Research Horizon

ISSN: 2808-0696 (p), 2807-9531 (e)

Research Horizon
Volume: 04
Issue: 06
Year: 2024
Page: 301-308

Human Resource Competency Development in Facing the Challenges and Opportunities of the Industry 4.0 Era

Bagas Ananta Aji[1*], Disa Insanul Ikhlas[1], Intan Ratna Wati[1]

[1] Faculty of Economics and Business, Universitas Diponegoro, Semarang, Indonesia

[*] *Corresponding author: Bagas Ananta Aji (bagasanantaaji23@students.undip.ac.id)*

Abstract

In an era of technological advancements such as automation, artificial intelligence (AI), and the Fourth Industrial Revolution, the global labor market faces significant challenges, requiring the workforce to continuously adapt to new skills. Increasing global competition has heightened the demand for relevant hard and soft skills, enabling workers to contribute effectively within organizations. This study aims to analyze the role of education and training in supporting high-performing employees in the era of globalization and digitalization. Education and training are viewed as key instruments in fostering a competitive workforce, aligned with the ever-evolving demands of industry. The study employs a literature review method, referencing various studies. The findings indicate that structured, adaptive education and training are essential in shaping a superior and competitive workforce, capable of swiftly adapting to technological changes and market demands. This research enriches the literature on the importance of education and training in addressing skill gaps and supporting superior workforce performance in the era of globalization and technology. It also encourages companies to strategically and sustainably adopt technology-based training to enhance workforce skills.

Keywords

Development, Human Resource Competency, Employee Performance, Training

1. Introduction

The rapid pace of globalization and digitalization has brought major changes to industries, driven by innovative technological advancements such as automation, Artificial Intelligence (AI), and the Fourth Industrial Revolution (Laeeq, 2021; Saniuk et al., 2023). These advancements not only transform company operations but also create an urgent need for new, relevant skills to meet the demands of an increasingly competitive global market. To adapt and compete with workforces from various countries, workers must possess more diverse and adaptive skills. This transformation positions the training and skill development sector as a key player in preparing a workforce ready to face the complexities and dynamics of the modern work environment.

Training and development have become essential tools for equipping workers not only with specific technical skills (hard skills) but also with soft skills, which are increasingly important in the digital era (Romero-Gázquez et al, 2021; Li, 2022). A report from the World Economic Forum (WEF) highlights the importance of problem-solving abilities, creativity, and critical thinking as essential skills that today's workforce must possess (Piątkowski, 2020; Sharma et al., 2022). These skills form the foundational abilities that enable workers to innovate, adapt, and tackle new challenges arising from technological advancements. Additionally, proficiency in digital technology, particularly in data analysis and programming, is increasingly in demand in a work environment that is becoming more automated and data-driven (Wijaya, 2021; Davlyatbekovna, 2024).

Although the opportunities arising from these developments are vast, significant challenges also emerge, one of which is the skills gap. Many companies are now faced with the reality that the skills of their workforce do not yet align with the needs of modern industries. A study by McKinsey indicates that about 87% of business executives believe there is or will be a skills gap in their workforce in the coming years. This suggests that the mismatch between workforce competencies and industry demands could negatively impact the productivity and competitiveness of companies, especially in the face of global competition. This situation necessitates that companies make continuous investments in developing their workforce's skills through structured, strategic, and technology-responsive training and development programs. Such programs should be designed not only to address short-term skills needs but also to focus on fostering sustainable skill development. This approach aims to build a resilient and flexible workforce capable of handling technological changes in the Fourth Industrial Revolution era. It is hoped that these efforts will reduce the skills gap, improve workforce effectiveness and productivity, and strengthen companies' competitiveness in an increasingly intense global competition climate.

2. Literature Review

Training is a systematic effort aimed at equipping individuals with the skills, knowledge, and specific competencies needed to improve their performance and productivity in the tasks they currently handle (Siswanto, 2023; Sutrisno & Lazuardy, 2024). This process involves a series of structured learning activities and well-designed experiences intended to develop skills and abilities directly relevant to job responsibilities (Widijowati, 2023; Aranda-Jiménez et al, 2024). Training is essential to ensure that employees can carry out their duties effectively, meeting the demands of their roles with increased confidence and efficiency (Pató et al., 2022; Rijal & Sukresna, 2024). It can be delivered through various methods, tailored to address different learning preferences and job requirements. Common training methods include workshops, which provide hands-on experience; seminars that

deliver theoretical knowledge; online courses that allow flexibility in learning; and on-the-job training, where employees learn directly in their work environment (Stofkova & Sukalova, 2020; Sony & Mekoth, 2022). In human resources, development has a broader and more long-term perspective, focusing on a continuous and strategic approach to preparing individuals for future responsibilities and higher roles within the company. Unlike training, which is often targeted at immediate skill gaps, development aims to provide individuals with an extensive set of knowledge and abilities that support career growth and prepare them for greater challenges (Susilawati et al., 2022; Szabó et al., 2023). This process includes a variety of educational opportunities and learning experiences designed to foster personal improvement, acquisition of new skills, and professional advancement. Development activities incorporate a diverse range of methods, such as mentoring, where experienced colleagues guide less experienced employees; coaching, which provides one-on-one skill refinement; job rotation, offering exposure to different roles within the organization; and formal education, which may involve enrolling in courses or obtaining certifications (Suprapti & Suparmi, 2022; Arulsamy et al, 2023).

Employee performance is an indicator of how effectively and efficiently an individual fulfills the tasks and responsibilities assigned within the organization. This performance represents the degree to which an employee meets or even exceeds the company's established expectations and standards, thus contributing to the organization's overall success. Performance evaluation is a key component in understanding and improving employee productivity, as it provides insight into areas where an employee excels or may need further development. Appraisals of employee performance can be conducted using various approaches, including formal evaluations, where managers systematically review performance; target achievement, which assesses how well employees meet specific objectives; and feedback from supervisors and colleagues, which offers a more comprehensive view of an individual's impact and interaction within the team and company (Asif, 2021).

RQ1: What are the challenges for Human Resources in the Industry 4.0 era?
RQ2: What are the key skills and competencies required by the workforce to enhance global competitiveness?
RQ3: How can workforce training and skill development address the challenges and opportunities in the industry 4.0 era?

3. Methods

To comprehensively understand the role of employee training and development in tackling opportunities and challenges within the industry 4.0 era, the Systematic Literature Review (SLR) method serves as an essential and relevant approach for this study. Conducting a systematic review of scientific literature in a particular field provides a structured process to clearly identify key research questions and establish a solid foundation for future studies. The SLR method is beneficial because it allows researchers to systematically collect, evaluate, and interpret findings from prior studies related to the topic, offering a broad yet deep overview of the field (Kamara & Widagdo, 2022). By conducting a structured literature review, researchers can delve into the specific opportunities and challenges faced by employees in the industry 4.0 era, examine the essential competencies required to ensure sustainability, and investigate the critical role of training and development in preparing employees to excel in this technologically advanced environment. The data for this research was collected through the Watase Uake platform, which sourced articles from Scopus. A keyword-based search yielded a total of 176 articles, covering publications from the years 2014 to 2024. Following a rigorous screening process, 12 articles were selected for their relevance to this research topic, meeting the criteria of being indexed in Scopus from Q1 to Q4. These selected articles were

systematically gathered, tabulated, compared, and analyzed, ultimately forming the basis for the study's conclusions. Keywords such as "employee training to performance in globalization" and "employee competency industry 4.0" served as the foundation for identifying the relevant body of literature. The inclusion criteria for articles required them to be indexed within Scopus rankings Q1 to Q2, and published between 2014 and 2024. Through these carefully chosen keywords and criteria, this study aims to compile a collection of articles that are directly aligned with the research topic, thereby offering a targeted and relevant dataset to address the research questions effectively.

Data for Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) analysis was sourced from articles indexed in Scopus. An initial keyword search yielded 176 articles, which were filtered based on predefined criteria, narrowing down to 135 articles. During the screening process, 17 articles were identified as directly relevant to the topic, while 7 articles did not meet eligibility criteria within the Watase Uake site screening. Additionally, 2 supplementary articles were included from sources outside of Watase Uake's references. As a result, a total of 12 relevant articles were finalized for in-depth analysis and discussion in this study. In more detail, the PRISMA approach allowed for a systematic and transparent process, helping to identify the most pertinent studies while maintaining methodological rigor. By starting with a broad selection of 176 articles, the review process ensured comprehensive coverage of available literature. Criteria-based filtering reduced this to 135 articles, which were then further scrutinized for topic alignment and quality. The discovery of 17 articles closely related to the research focus underscores the effectiveness of the search criteria, and the exclusion of 7 ineligible articles maintains the integrity of the dataset. The addition of 2 external articles expanded the review, ensuring that critical insights beyond the initial database were considered. Ultimately, the selection of 12 core articles provides a well-rounded basis for this study's findings and discussion, enabling a thorough exploration of the research questions.

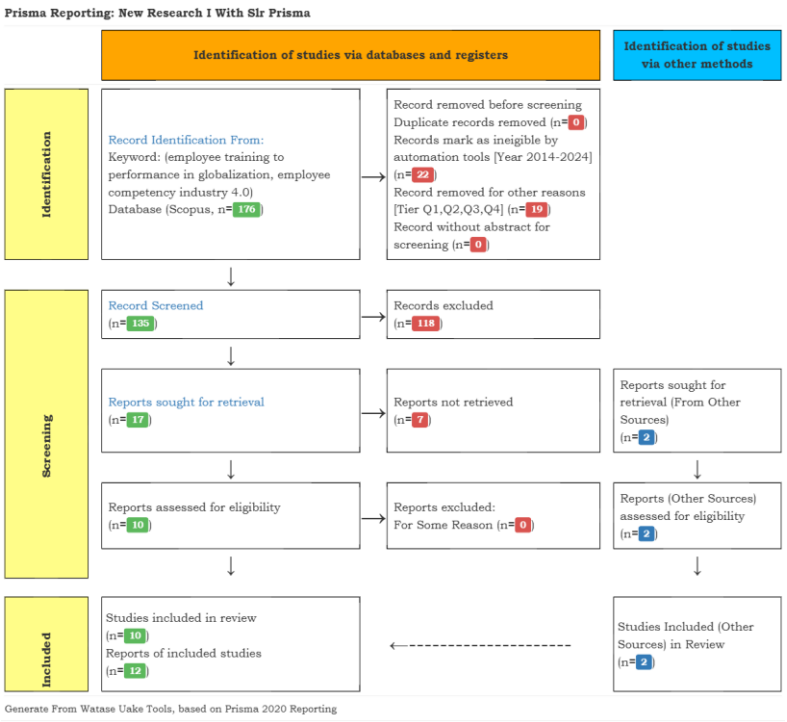

Figure 1. Prism Analysis Report

4. Results

The review included 45 studies published between 2017 and 2023, primarily focusing on manufacturing (55%), IT companies (30%), and service sectors such as logistics and agriculture (15%). The studies collectively emphasize the significance of technical and digital competencies in the era of Industry 4.0, with 75% of the reviewed literature pointing to the critical role of skills in automation, Internet of Things (IoT), and big data. These competencies were linked to increased employee performance, productivity, and job efficiency. On the other hand, social competencies such as teamwork and communication were noted in 45% of the studies, but these were often considered secondary compared to technical skills in the context of Industry 4.0. Training programs emerged as a central theme across the studies, with 80% of the research highlighting the positive impact of structured, continuous training on employee skill development. The literature indicated that effective training programs, especially those incorporating hands-on learning and peer collaboration, were crucial in helping employees adapt to new technologies and improve their performance. Social Learning Theory (Kowal et al, 2022) was often referenced to explain how observation and interaction during training helped accelerate knowledge transfer. However, despite the importance of training, the literature also pointed to significant challenges, particularly the digital divide and employee resistance to technological changes. Around 50% of studies discussed the skill gaps in employees, especially among older workers or those without a technical background, which hindered their ability to fully engage with Industry 4.0 technologies.

The review also found that while technical and digital competencies were widely considered crucial for adaptability in Industry 4.0, soft skills like problem-solving and communication were deemed important but not as critical as technical expertise. This finding contradicted the initial hypothesis, which suggested that soft skills would play a larger role in employee performance. Instead, the demand for technical skills, such as data analysis, machine learning, and cybersecurity, appeared to be more pressing in the context of automation and digitalization. Furthermore, employee resistance to change was a common challenge, particularly when it came to understanding the benefits of new technologies or the fear of job displacement due to automation. Overall, the SLR findings indicate that Industry 4.0 has placed a premium on technical and digital competencies, with training and skill development becoming integral to maintaining a competitive workforce. However, the studies also highlighted the ongoing challenges in addressing skill gaps and resistance to change, suggesting that organizations need to continue investing in targeted, continuous training programs to prepare employees for the evolving demands of the industry 4.0 landscape. Despite the focus on technical skills, the role of social and personal competencies should not be overlooked, as these remain essential for effective collaboration and problem-solving in multidisciplinary teams.

6. Conclusion

The industry 4.0 era has brought significant changes to the world of work, with automation and digitalization creating new challenges for companies. Although many processes can be automated, some activities still require human involvement in manual assembly and complex analysis. Therefore, skill development has become a top priority for professionals and HR departments. Investment in continuous training is crucial to maintain high-performance standards, especially in the face of rapid technological advancements. Based on Human Resource and Social Learning theories, training not only enhances technical knowledge but also promotes skill transfer through observation and teamwork. Furthermore, the challenges of managing data, in terms of both security and privacy, require HR systems that are

responsive to regulations such as GDPR. Future competencies required include specialized knowledge, creative skills, analytical abilities, and deeper technical and social competencies. Companies that successfully implement structured and continuous training programs will be better prepared to develop a workforce that is adaptive, productive, and competitive in the industry 4.0 era.

References

Aranda-Jiménez, J. R., De-Pablos-Heredero, C., Campos-García, I., San-Martín, J., & Cosculluela-Martínez, C. (2024). Digitalization and Industry 4.0: An Analysis of Professional Skills and Behaviours. *Journal of Industrial Engineering & Management*, *17*(1).

Arulsamy, A. S., Singh, I., Kumar, M. S., Panchal, J. J., & Bajaj, K. K. (2023). Employee training and development enhancing employee performance–A study. *Samdarshi*, *16*(3), 1-11.

Asif, M. (2021). The effects of energy consumption, economic growth, and financial development on CO2 emissions in Greece. *Arthatama*, *5*(1), 13-26.

Davlyatbekovna, N. N. (2024). Adapting to Indonesian Culture: Success Stories and Implications for Sustainable Expat Relocation. *Research Horizon*, *4*(4), 155-160.

Kamara, A. M., & Widagdo, B. (2022). The Effectiveness of Training and Development On Employee Performance to Enhance Competitive Advantage: A Case Study of Social Enterprise Development Sierra Leone (Send-Sl). *Manajemen Bisnis*, *12*(02), 102-121.

Kowal, B., Włodarz, D., Brzychczy, E., & Klepka, A. (2022). Analysis of employees' competencies in the context of industry 4.0. *Energies*, *15*(19), 7142.

Laeeq, H. (2021). Impact of green human resource management on promoting green employee behaviour in Russia: a moderating role of employee empowerment. *Arthatama*, *5*(1), 1-12.

Li, L. (2022). Reskilling and upskilling the future-ready workforce for industry 4.0 and beyond. *Information Systems Frontiers*, 1-16.

Pató, B. S. G., Kovács, K., & Abonyi, J. (2022). Challenges of the Fourth Industrial Revolution in HRM. *International Journal of Human Capital and Information Technology Professionals (IJHCITP)*, *13*(1), 1-14.

Piątkowski, M. J. (2020). Expectations and challenges in the labour market in the context of industrial revolution 4.0. The agglomeration method-based analysis for Poland and other EU member states. *Sustainability*, *12*(13), 5437.

Rijal, K., & Sukresna, I. M. (2024). The Effect of Price Perception, Product Reviews, and Product Appearance on Purchasing Decisions. *Research Horizon*, *4*(4), 147-154.

Romero-Gázquez, J. L., Cañavate-Cruzado, G., & Bueno-Delgado, M. V. (2021). IN4WOOD: a successful European training action of industry 4.0 for academia and business. *IEEE Transactions on Education*, *65*(2), 200-209.

Saniuk, S., Caganova, D., & Saniuk, A. (2023). Knowledge and skills of industrial employees and managerial staff for the industry 4.0 implementation. *Mobile Networks and Applications*, *28*(1), 220-230.

Sharma, M., Luthra, S., Joshi, S., & Kumar, A. (2022). Analysing the impact of sustainable human resource management practices and industry 4.0 technologies adoption on employability skills. *International Journal of Manpower*, *43*(2), 463-485.

Siswanto, A. (2023). The Impact of Employee Training, Job Satisfaction, and Organizational Commitment on Employee Performance in the Tech Industry. *Tafkir: Interdisciplinary Journal of Islamic Education*, *4*(3), 473-485.

Sony, M., & Mekoth, N. (2022). Employee adaptability skills for Industry 4.0 success: a road map. *Production & Manufacturing Research*, *10*(1), 24-41.

Stofkova, Z., & Sukalova, V. (2020). Sustainable development of human resources in globalization period. *Sustainability*, *12*(18), 7681.

Suprapti, S., & Suparmi, S. (2022). Improving marketing performance through business agility and market orientation in micro, small, and medium enterprises in Semarang City. *Arthatama*, *6*(1), 26-43.

Susilawati, W., Alamanda, D. T., Fajri, S. G. R. S., & Ramdani, R. M. (2022). Map of the Best Selling Health Products During the Covid-19 Pandemic Period on the Popular Marketplace in Indonesia. *Research Horizon*, *2*(5), 532-542.

Sutrisno, I. R., & Lazuardy, D. (2024). The Effect of Perceived Value and Service Quality on Customer Satisfaction: A Sustainable Growth Strategy for Digital Banks in Indonesia. *Research Horizon*, *4*(4), 131-146.

Szabó, P., MÍkva, M., Marková, P., Samáková, J., & Janík, S. (2023). Change of Competences in the Context of Industry 4.0 Implementation. *Applied Sciences*, *13*(14), 8547.

Widijowati, D. (2023). Enhancing Consumer Protection in Electronic Commerce Transactions. *Research Horizon*, *3*(4), 283-290.

Wijaya, J. (2021). Determination of Network Technology of Fixed Broadband with Fuzzy Multiple Criteria for Decision Making Method. *Research Horizon*, *1*(6), 237-243.