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Enhancing the Competitiveness of PT. Len Industri (Persero) through Human Resource Readiness to Support the Development of Defense and Security Equipment Mobility in the Era of Industry 4.0

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Abstract: This research aims to analyze the improvement of PT LEN Industri's (Persero) competitiveness through the readiness of human resources to support the development of defence and security equipment mobility in the fourth industrial revolution era. The method used in this research is data collection through questionnaire distribution and literature study. The respondents in this research are employees PT LEN Industri (Persero) who are involved in the development of defence and security equipment locomotion. The analysis results show that most respondents are ready to face the fourth industrial revolution, but there are still obstacles to using digital platforms improving PT. LEN Industri's (Persero) competitiveness can be achieved by enhancing the readiness of human resources to adopt new technologies such as the Internet of Things (IoT), Big Data, Cloud Computing, Artificial Intelligence (AI), and Digital Twin. In conclusion, this research recommends PT. LEN Industri (Persero) to further enhance and manage its human resources to be better prepared to increase competitiveness in the fourth industrial revolution era.

Keywords: PT LEN; Industry 4.0 Technology; Human Resources.

INTRODUCTION

The Indonesia Industry 4.0 Readiness Index (INDI 4.0) is a crucial indicator for evaluating Indonesian industries' readiness to face the Fourth Industrial Revolution era. INDI 4.0 measures industrial readiness across five main pillars: management and organization,

people and culture, products and services, technology, and factory operations. These five pillars are further divided into 17 areas that serve as benchmarks for assessing the readiness of Indonesian industries to transform towards Industry 4.0 (Kemenprin., 2018).

The defence industry in Indonesia, including PT LEN Industri (Persero), has undergone significant transformation in line with the development of the Fourth Industrial Revolution. In addition to developing defence and security equipment (Alpalhankam), the defence industry also produces supporting raw materials. Ministerial Regulation No. 23 of 2016 emphasizes the importance of cooperation in managing and utilizing the defence industry, including the production of Alpalhankam and its supporting raw materials (Hidayaturahmi & Farida, 2022).

PT LEN Industri (Persero) is a state-owned enterprise (BUMN) focusing on electronics for the industrial and infrastructure sectors. The company has extensive expertise in defence electronics, such as radar, tactical radios, and Combat Management Systems (CMS) for warships. However, evaluating human readiness, including the factors of people and culture, is crucial in transitioning toward Industry 4.0. The readiness of employees to adopt new technologies, improve skills, and embrace cultural changes within the company will be the determining factor in the success of industrial transformation.

Introduction to the Fourth Industrial Revolution and its impact on various industrial sectors, including the defence industry, has become a significant topic in technology and modern industry. The Fourth Industrial Revolution significantly transformed how humans and machines produce, communicate, and interact. This concept is supported by the use of advanced technologies such as Artificial Intelligence (AI), Internet of Things (IoT), robotics, cloud computing, and big data analytics, which have the potential to create a more adaptive, digitally connected, and efficient industrial environment. Based on the book (Schwab, 2016), the Fourth Industrial Revolution changed the industrial and technological world and influenced how we live, work, and interact daily.

The most significant impact of the Fourth Industrial Revolution lies in the industrial sector, including the defence industry. In the production and manufacturing sector, this technology enables the creation of "Smart Factories" that utilize digital networks to enhance production efficiency and flexibility through sensor integration, artificial intelligence, and Machine-to-Machine (M2M) communication. This can potentially increase productivity, accuracy, and responsiveness to market demands. The Fourth Industrial Revolution also introduced technologies like the Internet of Things (IoT) in logistics and supply chains, allowing real-time inventory and shipment monitoring. IoT sensors in transportation and storage can help optimize logistics efficiency, reduce costs, and shorten waiting times.

According to (Sarbu, 2020), the defence industry actively leverages technological advances to develop more sophisticated and responsive defence systems. Emphasizing the critical role of defence in this context, "leveraging advances in technology" refers to the defence industry that actively leverages the latest technological advances to develop more advanced and responsive defence systems. Utilizing technologies such as AI, sensor networks, robotics, and big data analytics enables the development of more efficient defence systems that are also adaptive. While the Fourth Industrial Revolution offers significant benefits, complex security and ethical challenges arise, especially in using artificial intelligence in military operations. Therefore, a deep understanding of the impacts of the Fourth Industrial Revolution is essential for the defence industry and other sectors to prepare for a dynamically changing future.

PT LEN Industri (Persero) faces a complex series of challenges and opportunities along with technological changes and market demands in the era of the Fourth Industrial Revolution. One of the main challenges faced in developing and improving the systems required to support national independence and integration in this era. This requires significant

investment in technology development and efficient system control to maintain the company's competitiveness at the global level (Savitri, 2019).

In addition, as part of the State-Owned Defense Industry Holding Company (Defend ID), PT LEN Industri (Persero) has opportunities to enhance the country's defence capabilities. Focusing on sustainable technology developments, such as developing advanced energy and materials products, can also lay the foundation for the company's future growth. However, to seize these opportunities, PT LEN Industri (Persero) must overcome existing challenges and develop effective strategies. This includes creating more advanced technologies, efficient system control, and steps to mitigate the negative impacts of economic issues and transnational crimes (Dwipratama, 2023).

In facing the challenges and opportunities of the Fourth Industrial Revolution, by INDI 4.0, PT LEN Industri (Persero) must pay attention to human resources (HR) readiness. This index measures industrial readiness regarding technology, infrastructure, and human aspects. Firstly, with a sufficient understanding of the concepts and technologies of Industry 4.0, HR will help companies effectively adopt new technologies. This includes understanding artificial intelligence, the Internet of Things, big data analytics, and other technologies that characterize Industry 4.0. Training and developing employees in this regard are essential to improving digital literacy and relevant skills.

Secondly, companies must consider aspects of work culture that support innovation, collaboration, and adaptability. A culture that promotes experimentation, knowledge sharing, and continuous learning will help create an environment where HR feels motivated to contribute creatively and add value to the company.

Furthermore, effective leadership is also vital in ensuring HR readiness for Industry 4.0. Visionary leaders who are results-oriented and able to manage change will become catalysts for successful organizational transformation. They must inspire and motivate teams and provide clear direction regarding the company's vision and strategy in facing the challenges of Industry 4.0.

In addition, HR diversification also needs attention. Having a demographically, educationally, and experientially diverse team will bring the variety of perspectives and innovative ideas needed to address the complexities of Industry 4.0.

Finally, it is essential to emphasize the importance of developing soft skills in HR readiness for Industry 4.0. Critical thinking, creativity, communication, teamwork, and problem-solving skills are becoming increasingly crucial in technology-influenced work. By paying attention to various aspects of HR readiness, companies can increase their competitiveness and adequately prepare themselves to address challenges and seize opportunities offered by Industry 4.0.

The Industrial Revolution 4.0

The Fourth Industrial Revolution marks a transition to a new era in industry, where all elements within are interconnected and communicate directly. This is enabled by using internet technology and Cyber-Physical Systems (CPS) that connect the digital and physical worlds. Its goal is to create new added value, opening up new opportunities and possibilities across various industrial aspects. In terms of connectivity, the Fourth Industrial Revolution emphasizes connectivity and real-time interaction between industrial elements. In technological aspects, CPS plays a crucial role in enabling this connectivity and interaction while achieving new added value and unlocking new potential across various industrial sectors (Fonna, 2019).

The defining characteristic of the Fourth Industrial Revolution is the blending of technologies that are breaking down barriers between the physical, digital, and biological worlds. Rapid advances in various fields such as artificial intelligence, robotics, blockchain, nanotechnology, quantum computing, biotechnology, the Internet of Things, 3D printing, and

autonomous vehicles have become hallmarks of this era. This revolution is bringing about significant changes in many aspects of human life, from how we work and communicate to how we conduct business. Automation and artificial intelligence are taking over many tasks previously performed by humans, increasing efficiency and productivity: more sophisticated connectivity and easy access to information open new opportunities for collaboration and innovation.

Industries must integrate digital technology to create a more efficient, adaptive, and interconnected production environment. This digital technology integrates interconnected production systems, utilizing big data and analytics, artificial intelligence, robotics, the Internet of Things (IoT), and cloud computing. Thus, the production systems are more autonomous and interconnected in real time. All collected data will be analyzed for industrial needs, such as analyzing performance, predicting equipment failures, improving efficiency, and optimizing production processes (Deni, 2023).

Technology Adoption in the Defense Industry.

Technology adoption in the defence industry is based on a model similar to the (LaMorte, 2022) innovation diffusion model. This model represents key steps in integrating new technologies into the military environment. The stages include identifying defence needs, innovation, technology evaluation, dissemination, and ultimately, adoption by most users. This process ensures that the defence industry properly embraces and utilizes new technologies effectively and maintains significant military advantages for national security.

In the defence industry, technology diffusion occurs when it is introduced to those who have first tested and evaluated it. Special forces and prototype units, the early adopters utilizing this technology, play an essential role in kickstarting and demonstrating its benefits. Ultimately, most users' acceptance of this technology indicates the successful integration of new technologies into the defence industry. This implementation process requires top management support, proper training, and technology integration into existing systems. Through this technology adoption model, the defence industry can ensure that new technologies are accepted and effectively utilized to maintain significant military advantages for national security.

In the defence industry, technology diffusion occurs when it is introduced to those who have first tested and evaluated it. Special forces and prototype units, the early adopters utilizing this technology, play an essential role in kickstarting and demonstrating its benefits. Eventually, acceptance of this technology by most users indicates the successful integration of new technologies into the defence industry. This implementation process requires top management support, proper training, and technology integration into existing systems. Through this technology adoption model, the defence industry can ensure that new technologies are embraced and effectively utilized to maintain significant military advantages for national security.

However, relative advantage alone is insufficient to guarantee successful technology implementation. In addition, new technologies also pose significant challenges. If a technology is too complex or difficult to apply, users may be reluctant to adopt it (Rogers, Diffusion of Innovations, 2003). Highlighted that complexity is one of the primary barriers to innovation adoption. Therefore, simplifying technologies and providing appropriate personnel training is essential to boost new technology adoption in the defence industry. This is consistent with the findings of (Tornatzky Klein, 1982) In their innovation characteristics and acceptance meta-analysis.

Industry Readiness in Adopting the Fourth Industrial Revolution.

The Fourth Industrial Revolution has been a primary driver of change across various industry sectors, pushing companies to upgrade their technology infrastructure, enhance

workforce skills, and develop adaptable management strategies. Research on industry readiness in adopting the Fourth Industrial Revolution has identified several factors that influence the level of preparedness, including technology infrastructure, workforce skills, and management strategies.

Technology infrastructure determines industry readiness to adopt the Fourth Industrial Revolution. Research by Hanafiah et al., 2020 highlighted the importance of robust digital infrastructure, including reliable internet connectivity, advanced data analytics systems, and adequate cybersecurity. Companies with solid technology infrastructure are more likely to be ready to face digital transformation.

In addition to technological infrastructure, human resource skills are crucial in determining an industry's readiness for the Fourth Industrial Revolution. (Prasad, Vaidya, & Rani, 2023) Research has found that employees who understand concepts such as the Internet of Things (IoT), Big Data, and artificial intelligence tend to be more effective in adopting new technologies. Therefore, training and skill development are crucial to enhancing a company's human resource readiness.

These studies indicate that technology infrastructure, workforce skills, and management strategies are crucial in determining industrial readiness to adopt the Fourth Industrial Revolution. Companies that can overcome these challenges and effectively manage these factors will have an advantage in facing the ongoing changes in the digital era.

METHOD

The research was conducted in West Java Province, specifically at PT LEN Industri (Persero). This defence industry is expected to provide many valuable benefits and insights into understanding the national defence industry.

This study used quantitative research methodology to test the established hypotheses. The method adopted an objective approach and collected numerically measurable data. The researchers systematically analyzed the relationships between the studied variables using statistical analysis. Through structured data collection using questionnaires, the researchers gathered relevant information from employees of the defence industry company. The obtained data could then be statistically analyzed to test the hypotheses and derive reliable conclusions.

The data sources in this study were obtained from PT LEN Industri, which distributed questionnaires targeted and filled out by defence industry employees. Questionnaire completion was carried out to get direct data and insights regarding strategies, operations, and challenges faced by PT LEN Industri as a defence industry company.

This study will focus on assessing the readiness of Human Resources (HR) at PT LEN Industri (Persero) to boost the company's competitiveness in addressing challenges and opportunities arising in the era of the Fourth Industrial Revolution. The Industry 4.0 era is characterized by the adoption of digital technologies, automation, connectivity, and data analytics in production and manufacturing processes. Therefore, PT LEN Industri must ensure that their HR possesses the necessary skills and knowledge to cope with these changes. The assessment identifies gaps and recommends training programs to prepare the workforce for Industry 4.0.

For this research, distributing questionnaires to relevant respondents at PT LEN Industri is an effective data collection method. The questionnaires are designed with specific questions. The questionnaires will be distributed during company visits, with some direct interviews conducted with respondents. The main advantage of collecting data through questionnaires is that it allows researchers to collect data from a representative number of respondents from various backgrounds and positions within PT LEN Industri. Thus, the data obtained will provide a comprehensive picture of career development in the company, taking into account different perspectives and experiences.

RESULTS AND DISCUSSION

The development of technology during the 4th Industrial Revolution has been a primary factor in massively changing the global way of working. This change reflects the transition from traditional production methods to methods influenced by digital technology, automation, and widespread connectivity. According to (Schwab, 2016) According to the World Economic Forum, the 4th Industrial Revolution is transforming the world with rapidly developing technologies, including how companies produce and manage. One of the main consequences of the 4th Industrial Revolution was the change in how jobs were carried out. (Brynjolfsson & McAfee, 2017) They highlighted this in their book "The Second Machine Age," stating that "technologies like artificial intelligence, robotics, and the Internet of Things (IoT) have enabled production processes to become more efficient and productive."

However, James Manyika and his team at McKinsey Global Institute emphasized in their report "Jobs Lost, Jobs Gained: Workforce Transitions in a Time of Automation" the potential for worker replacement by machines or robots. This report stresses the need for adaptation and skill upgrading so that workers can remain relevant in the continuously evolving job market. Davenport and Kirby affirmed that problem-solving, creativity, adaptability, and critical thinking are becoming increasingly vital in education and careers. (Manyika, et al., 2017).

The Industrial Revolution 4.0 also provided new opportunities in job fields that previously did not exist. According to the World Economic Forum's report "The Future of Jobs Report 2020", data analysis, software development, and cybersecurity skills are increasingly prioritized and can offer bright career prospects for individuals skilled in these areas. However, it must be remembered that the 4th Industrial Revolution also faced new challenges, such as data privacy, economic inequality, and environmental impact. Therefore, while we support technological advances that drive innovation, we must also consider the social and ecological consequences and ways to mitigate potential inequalities.

As a major company in Indonesia, PT LEN Industri (Persero) must ensure employees are prepared for changes in the era of the Fourth Industrial Revolution. PT LEN Industri (Persero) has recognized the importance of having a competent workforce ready to face future challenges. To prepare human resources, PT LEN Industri (Persero) must implement a holistic approach to training employees. This involves spending on educating and upgrading skills in line with the changing needs of the labour market. With appropriate training, employees can acquire new skills such as computer programming, data analysis, project management, and solving complex problems, which are becoming increasingly crucial in the era of the Fourth Industrial Revolution.

PT LEN Industri (Persero) can also strengthen its partnerships with educational and training institutions to ensure employees access relevant formal and non-formal educational programs. Such collaboration can ensure that employees have an in-depth understanding of the latest technologies and can implement them in their day-to-day work. PT LEN Industri (Persero) should also focus on developing employees' "soft skills" and technical skills. Strong communication abilities, leadership, teamwork, and the capability to adapt and continuously learn are essential qualities that support employees to interact and progress in a dynamic work environment.

Description of validation data

The results of the validity test listed in Table 1 prove that all survey items have a high validity level (sig. <0.05), indicating that the questionnaire questions can accurately measure the variables being studied. In addition, some survey results showed a high consistency level (> .600), suggesting that these questions can be trusted to measure the same concept overtime

during the research. Therefore, these findings affirm confidence in the survey instrument used in this study and its reliability and validity in collecting dependable data for further research.

Table 1. Validity and Reliability Test

Item	Validity (sig. <0,05)	Reliability (>0,600)
X1.1	0,000 (Valid)	0,879 (Reliabel)
X1.2	0,000 (Valid)	
X1.3	0,000 (Valid)	
X1.4	0,000 (Valid)	
X1.5	0,000 (Valid)	
X1.6	0,000 (Valid)	
X1.7	0,002 (Valid)	
X1.8	0,000 (Valid)	
X1.9	0,004 (Valid)	
X1.10	0,000 (Valid)	
X1.11	0,000 (Valid)	
X1.12	0,000 (Valid)	
X1.13	0,002 (Valid)	
X1.14	0,000 (Valid)	

Source: Data processed by researchers (2024)

The validity and reliability tests showed that the questionnaire used in this study properly measured the constructs being examined. All questionnaire items were proven valid as they accurately measured the research variables. Some items were also reliably tested to consistently measure a certain concept.

This quality of the questionnaire led to increased confidence in the collected data. Data obtained from a validated and reliable measuring instrument could be trusted as an accurate representation of the research object. Therefore, the data could be used to address the research problems and objectives.

The questionnaire's high validity and reliability also ensured that this measuring instrument could be relied on for further research on similar topics. Other researchers interested in studying comparable variables in similar contexts could also utilize this questionnaire. The findings regarding the quality of the measuring instrument simultaneously expanded the benefits of the initial research findings through potential replications or further developments.

Table 2. Frequency Data Based on IoT Knowledge

		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid	Very Certain	8	25.8	25.8	25.8
	Certain	16	51.6	51.6	77.4
	50/50	7	22.6	22.6	100.0
	Total	31	100.0	100.0	

Source: Data processed by researchers (2024)

Table 3. Frequency Data Based on Big Data Knowledge

		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid	Very Certain	3	9.7	9.7	9.7
	Certain	19	61.3	61.3	71.0
	50/50	8	25.8	25.8	96.8
	Do Not Know	1	3.2	3.2	100.0
	Total	31	100.0	100.0	

Source: Data processed by researchers (2024)

Table 4. Frequency Data Based on Cloud Computing Knowledge

		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid	Very Certain	2	6.5	6.5	6.5

	Certain	18	58.1	58.1	64.5
	50/50	9	29.0	29.0	93.5
	Do Not Know	2	6.5	6.5	100.0
	Total	31	100.0	100.0	

Source: Data processed by researchers (2024)

Table 5. Frequency Data Based on Artificial Intelligent Knowledge

		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid	Very Certain	4	12.9	12.9	12.9
	Certain	21	67.7	67.7	80.6
	50/50	6	19.4	19.4	100.0
	Total	31	100.0	100.0	

Source: Data processed by researchers (2024)

Table 6. Frequency Data Based on Digital Twin Knowledge

		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid	Very Certain	2	6.5	6.5	6.5
	Certain	12	38.7	38.7	45.2
	50/50	8	25.8	25.8	71.0
	Do Not Know	8	25.8	25.8	96.8
	Very Uncertain	1	3.2	3.2	100.0
	Total	31	100.0	100.0	

Source: Data processed by researchers (2024)

Human resources readiness analysis

The research results show that PT LEN Industri (Persero)'s human resources have good knowledge about technologies of the Fourth Industrial Revolution era. Survey or analysis results showed that PT LEN Industri (Persero) employees understood critical concepts of the Fourth Industrial Revolution, such as artificial intelligence (AI), Internet of Things (IoT), and Digital Twin technology sufficiently well. Assessing aspects that indicate an adequate level of knowledge is vital. This involves understanding basic concepts, using technology in work, the ability to determine the impact of technology on work processes, and readiness to face changes from the Fourth Industrial Revolution.

Understanding how this level of knowledge impacts the company's overall performance is also essential. Has a sufficient understanding of technology-enhanced effectiveness, creativity, or competitiveness? Is this knowledge reflected in the quality of products or services or the ability to adapt quickly to market changes? Then, companies can look for ways to leverage employees' knowledge of 4IR technologies more efficiently. Has the company developed training or development programs for employees to enhance their knowledge in this field? Does the company utilize employees' expertise when planning business strategies to address technology-related challenges and opportunities? By conducting a comprehensive analysis of employees' knowledge of 4IR technologies, PT LEN Industri (Persero) can better understand the potential and limitations of human resources in addressing current industrial development.

Most survey participants also showed a similar tendency in using technology in their daily work. They continuously leverage various technological tools and platforms in their jobs, demonstrating how technology has become an integral part of their work environment. Most respondents also tended to agree on the importance of keeping up with technological developments and participating in relevant training to upgrade their skills. This shows that employees recognize the significance of embracing new technologies and acquiring new skills to remain competent in today's digital workplace. Overall, there is an acknowledgement among employees regarding the usefulness of technology in expediting work and the necessity to adapt their skills for future changes continuously.

The advent of the Fourth Industrial Revolution provides an excellent example of how important it is to keep up with disruptive technological developments constantly. Given the continuous evolution of technology, it is crucial for employees to continuously hone their knowledge and skills in order to remain relevant in today's dynamic job market. The company has provided training to enhance employees' understanding of emerging technologies. Employees can acquire new skills to address new challenges and opportunities by participating in suitable training programs. However, it is essential to comprehensively consider the significance of staying up-to-date with technological advancements and training. First and foremost, organizations must ensure that the training provided is aligned with current needs and technological developments. An in-depth understanding of industry trends and staff requirements is necessary to identify the most relevant and effective training programs. Tailored development initiatives that match the technological pace and employee needs are essential to support workforce readiness in the digital era.

Moreover, it is essential to cultivate a culture that supports continuous learning and development in the workplace. This involves encouraging workers to take an active role in enhancing their capabilities and providing the assistance and resources they need to achieve learning objectives. By establishing a working environment that fosters ongoing learning, companies can ensure employees stay up-to-date and competent in dealing with business changes. Overall, it remains relevant to continuously track technological advancements and undergo training to upgrade abilities in the Fourth Industrial Revolution era. Companies can ensure workforce preparedness to address challenges and leverage emerging opportunities in the technology era by adequately understanding and addressing such needs. Fostering a culture of continuous skill-building empowers employees and bolsters organizational agility for future disruptions and innovations.

While most respondents are ready to embrace technological advancements, some areas for improvement remain, particularly related to adopting technology-enabled work systems like IoT, Big Data, AI, and DT. These technologies have proven critical in boosting efficiency, productivity, and innovation across many industries. However, some companies may still need help in efficiently implementing these technologies. This could be due to several factors, such as a need for more understanding of the concepts, limited resources, and difficulties integrating the new technologies with existing infrastructure. To fully leverage the benefits of emerging technologies, companies need to address current gaps through strategic investments, customized training programs, and careful system integration plans. Close collaboration between leadership, IT, and operations teams is crucial to ensure seamless adoption of Industry 4.0 solutions.

The company needs to take appropriate action to address these challenges. The first step should be to enhance employees' understanding and awareness of new technologies through suitable training and education. By educating employees on the potential and benefits of IoT, Big Data, AI, and DT, they will be more receptive to embracing and leveraging these technologies in their daily work activities.

Next, the company must allocate funds to build the infrastructure needed to support implementing these technologies. This could involve upgrading internet infrastructure, investing in required equipment and programs, and developing policies and procedures that enable the effective and secure use of technology.

Close collaboration between departments is also essential. Departments need to collaborate to map out technology adoption roadmaps, address compatibility issues, ensure data governance, provide support, and assess impacts on processes and workforce needs.

With a strategic approach that includes investment in skills development and tools, companies can successfully integrate the latest industrial technologies for higher performance and future-proof operations. Regular reviews should be conducted to ensure technologies continue to create value and that employees have support adapting to changes.

Additionally, companies must consider aspects like data protection and confidentiality when implementing these technologies. Businesses can mitigate risks associated with deploying advanced technologies by properly safeguarding corporate data and sensitive employee information.

While barriers may exist in adopting technology-enabled work systems leveraging IoT, Big Data, AI, and DT, appropriate measures can address these challenges. By opting to allocate sufficient funding for education, infrastructure improvements, and security, organizations can harness these powerful technologies optimally to boost productivity and gain competitive advantages in the era of the Fourth Industrial Revolution. Continuous assessment and adjustment of strategies according to the changing landscape will also help sustain long-term success. With prudent planning and execution, industries can reap the full benefits of technological progress while safeguarding organizational and personal interests.

CONCLUSION

Human Resource Readiness for Industry 4.0 Technologies at PT LEN Industri (Persero). Based on the research that has been conducted, several conclusions can be drawn about PT LEN Industri (Persero) human resource readiness for Industry 4.0 technologies.

The first is that employees at PT LEN Industri (Persero) have an adequate understanding of technologies relevant to the Fourth Industrial Revolution era, including critical concepts like the Internet of Things (IoT), Big Data, Artificial Intelligence (AI), and Digital Twin (DT). A survey found that most respondents demonstrated familiarity with these technologies.

Secondly, the use of technology in employees' daily work is relatively high, showing that technology has become an integral part of their work environments. Most survey participants reported continuously leveraging various technological tools and platforms in carrying out their jobs.

However, there are still some areas for improvement related to adopting technology-enabled work systems focusing on the Internet of Things, Big Data, Artificial Intelligence, and Digital Twins. This indicates barriers that need to be addressed for optimal implementation.

Therefore, the company should boost employees' awareness and understanding of new technologies through suitable training. Funds must also be allocated for building the necessary infrastructure to support technology integration.

Data protection and confidentiality should also be top priorities when rolling out advanced technologies. With a strategic approach focusing on skills, resources, and security, PT LEN Industri (Persero) can better harness Industry 4.0 solutions to augment efficiency and competitiveness in the future.

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