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Analysis of Human Resource Competencies In Facing The Industry 4.0 Era

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Abstract: This study aims to analyze the competencies of Indonesian human resources (HR) in facing the challenges of the Industry era. The research employed a qualitative approach through in-depth interviews with informants from the industrial sector, vocational education, and training institutions. Findings reveal that HR competencies—both technical (hard skills) such as digital technology proficiency, and non-technical (soft skills) such as critical thinking, adaptability, and initiative—are not yet optimal. Several inhibiting factors in competency development include limited access to training, weak organizational support, and misalignment between education and industry needs. Strategies to address these challenges include continuous training, fostering a learning culture, utilizing online learning technologies, and enhancing collaboration among educational institutions, industries, and the government. This study highlights the importance of an adaptive and responsive learning ecosystem to shape HR capable of navigating technological changes and the dynamic digital work environment.

Keywords: Human Resource Competency, 4.0 Industry era, hard skills, soft skills, digital training, development strategy

INTRODUCTION

The Fourth Industrial Revolution, marked by advancements in digital technologies such as artificial intelligence (AI), big data, the Internet of Things (IoT), and automation, has significantly impacted how we work and interact. The industrial sector now relies heavily on technology to enhance efficiency, productivity, and innovation. This development demands a substantial shift in the competencies required by human resources (HR) to adapt to work environments increasingly dominated by automation and digital technology (Brynjolfsson & McAfee, 2014). According to Sumarsono (2019), technical skills such as computer programming, data analysis, and the use of automation systems are essential for adapting to the growing complexity of the work environment. Therefore, it is crucial for HR to develop competencies that include not only technical skills—such as software proficiency and data analysis—but also interpersonal skills, such as communication and teamwork, to remain competitive in an increasingly demanding job market.

Technical skills alone are not sufficient to navigate technology effectively. In addition to technical expertise, soft skills or interpersonal competencies are becoming increasingly important. Setiawan and Prasetyo (2018) state that in this digital era, many jobs that once required manual labor are now being replaced by automation and digital technologies. In this context, the skills that HR must master include critical thinking, creativity, the ability to solve problems innovatively, and the capacity to adapt to rapid change. McKinsey & Company (2017) emphasized the importance of developing digital skills alongside social skills to prepare a workforce capable of functioning effectively in a technology-driven work environment. Thus, abilities such as teamwork, time management, and effective communication are crucial for managing ongoing changes.

The importance of lifelong learning is also increasingly recognized in the era of the Fourth Industrial Revolution. With technological changes occurring at such a rapid pace, HR is required to continually update their skills to remain relevant to industry needs. The concept of lifelong learning refers to the continuous effort to enhance individual knowledge and skills through various training and educational programs, whether provided by companies, educational institutions, or more flexible online learning platforms. Sari (2017) explains that to improve competitiveness in facing global challenges, HR must constantly be updated with new skills relevant to industrial developments. The Future of Jobs Report 2018 by the World Economic Forum (2018) states that to cope with these rapid changes, technology-based education and training will be key in ensuring that HR can fill newly emerging jobs resulting from automation and AI. With continuously evolving skills, the workforce can more easily adapt to technological changes while simultaneously increasing their productivity.

HR competency development is not solely the responsibility of individuals but also of organizations and governments. Strong collaboration among the industrial sector, educational institutions, and government is crucial in creating an ecosystem that supports the development of relevant skills. For instance, the industrial sector can contribute by designing training programs tailored to the latest technological needs, while educational institutions should introduce curricula that are more integrated with digital technologies and labor market demands (Lasi et al., 2014). Utami and Rahman (2018) suggest that the industrial sector and educational institutions must collaborate to design training programs that are aligned with the increasingly technology-driven labor market. The government, on the other hand, can support this through policies that facilitate access to education and training for workers, as well as implement adequate policies to address the social and economic impacts of automation that may reduce traditional job opportunities (Schwab, 2016).

Moreover, a technology-based approach to training should be a priority in efforts to improve HR competencies. The use of technologies such as virtual reality (VR)-based simulations, online courses, and AI-based learning programs allows workers to receive training that is more effective and efficient. The integration of technology in learning also enables broader and more equitable knowledge dissemination, allowing workers in various regions to access training without being limited by location or cost (Hermann et al., 2016). With these technologies, learning can be tailored to individual needs and conducted at any time, enabling workers to learn in more flexible ways.

Meanwhile, adaptability is also becoming an increasingly essential competency for HR. Santosa (2019) states that the ability to quickly adapt to new technological developments and to remain flexible in the face of change will be a significant advantage for workers in a fast-paced digital world. In a constantly evolving world with ever-advancing technologies, workers who can quickly adapt and learn from experience will have greater success in their careers. Adapting to new technologies and collaborating within more dynamic and tech-based work environments will be key to success in the future job market.

Based on the background outlined above, several critical issues need to be explored in depth. One of the main issues is the extent to which current human resource competencies are adequate in responding to the challenges brought by Industry 4.0. The rapid pace of change demands capabilities that are not only technical but also include non-technical skills such as critical thinking, teamwork, and adaptability. However, many individuals and organizations are still not fully prepared to face this transformation. Therefore, it is also important to analyze which types of competencies remain underdeveloped or unfulfilled. In addition, it is crucial to identify the factors that hinder competency development, both from individual internal aspects and from organizational environments or educational systems. Finally, this study aims to formulate appropriate strategies to enhance HR capacity and readiness to compete and thrive within the dynamics of a digitally-driven industrial landscape.

METHOD

This study uses a descriptive qualitative approach aimed at deeply understanding how human resource (HR) competencies are developed and confronted with challenges in the 4.0 Industry era. This approach was chosen because it is capable of capturing complex social realities and provides space for exploring the meaning behind the experiences of individuals directly involved in the transformation of the world of work. This study is not focused on a particular institution or company but targets diverse perspectives from actors in the world of work relevant to the issue of HR development. Informants in this study were selected purposively, based on specific considerations such as work experience, involvement in technology adaptation processes, and understanding of competency changes in the digital era.

Data collection techniques were conducted through in-depth interviews to explore informants' experiences and views, supported by literature reviews to strengthen the theoretical framework and understanding of the research context. Where possible, observations were also made to directly observe workplace dynamics. Data obtained from various sources were analyzed using thematic analysis techniques. This process includes filtering important information (data reduction), assigning codes to group similar data, and formulating main themes that represent the research findings. The entire analysis process was conducted systematically to describe the competencies required by HR in facing Industry 4.0 developments. To ensure the accuracy and validity of the data, researchers used source triangulation strategies, rechecked interview results with informants, and held peer discussions to avoid interpretation bias.

RESULTS AND DISCUSSION

HR Competency Levels in Facing the Challenges and Demands of the Industry 4.0 Era In-depth interviews with informants from the industrial, vocational education, and training institution sectors show that the level of Indonesian human resources (HR) competencies in facing the Industry 4.0 era still encounters many challenges, both in technical and non-technical aspects. Most informants reported that HR understanding of digital technology is still limited, particularly in the use of technologies such as automation systems, big data, and artificial intelligence. This occurs not only among field workers but also at the managerial level, who are not yet fully capable of utilizing digital systems and data to support decision-making.

An informant from the manufacturing sector stated that most workers in his company are not yet ready to fully embrace digital transformation. Many still rely on conventional work methods due to limited access to training and a lack of support in the adaptation process. This aligns with Bappenas (2020), which states that the mismatch between workforce skills and digital industry needs is one of the main barriers to developing superior HR in Indonesia. In addition to technical capabilities, challenges also arise from non-

technical or soft skills, such as critical thinking, adaptability to change, and initiative in solving problems independently. A vocational trainer interviewed noted that many training participants remain passive and lack confidence in exploring technological solutions. They tend to wait for instructions rather than take initiative, indicating a weak self-learning culture in the workplace. However, there is optimism among young HR groups, especially new graduates from technology or digital backgrounds. They adapt more quickly to technological developments and show high curiosity about digital tools. Nevertheless, this group still requires guidance in work management, discipline, and cross-team communication skills.

Moreover, organizational support is a key factor in improving HR competencies. Informants from the private sector revealed that their companies actively conduct training and provide access to online learning. As a result, employees become more enthusiastic and progressive in accepting change. This is reinforced by the LAN RI (2021) report, which emphasizes the importance of organizational culture transformation as the foundation for adaptive and innovative HR transformation. Overall, these findings show that Indonesian HR competency levels in meeting Industry 4.0 demands are still growing. Continued collaboration between education institutions, training providers, industries, and the government is needed to create a learning ecosystem that enhances both technical and behavioral skills.

Types of Competencies (Hard and Soft Skills) Still Lacking Among HR in the Context of Industry 4.0 The Industry 4.0 era marks a major transformation in the world of work, where technology becomes the main foundation for conducting economic and social activities. In this context, the need for excellent, adaptive, and competent HR becomes increasingly critical. However, based on field observations and interview results, there is a clear gap between the skills that HR currently possesses and the skills needed to compete and grow in the digital era. This gap spans two main dimensions: hard skills (technical abilities) and soft skills (non-technical abilities).

Deficiencies in Hard Skills Hard skills refer to specific, measurable abilities, such as operating software, understanding digital systems, and mastering programming languages. In the context of Industry 4.0, highly needed technical skills include:

- **Digital Technology Proficiency**: Many HR personnel still lack adequate digital literacy, even in basic areas like using cloud-based apps, collaborative platforms, or simple data processing—skills that are foundational in a digitized work environment.
- **Data Analysis and Big Data Utilization**: Industry 4.0 relies heavily on data-driven decision-making. However, many workers struggle with data management and digital data visualization, impacting the quality of decisions made.
- **Automation and Basic Programming**: The use of automation and integrated systems is common in manufacturing and service industries. Yet, not all HR personnel can keep up due to insufficient training or relevant education. According to the Ministry of Manpower (2022), only a small percentage of Indonesian workers possess technology-based and programming skills.
- **Cybersecurity and Data Protection Awareness**: Cyber threats pose significant risks in the digital era. Unfortunately, HR awareness and skills in safeguarding information remain low, leading to frequent data breaches and system misuse.

Deficiencies in Soft Skills Soft skills are personal and social abilities vital in modern work environments, especially as organizations become more dynamic and collaborative. Commonly lacking skills include:

- **Critical Thinking and Problem Solving**: Many workers still display reactive rather than proactive mindsets. They often wait for instructions or blame external conditions rather than seek independent solutions. LAN (2021) highlights problem-solving as crucial for innovation and work efficiency.

- **Adaptability**: Rapid technological and work system changes often overwhelm HR. "Digital shock" is common when transitioning from manual to digital systems, revealing weak mental and emotional flexibility.
- **Effective Communication in Digital Environments**: Many HR personnel, especially senior staff, struggle with virtual communication—whether in choosing the right language, observing digital etiquette, or using collaboration platforms like Zoom, Teams, or Slack.
- **Cross-disciplinary and Cross-cultural Collaboration**: Modern industries depend on collaborative teams, but collaboration across generations and disciplines remains suboptimal. Communication gaps often arise between digital-native youth and conventionally inclined senior workers.
- **Time Management and Self-discipline in Flexible Work Settings**: Hybrid and remote work demand strong self-discipline and time management. Yet, most workers are not accustomed to setting personal targets without direct supervision, leading to reduced productivity and increased stress.

Factors Contributing to Competency Gaps Key causes of competency gaps include:

- Mismatch between educational curricula and digital industry demands.
- Lack of ongoing technical and non-technical training.
- Low organizational awareness and investment in HR development.
- Work cultures unaccustomed to lifelong learning.

As emphasized by Bappenas (2020), developing Indonesia's HR in the Industry 4.0 era requires a holistic approach involving education, vocational training, and nurturing a tech-adaptive work culture.

Barriers to HR Competency Development in the Digital Era Analysis of interview results reveals that HR competency development in the digital age faces complex and interrelated barriers—individual, institutional, and structural. Limited Access to Digital-based Education and Training A major issue frequently cited is limited access to digital training, especially in non-urban areas. Many regional workers lack stable internet or adequate devices for online training. This widens the digital divide between urban and rural workforces. The Ministry of Manpower (2022) notes that over 60% of Indonesia’s workforce is in the informal sector and remains unreached by digital training programs.

Lack of Basic Digital Literacy Many workers lack even basic digital literacy—such as using communication apps, file management, or accessing learning platforms. This impedes independent learning, a key pillar of digital competency development. Training institutions report that many trainees require "pre-training" to equip them with essential tech skills before engaging with actual digital training content.

Workplace Culture Not Supporting Continuous Learning Most organizations, especially small and medium enterprises (SMEs), lack a workplace culture that supports lifelong learning. HR is often too focused on daily routines, without time or encouragement to develop themselves. In an interview, an HR manager from a logistics company shared that training is often seen as a cost burden rather than an investment. Consequently, it is treated as formality and not integrated into strategic development plans.

Mismatch Between Training Content and Industry Needs Some industrial sector informants said training materials provided by educational institutions or the government often do not meet actual workplace demands. For example, digital training may focus on general theory without real-world case studies. This mismatch renders trainees unprepared for immediate employment. Bappenas (2020) also highlights the need for synergy between government, industry, and educational institutions in designing demand-driven training curricula.

Low Personal Motivation to Learn Psychological factors also play a role. Some informants said worker motivation to learn new things—especially technology—is low,

particularly among those over 40. Many fear failure, feel embarrassed to learn from scratch, or believe they are no longer relevant in the fast-paced digital ecosystem. This is worsened by a lack of mentoring systems at work to support humane, non-intimidating transitions from conventional to digital modes.

Lack of Regulatory Support and Incentives Finally, industry stakeholders noted limited government regulation and incentives supporting tech-based HR training. Not all companies receive incentives for internal training, and access to government digital training platforms remains suboptimal. The LAN RI (2021) report stresses the importance of inclusive public policy that drives structural digital transformation—not just in infrastructure, but also in mindset and work systems.

Strategies for Improving HR Competencies in Facing Digital Work Transformation Rapid technological transformation from Industry 4.0 to Industry 5.0 has created new dynamics in the job market. Various jobs have undergone significant change, with some being replaced by machines or automation systems. This condition demands HR to possess competencies that are not only relevant but also flexible and adaptive.

One key strategy is significantly and systematically improving digital literacy. Digital literacy is the foundation for facing technology-driven changes. HR capable of understanding, accessing, and utilizing IT will more easily adapt to digitalized work systems. This can be done through technical training in software use, data management, basic programming, and cybersecurity. Training need not be formal—it can be accessed via flexible online platforms and tailored to individual needs.

Strengthening soft skills is equally crucial. Modern work environments demand not just technical skills but also strong communication, teamwork, creativity, critical thinking, and mental resilience. HR who can collaborate in multidisciplinary teams, adapt to change, and demonstrate initiative and flexible leadership will be more likely to thrive. Another strategy is establishing a culture of lifelong learning. Learning should not stop at formal education. Individuals must continuously update their knowledge. Organizations should foster a learning-friendly environment through mentoring, coaching, internal discussions, or training and certification incentives. When companies facilitate learning spaces, it boosts motivation and overall workforce quality.

Utilizing technology in learning systems is also highly effective. With digital learning platforms like Learning Management Systems (LMS), e-learning, and online courses, knowledge access becomes easier and more affordable. Both companies and government agencies can develop video-based content, simulations, or educational games that increase participant engagement.

In addition, synergy between government, industry, and educational institutions is essential in building an HR development ecosystem. Government provides policy and incentives, industry outlines skill needs, and education aligns curricula with job market demands. This Triple Helix approach has proven effective in creating future-ready HR. By integrating these strategies comprehensively, HR competency development becomes more focused and sustainable. While change is inevitable, with the right preparedness, Indonesian HR can not only survive—but thrive—in global competition.

CONCLUSION

1. **HR Competency Levels in the Industry 4.0 Era**
   Indonesian human resources still face obstacles in mastering digital technology, both at the technical and managerial levels. The younger generation adapts more quickly but still requires guidance in soft skills and professional work habits.
2. **Deficiencies in HR Competencies (Hard Skills & Soft Skills)**

Deficiencies in technical competencies such as the use of industrial technology and data analysis remain dominant. Meanwhile, soft skills such as critical thinking, communication, and adaptability have also not developed optimally.

3. **Barriers to HR Competency Development**
   The development of HR is hindered by lack of access to training, a weak learning culture, minimal organizational support, and the mismatch between educational curricula and industry needs.
4. **Strategies to Improve HR Competencies**
   Effective strategies include digital training, strengthening soft skills, building a lifelong learning culture, utilizing online platforms, and fostering collaboration among industry, education, and government.

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