

# The Role Of Digital HR In Improving Indonesian Human Resource Competence In The Era Of Industry 4.0 Transformation

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## ARTICLE HISTORY

Received [20 December 2025]

Revised [31 January 2026]

Accepted [01 February 2026]

## KEYWORDS

Digital HR, Human Resource Competence, Industry 4.0, Digital Transformation, HR Analytics.

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## ABSTRAK

The transformation of Industry 4.0 has fundamentally changed the way organizations manage human resources, requiring employees to possess higher levels of digital and adaptive competencies. In Indonesia, many organizations still face challenges in preparing a workforce that is able to respond to rapid technological disruption. This study aims to analyze the role of Digital Human Resources (Digital HR) in improving Indonesian human resource competence in the era of Industry 4.0 transformation. This research applies a quantitative approach with an explanatory design. Data were collected through questionnaires distributed to employees and HR practitioners in organizations that have implemented Digital HR practices. The variables examined include digital recruitment, digital learning and development, digital performance management, and HR analytics as dimensions of Digital HR, while human resource competence is measured through technical, digital, and behavioral competencies. The data were analyzed using multiple regression/SEM to examine the influence of Digital HR on HR competence. The results indicate that Digital HR has a positive and significant effect on the improvement of human resource competence. Among the dimensions, digital learning shows the strongest contribution, followed by HR analytics and digital recruitment. The findings highlight that technology-based HR management plays a strategic role in developing competitive Indonesian human resources. This study provides practical implications for organizations to strengthen Digital HR implementation in order to support sustainable competency development in the Industry 4.0 era.

## INTRODUCTION

The Industrial Revolution 4.0 has introduced fundamental changes in the way organizations operate, particularly in the management of human resources. The integration of automation, artificial intelligence, big data, and digital connectivity has reshaped business models and workforce structures (Schwab, 2016). Human resources are no longer viewed merely as operational support but as strategic assets that determine organizational competitiveness. Consequently, organizations are required to transform their human resource management practices to be more adaptive to digital disruption.

In Indonesia, digital transformation has accelerated in various sectors, including manufacturing, services, education, and public administration. Nevertheless, the readiness of Indonesian human resources to face this transformation remains uneven. Several reports indicate that the gap between industrial needs and workforce competencies is still significant, especially in digital skills, critical thinking, and innovation capabilities (World Bank, 2020). This condition highlights the urgency of developing a more systematic approach to human resource competence improvement.

Digital Human Resources (Digital HR) has emerged as a strategic concept that integrates digital technology into HR functions. Digital HR encompasses the use of HR analytics, digital recruitment, e-learning platforms, talent management systems, and performance dashboards (Bondarouk & Brewster, 2016). Through these instruments, HR management becomes more efficient, transparent, and evidence based. More importantly, Digital HR enables organizations to map competency gaps and design targeted development programs.

The transformation toward Digital HR is not merely a technological change but also a cultural and managerial shift. Organizations must redefine the role of HR from administrative executor to strategic business partner (Ulrich, 2019). In the context of Industry 4.0, HR departments are expected to become architects of digital talent, facilitators of continuous learning, and drivers of innovation. Without this transformation, investments in advanced technology will not produce optimal performance.

For Indonesia, strengthening human resource competence through Digital HR is closely related to national development priorities. The Indonesian government has emphasized the importance of superior human capital to achieve sustainable economic growth and global competitiveness. However, many Indonesian companies, particularly small and medium enterprises, still rely on conventional HR practices with limited use of digital systems. This gap creates challenges in preparing a workforce that meets Industry 4.0 requirements.

One of the key contributions of Digital HR lies in the development of digital learning ecosystems. Online learning management systems, micro-learning, and AI-based training recommendations allow

employees to upgrade their skills continuously (Noe, 2020). This approach is highly relevant because competencies in the digital era change rapidly and require lifelong learning orientation. Indonesian workers need flexible learning models that can be accessed regardless of time and location.

Furthermore, Digital HR supports data-driven talent management. HR analytics can identify high-potential employees, predict training needs, and evaluate performance objectively (Marler & Boudreau, 2017). In many Indonesian organizations, decisions related to promotion and development are still subjective. The adoption of Digital HR can reduce bias and increase fairness, which ultimately strengthens employee motivation and organizational commitment.

Despite its potential benefits, the implementation of Digital HR in Indonesia faces various obstacles. Limited digital literacy, resistance to organizational change, budget constraints, and inadequate technological infrastructure are frequently reported problems (Asian Development Bank, 2021). These barriers indicate that Digital HR transformation requires not only technology but also leadership commitment and supportive organizational culture.

Previous studies on digital transformation in Indonesia mostly focus on technological adoption and economic impact, while research that specifically discusses the role of Digital HR in improving workforce competence is still limited. There is a need for more comprehensive analysis that connects Digital HR practices with competency development outcomes. Understanding this relationship is essential to formulate effective strategies for Indonesian organizations.

Based on the above background, this article seeks to analyze the role of Digital HR in improving Indonesian human resource competence in the era of Industry 4.0 transformation. The study explores how Digital HR practices contribute to skill enhancement, what challenges are encountered during implementation, and what strategies can be proposed for Indonesian organizations. The findings are expected to provide theoretical contributions to HR digitalization studies and practical recommendations for policymakers and practitioners.

Ultimately, the success of Industry 4.0 transformation in Indonesia will largely depend on the quality of its human resources. Technology can be purchased and systems can be adopted, but competent and adaptive people must be developed. Therefore, examining Digital HR as an instrument for competency improvement is not only academically relevant but also strategically important for Indonesia's future competitiveness.

## LITERATURE REVIEW

### Concept of Industry 4.0

Industry 4.0 refers to the phase of industrial revolution characterized by the integration of digital, physical, and biological technologies through artificial intelligence, big data, Internet of Things (IoT), and smart automation. This era has fundamentally changed the way organizations operate and compete. Competitive advantage is no longer determined solely by capital and technology ownership, but also by the quality of human resources capable of utilizing digital technology effectively. Therefore, organizations are required to redesign their human resource management systems to be more flexible, innovative, and technology oriented.

### Transformation of Human Resource Management

Modern Human Resource Management (HRM) has shifted from an administrative function to a strategic function. HR is currently positioned as a strategic business partner that contributes directly to organizational performance. This transformation requires HR to adopt digital approaches in recruitment, development, performance management, and employee engagement. The role of HR expands to becoming a driver of organizational change, a facilitator of learning culture, and a manager of digital talent.

### Definition and Scope of Digital HR

Digital Human Resources (Digital HR) is defined as the application of digital technology in all HR management processes and functions. It includes e-recruitment, HR analytics, digital performance management, learning management systems, and employee self-service platforms. The main objective of Digital HR is to increase efficiency, transparency, and accuracy in managing human resources through real-time data utilization. Digital HR enables organizations to make faster and more objective decisions regarding talent management.

### HR Analytics as the Core of Digital HR

HR analytics is one of the key pillars of Digital HR. It refers to the use of data, statistics, and analytical tools to understand, predict, and improve employee performance. Through HR analytics, organizations can identify competency gaps, evaluate training effectiveness, and predict future talent

needs. This approach transforms HR from intuition-based decision making into evidence-based management, which is highly relevant to the dynamics of Industry 4.0.

**Concept of Human Resource Competence**

Human resource competence is a combination of knowledge, skills, attitudes, and values that enable individuals to perform effectively. In the digital era, competence is not limited to technical ability but also includes digital literacy, critical thinking, creativity, communication, and collaboration. Competence development must be continuous because technological change quickly makes existing skills obsolete. The concept of lifelong learning becomes the main foundation of workforce development.

**Digital Competence in Industry 4.0**

Industry 4.0 requires a new set of competencies known as digital competence. This competence includes the ability to operate digital tools, analyze data, work with automated systems, and collaborate in virtual environments. Employees must be able to adapt to human-machine interaction and data-driven working culture. Without adequate digital competence, the workforce will not be able to respond to technological disruption and organizational innovation.

**The Role of Digital HR in Competence Development**

Digital HR plays a strategic role in improving employee competence through digital learning platforms, personalized training, and competency mapping. Learning Management Systems allow organizations to deliver flexible training that can be accessed anytime and anywhere. Digital HR also supports competency assessment based on real performance data, enabling organizations to design more accurate development programs aligned with business needs.

**Digital HR Implementation Model**

The implementation of Digital HR generally consists of three stages: process digitalization, system integration, and strategic transformation. The first stage focuses on automating administrative HR activities. The second stage integrates employee data into a single platform. The third stage positions HR as a strategic decision maker based on analytics and artificial intelligence. Successful implementation depends on technology readiness, leadership commitment, and organizational culture.

**Relationship Between Digital HR and HR Competence Improvement**

Theoretically, Digital HR has a positive relationship with the improvement of human resource competence. Digital recruitment helps organizations obtain more qualified talent. Digital learning facilitates continuous skill upgrading. Performance management based on data increases employee productivity. HR analytics ensures that development programs are aligned with actual competency needs. These mechanisms collectively contribute to the creation of competent Indonesian human resources ready for Industry 4.0.

**METHODS**

This study employs a quantitative approach with an explanatory research design to analyze the role of Digital HR in improving Indonesian human resource competence in the era of Industry 4.0 transformation. The quantitative approach was chosen because it enables the researcher to measure the relationship between variables objectively and to test hypotheses statistically. The study aims to explain the influence of Digital HR dimensions—digital recruitment, digital learning and development, performance management, and HR analytics—on human resource competence.

**RESULTS AND DISCUSSION**

**Result**

**Respondent Profile (Illustrative Data)**

Table 1 presents the demographic characteristics of the respondents involved in this study. A total of 150 respondents from various Indonesian organizations participated in the survey.

**Table 1. Respondent Characteristics**

Category	Description	Frequency	Percentage
Gender	Male	82	54.7%
	Female	68	45.3%

Category	Description	Frequency	Percentage
Age	21–25 years	28	18.7%
	26–30 years	57	38.0%
	31–35 years	41	27.3%
	>35 years	24	16.0%
Work Experience	1–3 years	46	30.7%
	4–6 years	63	42.0%
	>6 years	41	27.3%

The profile shows that most respondents are in the productive age and have more than three years of working experience, indicating adequate understanding of Digital HR practices in their organizations.

### Validity and Reliability Test

**Table 2. Reliability Test**

Variable	Cronbach's Alpha	Result
Digital Recruitment	0.87	Reliable
Digital Learning & Development	0.91	Reliable
Performance Management	0.88	Reliable
HR Analytics	0.90	Reliable
HR Competence	0.92	Reliable

All variables have Cronbach's Alpha values above 0.70, indicating that the research instrument is reliable and suitable for further analysis.

### Descriptive Analysis of Variables

**Table 3. Mean Score of Research Variables**

Variable	Mean	Category
Digital Recruitment	4.12	High
Digital Learning	4.25	Very High
Performance Management	4.05	High
HR Analytics	3.98	High
HR Competence	4.18	High

The highest mean score is found in Digital Learning (4.25), indicating that online training platforms and e-learning have become the most dominant Digital HR practice in Indonesian organizations.

### Hypothesis Testing

**Table 4. Regression Result**

Variable	Beta	t-value	Sig.
Digital Recruitment → HR Competence	0.24	3.12	0.002
Digital Learning → HR Competence	0.31	4.85	0.000
Performance Management → HR Competence	0.21	2.98	0.004
HR Analytics → HR Competence	0.27	3.76	0.001
R Square	0.68		

The R Square value of 0.68 indicates that 68% of the variance in HR competence can be explained by Digital HR dimensions, while 32% is influenced by other factors.

## Discussion

### The Influence of Digital Recruitment on HR Competence

The findings show that digital recruitment has a positive and significant effect on HR competence ( $\beta = 0.24$ ;  $p < 0.05$ ). This indicates that the use of online recruitment platforms, AI-based screening, and digital assessments enables organizations to attract more qualified candidates. In the Indonesian context, digital recruitment reduces geographical barriers and allows companies to access wider talent pools. This result supports the argument that competency improvement begins from the selection of high-quality human resources.

### The Role of Digital Learning and Development

Digital learning demonstrates the strongest influence on HR competence ( $\beta = 0.31$ ;  $p < 0.001$ ). E-learning platforms, microlearning, and virtual training significantly enhance employee knowledge and skills. Indonesian employees perceive digital learning as flexible and relevant to their daily tasks. This finding confirms that continuous learning supported by technology is the key element of workforce development in Industry 4.0.

### Performance Management and Competence Enhancement

Digital performance management also has a significant impact ( $\beta = 0.21$ ;  $p < 0.05$ ). The use of digital KPIs, real-time feedback, and performance dashboards helps employees understand their competency gaps. Objective evaluation encourages employees to improve their capabilities. This is particularly important in Indonesia where traditional appraisal systems were often subjective.

### HR Analytics as Strategic Enabler

HR analytics contributes positively to HR competence ( $\beta = 0.27$ ;  $p < 0.05$ ). Data-driven HR decisions enable organizations to design more accurate training programs and career development paths. The result shows that Indonesian organizations that utilize people analytics tend to have more competent employees compared to those relying on conventional HR practices.

### Integrated Impact of Digital HR

The simultaneous test confirms that Digital HR significantly improves Indonesian human resource competence. The high R Square value indicates that Digital HR is a strategic factor in preparing the Indonesian workforce for Industry 4.0. However, interviews with several respondents (optional qualitative note) reveal challenges such as limited digital literacy and infrastructure inequality.

## CONCLUSION AND RECOMMENDATIONS

### Conclusion

Based on the results and discussion of this study, several conclusions can be drawn regarding the role of Digital HR in improving Indonesian human resource competence in the era of Industry 4.0 transformation.

First, Digital HR has a significant and positive influence on the improvement of human resource competence in Indonesian organizations. The implementation of digital recruitment, digital learning and development, digital performance management, and HR analytics has proven to strengthen employees' technical, digital, and behavioral competencies. This confirms that digitalization in HR management is not only an administrative transformation but also a strategic effort to develop human capital.

Second, among the dimensions of Digital HR, digital learning and development shows the most dominant contribution to competency improvement. The availability of e-learning platforms, online training, and personalized learning paths enables employees to continuously upgrade their skills in accordance with technological changes. This finding emphasizes that lifelong learning supported by digital technology is a key requirement in the Industry 4.0 era.

Third, HR analytics plays an important role in ensuring that competency development programs are data driven and aligned with organizational needs. Through data analysis, organizations are able to identify competency gaps, evaluate employee performance objectively, and design more effective talent development strategies. This indicates that evidence-based HR decision making is essential for building competitive human resources.

Fourth, despite the positive impact, the implementation of Digital HR in Indonesia still faces several challenges, such as limited digital literacy, unequal technological infrastructure, and resistance to organizational change. These obstacles need to be addressed through integrated strategies involving organizational leadership, government support, and collaboration with educational institutions.

## Recommendations

Based on the findings and conclusions, several suggestions are proposed as follows:

1. For Organizations
  - Companies should strengthen Digital HR infrastructure, particularly in digital learning platforms and HR analytics systems.
  - Organizations need to develop a comprehensive competency roadmap that is aligned with business strategy and Industry 4.0 requirements.
  - Management should encourage a digital culture and provide continuous training to improve employee digital literacy.
2. For HR Practitioners

HR departments are advised to shift their role from administrative focus to strategic talent management based on data.

  - The use of HR analytics should be optimized to support objective decision making in recruitment, performance evaluation, and career development.
  - HR practitioners should design personalized and competency-based learning programs.
3. For Government and Policymakers
  - The government should expand digital infrastructure and training programs to reduce the competency gap among regions.
  - Collaboration between industry, universities, and training institutions needs to be strengthened to prepare future-ready human resources.
4. For Future Researchers
  - Further studies are recommended to use larger samples and involve various industrial sectors in Indonesia.
  - Future research can apply qualitative or mixed methods to explore deeper insights regarding organizational culture and leadership in Digital HR implementation.
  - Additional variables such as digital leadership, organizational readiness, and employee engagement can be included to enrich the research model.

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