativeness of the sample across hierarchical structures.

This study utilizes quantitative data obtained primarily from questionnaire responses completed by research participants. Primary data are collected directly from respondents through structured survey instruments, while secondary data are derived from scholarly journal publications, academic literature, and relevant organizational documents to strengthen the theoretical foundation of the study.

Secondary data serve as a theoretical triangulation mechanism in interpreting empirical findings and situating the results within the broader academic discourse (Gideon, 2025).

Data collection is conducted through the distribution of structured questionnaires measured using a five-point Likert scale, ranging from “Strongly Disagree” to “Strongly Agree.” This scale is selected to provide adequate sensitivity in capturing respondents’ perceptions without creating cognitive overload.

In addition to survey data, a literature review is undertaken to reinforce the conceptual framework and support the interpretation of research findings. Documentation techniques are also applied by collecting relevant organizational records and internal reports (Iswandi & Kuswinarno, 2025). These documents include information related to digital work system configurations, workforce demographics, and organizational policies facilitating technological transition and adoption. Such documentation functions as supporting data for triangulating questionnaire results, thereby enhancing the validity of the observed phenomena through official organizational evidence.

To evaluate the relationships among variables, this study applies multiple linear regression analysis. The data analysis process begins with instrument quality assessment, followed by classical assumption testing, and concludes with hypothesis testing and model evaluation.

Instrument quality is assessed through validity and reliability tests to ensure that the questionnaire accurately and consistently measures the constructs under study. Classical assumption tests including normality, multicollinearity, and heteroscedasticity tests—are conducted as prerequisite conditions for regression analysis to confirm that the data meet the criteria for generating a Best Linear Unbiased Estimator (BLUE).

Hypothesis testing is performed using partial significance tests (t-tests) to examine the individual effect of each independent variable and simultaneous significance tests (F-tests) to assess the collective influence of digital literacy and adaptive capability on employee performance. Furthermore, the coefficient of determination (R^2) is employed to measure the explanatory power of the regression model, indicating the extent to which variations in employee performance can be explained by the independent variables (Darma, n.d.), (Hanum et al., 2024).

RESULTS AND DISCUSSION

Based on the data analysis, the findings indicate that digital literacy is a key determinant of employee performance. A high level of digital literacy enables employees to optimally leverage artificial intelligence-based systems, resulting in more precise work processes and a reduction in technical barriers that may hinder productivity. Employees with strong digital competencies demonstrate greater efficiency in utilizing digital tools, managing information flows, and adapting to technology-driven work environments.

The results further reveal that adaptive capability constitutes a crucial determinant with a significant impact on work effectiveness. Employees' capacity to respond to rapid changes in digital systems and evolving work procedures shows a direct correlation with the achievement of organizational targets and the enhancement of work quality. Adaptive employees tend to exhibit flexibility, resilience, and a proactive learning orientation, allowing them to maintain performance stability amid technological transitions.

Simultaneous testing confirms that digital literacy and adaptive capability collectively exert a significant influence on employee performance. This finding supports prior empirical evidence suggesting that the integration of technological competence and personal agility is essential for sustaining workforce productivity in the era of automation and artificial intelligence (Dinata, 2021).

Table 1. Results of Hypothesis Testing

No	Hypothesis	Hypothesis Statement	Test Result	Conclusion
1	H ₁	Digital Literacy → Employee Performance	Significant	Accepted
2	H ₂	Adaptive Capability → Employee Performance	Significant	Accepted
3	H ₃	Digital Literacy & Adaptive Capability → Employee Performance	Significant	Accepted

As presented in Table 1, the hypothesis testing results demonstrate that both digital literacy and adaptive capability have a significant linear effect on employee performance. Hypotheses H₁ and H₂ are accepted, indicating that each independent variable individually exerts a partial influence on employee performance. This finding underscores the role of digital literacy in enabling employees to utilize advanced technologies effectively, while adaptive capability allows them to cope with continuous system changes and organizational adjustments.

Moreover, the simultaneous test results reveal that digital literacy and adaptive capability jointly have a significant impact on employee performance, leading to the acceptance of hypothesis H₃. This outcome suggests that employee performance in automation- and AI-based work environments is not solely driven by technological skills, but also by the ability to adapt to dynamic and uncertain conditions.

These findings reinforce previous studies emphasizing that digital competence and adaptability are critical factors in enhancing employee performance within technologically intensive organizations. In the context of automation and artificial intelligence, employees who possess both strong digital literacy and high adaptive capability are better positioned to

transform technological disruption into opportunities for improved efficiency, innovation, and sustained organizational performance.

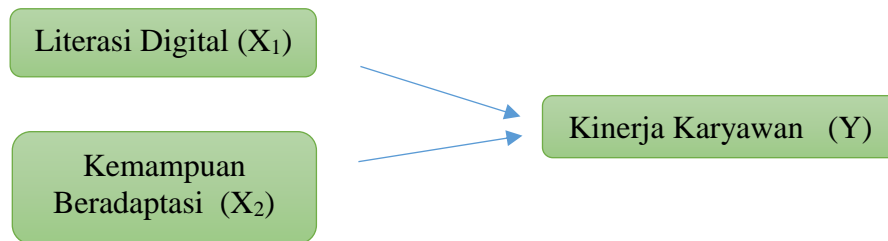


Figure 1. Conceptual Framework

Analysis of the Effect of Digital Literacy (X1) on Employee Performance (Y)

Based on the data analysis, digital literacy is identified as a key determinant underlying employee performance in contemporary work environments. The findings confirm that digital competence is not merely an additional technical skill, but a fundamental capability that enables employees to optimally leverage artificial intelligence-based systems. Through strong digital literacy, employees are able to establish more precise workflows and reduce technical barriers that may otherwise hinder daily productivity.

A strong linear relationship is evident, indicating that higher levels of proficiency in operating digital tools are associated with significantly improved work effectiveness. This finding aligns with the perspective that digital literacy facilitates individuals in processing information productively and responsibly, particularly in filtering complex data streams. In operational terms, high digital literacy enables employees to achieve performance targets more efficiently through faster cross-platform collaboration and more accurate information processing. Consequently, digital literacy emerges as a critical enabler of efficiency and effectiveness in technology-intensive work settings.

Analysis of the Effect of Adaptive Capability (X2) on Employee Performance (Y)

The results empirically confirm that adaptive capability has a significant impact on enhancing employee work effectiveness in the digital era. Adaptability is no longer a supplementary competence; rather, it has become a primary predictor of long-term professional success, surpassing static technical skills. Employees' capacity to respond to the evolution of digital tools and their flexibility in adjusting to changes in work processes are directly correlated with organizational target achievement and superior output quality.

In dynamic operational environments, employee flexibility in responding to changes in work systems plays a pivotal role in maintaining productivity stability. Employees with high adaptive capability tend to transform technological challenges—such as automation and AI integration—into opportunities for improving service quality and performance outcomes. Moreover, strong adaptability helps mitigate work-related stress arising from policy shifts or organizational restructuring, enabling employees to sustain consistent performance despite pressures associated with system transitions.

Analysis of the Simultaneous Effect of Digital Literacy (X1) and Adaptive Capability (X2) on Employee Performance (Y)

Simultaneous hypothesis testing provides empirical evidence that digital literacy and adaptive capability collectively exert a significant and strategic influence on employee performance. This finding underscores that optimal performance in an era of disruption cannot be achieved by relying on a single factor in isolation. Instead, the synergy between technological proficiency and individual flexibility plays a decisive role in driving productivity growth, improving operational accuracy, and sustaining long-term performance consistency across organizational levels.

The results validate prior literature emphasizing that the integration of technological capabilities (hard skills) and personal agility (soft skills) constitutes a primary determinant in maintaining workforce competitiveness amid rapid automation and artificial intelligence advancements. Collectively, these variables enhance organizational readiness by enabling human resources to transform technological challenges into strategic opportunities that improve overall service quality and performance outcomes. Accordingly, organizations that successfully align digital competence with a dynamic and adaptive work environment are more likely to achieve stable competitive advantages in the current phase of automation-driven transformation.

The empirical findings of this study indicate that digital literacy and adaptive capability have a significant influence, both partially and simultaneously, on employee performance, which is generally consistent with various previous studies and theoretical foundations. Theoretically, the concept of digital literacy proposed by Paul Gilster emphasizes that digital literacy is not merely limited to technical skills but also includes critical thinking abilities in utilizing digital information. In this study, such capabilities are proven to contribute to improved work efficiency and accuracy.

These findings are in line with the perspective of Spante et al., who argue that digital literacy enhances work effectiveness through the ability to process complex information. Furthermore, the results of this study also support the work of Lusiyanthi and Manguwihardjo, who highlight that adaptive capability plays an important role in improving performance through individual flexibility in responding to changes in the work environment.

Moreover, the findings regarding the simultaneous influence of both variables reinforce the argument of Liang et al., who state that in the era of artificial intelligence, the combination of technological competence and adaptive capability becomes a key factor in achieving long-term performance success.

Thus, this study not only confirms existing theories and previous research findings but also extends them by demonstrating that the integration of digital literacy and adaptive capability jointly provides a stronger contribution to employee performance, particularly in the context of work environments driven by automation and artificial intelligence.

CONCLUSION

Based on the results of data analysis and discussion, it can be concluded that digital literacy and adaptive capability play a crucial role in determining employee performance in an era of disruption. Partially, digital literacy demonstrates a significant positive contribution, indicating that proficiency in utilizing digital tools and artificial intelligence directly enhances work effectiveness. In parallel, adaptive capability also exerts a substantial influence on individual performance, where flexibility in responding to changes in work systems becomes

a key factor in maintaining productivity stability. Simultaneously, the integration of technological competence and personal agility emerges as a strong predictor of workforce success in addressing the increasingly complex demands of automation. These findings underscore that optimal employee performance in technology-driven environments is achieved not through isolated competencies, but through the synergy between digital skills and adaptability. Based on these findings, organizations are recommended to initiate comprehensive and continuous digital competency development programs to reduce skill gaps amid the widespread adoption of artificial intelligence. Management is also encouraged to cultivate a work ecosystem that supports change and fosters employee resilience, thereby enabling a smoother transition toward automated work systems. For future research, it is suggested to expand the research scope across more heterogeneous industrial sectors and incorporate additional variables such as digital leadership or organizational culture to further enrich the body of knowledge on employee performance dynamics in the digital era.

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