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THE LITERATURE REVIEW ANALYSIS OF THE HUMAN RESOURCES DEVELOPMENT IN THE INDUSTRY ERA 4.0 TOWARDS THE ERA OF SOCIETY 5.0

Ardiansyah Putra[1], Muh Azis Muslim[2]
Administrative Sciences Faculty, Universitas Indonesia
[1]Student of the Master's Program at the Administrative Sciences Faculty, Universitas Indonesia
[2]Doctor of Administrative Sciences Faculty, Universitas Indonesia
ardian.arput@gmail.com

ABSTRACT

Since the beginning of the First Industrial Revolution (Industry 1.0), humans have realized the potential of technology as a tool for sustainable progress from time to time. During the Second Industrial Revolution (Industry 2.0), manufacturers began to switch to using electricity for assembly lines and mass production, which started in the 1870s. Then, with the application of electronic and information technology (IT), the concept of automation in the manufacturing industry was introduced during the Third Industrial Revolution (Industry 3.0) in the 1970s. In the context of the Fourth Industrial Revolution (Industry 4.0), the rapid progress of digital technology has changed the industrial world significantly, giving birth to what is called Industry 4.0. At this time human nature is increasingly complex in adapting to rapid change. However, along with advances in technology, new challenges have emerged in managing human resources effectively. Along with the Industrial Revolution, a new concept emerged known as Society 5.0, which encourages the integration of technology and social life outside of society. In the Society 5.0 era, society is expected to be able to quickly adapt to technological advances while maintaining human dignity in their professional lives. Therefore, it is important to understand how human evolution can adapt to this new paradigm. This research aims to explore the development of human resources in the context of the transition from Industry 4.0 to Society 5.0. This research uses the Systematic Literature Review (SLR) research method, which explores the development of human resources in facing the era of society 5.0, which is then prepared as a basis for determining strategic management of human resources using the PRISMA pattern. The research results show that there are implications for human resource management, organizational leadership, and job development in facing the challenges of Industry 4.0 and maximizing the opportunities provided by Society 5.0.

Keywords: Human resources, industry 4.0, society 5.0 era, Industrial era, Systematic Literature Review

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1. INTRODUCTION

Since the first industrial revolution (Industry 1.0), humanity has realized the potential of technology as a means of progress over time. The first industrial revolution, dating from the 1780s and late 18th century, began with the use of raw resources such as water, steam, and fossil fuels to produce mechanical power. During the second revolution (Industry 2.0), manufacturers using assembly lines and mass production preferred electricity in the 1870s. Through the application of electronics and information technology (IT), the idea of integrating automation into the manufacturing industry was introduced during the Third Industrial Revolution (Industry 3.0) in the 1970s. In the fourth industrial revolution (Industry 4.0), the Internet of Things (IoT) and cloud computing work together with artificial intelligence (AI) to make it easier to realize Smart Cyber-Physical Systems (CPS), which act as real-time interfaces between worlds. virtual and physical. Several countries, including the US, Japan, and the European Union, are currently working to introduce a human-centric period also referred to as Industrialization 5.0. (Mourtzis et al., 2022).

Since the beginning of the development of the Industrial Revolution from Industrial Revolution 1.0 to Industrial Revolution 5.0, technology has developed over time. People's social behavior patterns have changed as a result of technological advances, previously only focusing on people's needs without paying attention to technology, but now all aspects of life and people's needs will be human-centered and dependent on technology (Ade Octaviany et al., 2023). The 2016 Keidanren Declaration "Toward Realization of the New Economy and Society – Reform of the Economy and Society" (Keidanren, 2016) defines Society 5.0 as a new vision for sustainable responsible societal growth. A human-centered society that achieves a balance between social problem-solving and economic growth through a system that deeply connects cyberspace and physical space is called Society 5.0. (Potočan et al., 2021). Since 2017, many academics have introduced the idea of Industry 5.0, which recognizes the importance of extended periods of human-robot interaction (Muldoon, 2017; Demir et al., 2019; Longo et al., 2020). According to Xu et al. (2021), “humans and machines united and worked in symbiosis” during this era. Industry 5.0 emphasizes the importance of a human-centered approach following a systemic vision, while according to Xu et al., 2021, they argue that industry 4.0 includes human-machine interactions (Magni et al., 2023). Another expert opinion states that Industry 5.0 is defined as combining digital technology and human civilization while maintaining the essence of humans as individuals. (Nahavandi, 2019). In the industrial revolution 5.0, all procedures are carried out automatically, including the activation process. The increasingly advanced use of internet technology not only connects people around the world but also serves as the basis for online transactions involving governments and the general public.

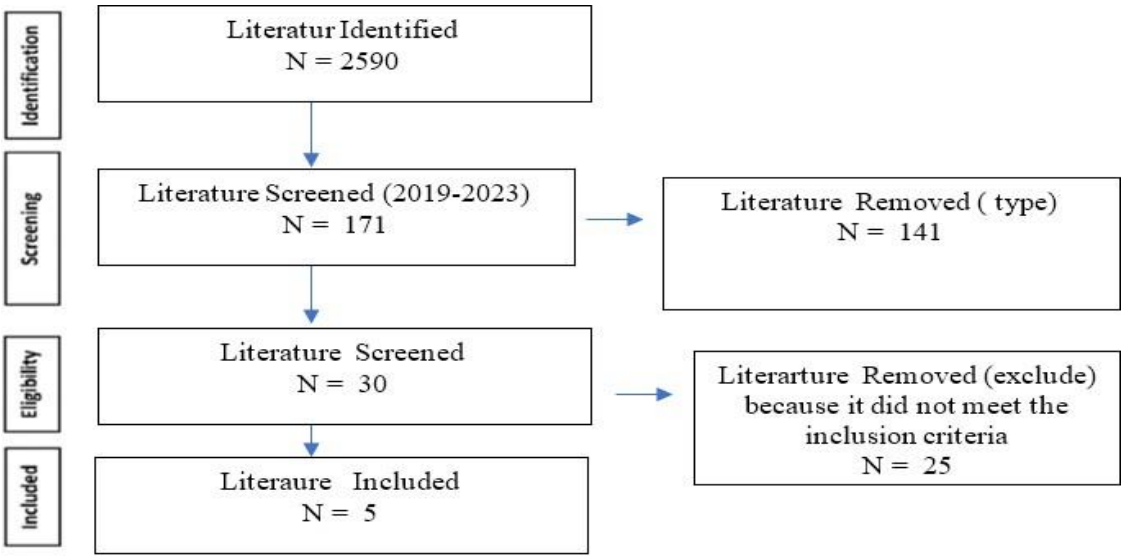
Human Resources will be influenced by the development of Society 5.0, which will have high-speed telecommunications as its hallmark. The telecommunications sector can compete with other advanced technology operators because it uses a digital dividend frequency spectrum and shared infrastructure. Human resources experienced in digital technology are currently urgently needed considering that the world will switch to a human-centered cyber-physical system in a few years. It cannot be denied that new technologies with a large digital component have also appeared in many areas of society. Starting from the digitalization of processing, distribution, and conservation of information in all its forms to coding (software) operations have emerged as major economic system development activities. Continuous change in the design and development process of products and systems, as well as in education and entertainment services, is one of the impacts of digital technology (Azhar, 2022a). Even though Industry 4.0 has been implemented in

Indonesia for more than ten years, the country's adoption rate still seems slow. By providing adequate infrastructure and educational opportunities, the government works to promote sustainable improvement in the quality of human resources.

Education and training programs are needed to prepare and develop the quality of human resources along with social changes because obtaining quality resources is a process. Three things are needed for human resources in education in the era of globalization: quality human resources, human resources who continue to seek knowledge, and human resources with values related to local wisdom. Excellent human resource development can help meet these three needs (Rezky, et al., 2019). The era of Society 5.0, sometimes referred to as the era of Industry 5.0, has arrived, in this era, all technology is integrated into the human condition while on the other hand, humans still need to adapt to the changes brought about by Industry 4.0. The term "Society Era 5.0" originates from Japan and refers to the goal of building a human-centered society that harmoniously integrates social problem-solving and economic growth through a comprehensively integrated virtual and real-world system, thereby enabling people to live comfortably and happily. high quality of life (Fukuyama, 2018). With the emergence of Society 5.0, humans use the internet to live in harmony with each other in addition to finding information (Aulia et al., 2024).

2. METHOD

This research uses the Systematic Literature Review (SLR) method, which traces the development of human resources in facing the era of society 5.0, which is then prepared as a basis for determining strategic management of human resources. In this research, the author used the Preferred Reporting Items for Systematic Literature Reviews and Meta_Analyses (PRISMA) pattern. The PRISMA method is carried out in SLR because it can prevent bias in selecting articles, analysis, or reporting findings. In collecting data, the author used the Publish or Perish program using the terms Human Resources Development, Industrial Era 4.0, and Society Era 5.0. Research materials were found by searching for papers in the Science Direct database published in the period between 2019 and 2023 as follows:



Picture 1. Prism Flowchart

Next, the author takes information from publications to find literature that meets the criteria. The source of the criteria used is as follows:

Table 1. Literature Criteria

Criteria	Summary
Publications Year	2019 – 2023
Key Words	Human Resources; Industri 4.0; Society Era 5.0
Indexation	Dimension, Scopus
Languages	Indonesian; English
Method	Description

3. LITERATURE REVIEW

As the world adjusts to the Industrial Revolution 4.0, Japanese Prime Minister Shinzo Abe surprised everyone in early January 2019 with the concept of "Society 5.0" at the Global Economic Forum in Davos, Switzerland. Industry 4.0, according to Shinzo Abe, is based on the idea of artificial intelligence (AI), but Society 5.0 is primarily concerned with human resources. This concept is a development of the Industrial Revolution 4.0 planned in Germany. At that time, to create a long-lasting European industry that was human-centered and sustainable, the European Commission (EC) developed the Industry 5.0 paradigm, which takes advantage of rapid advances in sensor, wearable, actuator, and communications technologies (Gladysz et al., 2023). According to Fukuyama (2018), the period to enables people to live a comfortable and high-quality life in a system that deeply integrates the virtual and physical worlds is called "Society 5.0", this statement is a Japanese expression that aims to create a society centered on people who balance economic development with solving social problems. (Aulia et al., 2024).

According to Lee et al., (2015), industry 4.0 is the latest advancement in the manufacturing industry that has paved the way for the systematic implementation of Cyber Physics Systems (CPS), in which information from all related perspectives is closely monitored and synchronized between the physical factory and the world. virtual factory and computing space. Additionally, by leveraging advanced information analysis, connected machines will be able to work more efficiently, collaboratively, and superiorly. This trend is changing the manufacturing industry into the next generation. (Tahar et al., 2022). Society 5.0 is a concept based on technology and humanity. Society in this century must live with technological advances. Therefore, to help people overcome various social problems and life obstacles, HR competencies need to be improved so that they can fully utilize and utilize every technological advancement, including the Internet of Things, Big Data, robotics, and Artificial Intelligence.

More specifically, Pereira et al. (2020) explained that the goal of Society 5.0 is to utilize the tools and technology created during Industry 4.0 to advance humanity. According to Pereira, placing human resources at the center of innovation, technological transformation, and industrial automation is a key component of Society 5.0 (Islami & Sopiah, 2022).

Another description of Society 5.0 is a "data-driven society"(Azhar, 2022). An information-driven society is one where knowledge and information derived from data (collected by IoT / Internet of Things networks) "amplify" the physical world. First, data uses humans to indirectly change the world. In other words, a wealth of data sources influences and informs human

decision-making, which in turn influences global change. Second, data uses automated processes to change the world directly – without the need for human interaction. But in a data-driven society, there will be a lot of amazing and comprehensive real-time data.

In the field of education, according to Suryatni (2014), universities in Indonesia still display some progressive events. (Muchsin, 2021)). Initially, the Industrial Revolution 4.0 was brought about by the digital world, which was characterized by the increased use of artificial intelligence (AI) in manufacturing processes, such as robots with AI capabilities that allow them to learn new topics without operator intervention. Robots not only increase industrial efficiency but also reduce the demand for human labor. Improving and harmonizing educational standards, using technology to provide high-quality education, and increasing access and relevance are the goals of education in the Society 5.0 era to support the realization of smart education (Alfikri, 2023).

4. RESULTS AND DISCUSSION

Based on the literature that has been included, various views emerge from researchers who have different points of view but overall have several similarities. The results of this research can be seen in Table 2 below:

Table 2. Analysis Data based on author, year, title, and discussion

Number	References	Titles	Discussions
1	2	3	4
1	Carolina, et. al (2021)	*Society 5.0: A Japanese Concept for A Superintelligent Society*	This study, discussing the Japanese concept of Society 5.0, is based on a society-centered methodology, aiming to utilize technological advances to address the problems currently facing Japan, namely aging, low birth rates, and lack of competitiveness.
2	Dimitris, et.al (2022)	*A Literature Review of the Challenges and Opportunities of the Transition from Industry 4.0 to Society 5.0*	This literature discusses the emergence of Industry 4.0 bringing transformation in manufacturing and production systems through increased operational efficiency and the creation and use of new business models, services, and products as the emphasis is on digitalization of systems. As a result, some countries have begun coordinating efforts aimed at designing and developing human-centered system components, services, and technologies – a concept that known as Industry 5.0.

3	Leonid Melnyk, et. al (2021)	*Transformation of The Human Capital Reproduction in Line with Industries 4.0 and 5.0*	The relevance of this study lies in how the reproduction of human capital is changing as a result of the shift to new socio-economic models and current changes (customization, cyberization, digitalization, etc.) occurring in Industry 4.0 and 5.0. Industry 4.0 and 5.0 is in line with current trends in the reproduction of human capital, including intellectual, enhanced communication, globalization, skills learning, customization, and consumer communication.
4	Rini Ade Octavianty, et. Al (2022)	*Human Resource Development as Preparation for The Industrial Revolution Era 5.0*	This study outlines HRD strategies in the face of the coming Industrial Revolution. (IR 5.0). With the emergence of the Internet of Things (IoT), which connects people, machines, and data, industry is starting to make its mark in the virtual world of the 5.0 era. Indonesia is a country with a large number of productive people, so Strategy Human Resource Development needs to be considered.
5	Dewi Shinta Wulandari Lubis (2023)	*Challenges and The Role of Human Resources in Facing the Era of Society 5.0*	The discovery of this research shows that humans are the main element of the Society 5.0 era because the Society 5.0 era was created to support high-quality human life led by high-quality human resources too, what is desired in this society era is human resources that can meet difficulties and competent in all fields.

Based on the analysis data in Table 2 above, it shows that the Society 5.0 era is a new era that must be prepared well as a continuation of the Industry 4.0 era.

According to Carolina et.al (2021), Industrial Revolution 4.0 sees the creation of a variety of new factory technologies built on information systems and sensors, with the aim of customizing and creating personalized customer service. The goal is to quickly design and create new information systems based on contemporary infrastructure for the digital revolution, as well as subsequent transitions and adjustments. (Narvaez Rojas et al., 2021) Still according to Carolina et.al (2021), in the new paradigm of Society 5.0, technology technologies such as the Internet of Things, big data, and artificial intelligence (AI) are some of the things that are related because they are based on technology that connects physical and digital places. As a result, sensor networks are used in big data to collect and store large volumes of huge data effectively.

AI algorithms process this data to analyze it, extract information, and create value. This service process is created and can be used by anyone, anywhere, anytime. Carolina further stated that Society 5.0 in its implementation and impact is related to 1) IT Infrastructure; 2) Health; 3) Education; 4) Manufacturing; 5) Continuous innovation; 6) Digital Transformation. However, despite the various advantages, there are also disadvantages to the concept of the Society 5.0 era, namely: the need to increase security to avoid cyber attacks, increased use of data volumes so that they can be attacked by hackers, decreased number of workers, technology must be changed, reduced use of hardware and the emergence of environmental pollution. This is in line with Gadnize's (2023) opinion that many organizations predict these changes in the labor market combined with a striking requirement to upgrade certain skills. A McKinsey & Company study, for example, estimates that by 2030, automation could force up to 375 million workers to change job categories, and all workers will have to adapt to living alongside increasingly capable robots. According to a 2017 McKinsey Global Institute survey, 62% of corporate executives think that automation and digital technologies will require retraining for more than a quarter of their workforce. (Gagnidze, 2023).

Furthermore, Dimitris, et.al (2022) stated that Industry 5.0 is more than just a fad, Society 5.0 will offer unprecedented opportunities to build a highly intelligent global community. Knowledge shows how technology facilitates the relationship between two concepts, namely between the Industry 4.0 era and the Society 5 era, ensuring the long-term growth of a human-centered society by building a physical circle from digital to physical. Three main challenges that must be resolved to successfully link Society t 5.0 and Industry 4.0 are identified as follows: 1) people-oriented actions; 2) sustainable development; and 3) physical to digital to physical circle.

Table 3. Industry shift from Society 4.0 to Society 5.0

	Society 1.0 to Society 4.0	**Society 5.0 onwards**
Industrial Focus	Product and business type	Values realized and problems solved
Application Areas	Electricity, mobility, infrastructure, construction, medical equipment, logistics, and financial services	Environmentally friendly energy, comfortable movement, and health realization
General Aims	Transition to autonomy, to an independent and decentralized framework where companies build industrial structures based on consumer values and integrate channels and technologies in specific areas to realize those values	

Another researcher, Leonid Melnyk, et.al (2021) has other thoughts. According to him, the development of renewable energy requires knowledge and skills related to Industry 4.0 items, which include digital twins, cloud computing, artificial intelligence, augmented reality, machine learning, the Internet of Things, and cybersecurity. However, on the other hand, Industry 5.0 makes one search for new opportunities and creative roles in the cybernetic environment. This results in a need for employees with skills including flexibility, critical thinking, decision-making, knowledge of cross-functional processes, advanced writing skills, the ability to solve complex problems, advanced data analysis, and more. Changes in the way human capital is produced are the result and accelerator of social change is going. The reproduction of new individuals (containing knowledge, skills, moral standards, and essential foundations, which are personal

principles) is necessary for the new economy. However, individuals must be able to change Industry 4.0 and must be responsible for developments in the technological environment. According to Leonid, in Industry 5.0, improving conditions for the development of a person's social personality has priority over the goals of productivity and efficiency growth (Melnyk et al., 2021).

Meanwhile, according to Rini Ade Octavianty, et. Al (2022), an interesting part of the coming manufacturing revolution is how digital technology is developing; In the end, the industrial era 5.0 brings back the human touch and returns to human interests. Industry 5.0 is a deliberate effort to promote collaboration between technological innovation and human excellence. In the Industry 5.0 era, businesses are implementing internal automation while complying with future megatrends. In response, Indonesia needs to remain familiar with these advances and maintain relevant human resource capabilities.

In contrast to other researchers, Dewi Shinta Wulandari Lubis (2023), stated that the transition from analog technology to digital technology, known as the industrial era 4.0, is what resulted in the current period of Society 5.0. Problems facing the Society
5.0 must be focused on human resources. In this situation, human resources are needed to encourage innovation and add value to workers and society which is very dependent on technology as a whole. The social stage of technology, or interactions between communities and technology, will become more common, which could pose problems for Society 5.0. Therefore, the Society 5.0 period has a good effect on the realization of the vision and goals of every organization, with community serving as the goal of the organization.

5. CONCLUSION

Based on the description of some of the literature above, it can be concluded that researchers have different points of view but generally have in common that the Society 5.0 era is a future era that is different from the era currently being faced namely the Industry 4.0 era. Industry 5.0 is more than just a fad, Society 5.0 will offer unprecedented opportunities to build truly intelligent global communities. In the literature study presented, the technological background is discussed in detail to provide a comprehensive understanding of the current level of technological readiness and the trends expected to emerge in the coming years. Studies show a close relationship between Industry 4.0 and Society 5.0. Knowledge shows how technology facilitates the connection between two concepts, ensuring the long-term growth of a human-centered society by building a physical circle from digital to physical. Humans are at the center of change in Society 5.0, along with technological progress, economic expansion, and sustainability. According to the researchers, the Society 5.0 methodology enables continued technological progress without hindering prosperity.

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