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Industrial revolution 4.0: What should be prepared for the next stage?

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Abstract

This article aims to analyze the opportunities and challenges in the era of the industrial revolution 4.0. This research is a descriptive study with a qualitative approach and uses the literature study method. This study indicates that the opportunities in the era of the industrial revolution 4.0 are in the industrial ecosystem, which is increasingly open, and the challenges are focused on the readiness of human resources. This study formulates that to prepare competitive human resources in the era of the 4.0 industrial revolution, learning in tertiary institutions must be oriented towards a) inter-multi discipline; b) problem solving oriented; c) interpersonal skills, and d) innovation based on technology.

Keywords: Industrial revolution; human resources; innovation

Introduction

The industrial revolution 4.0 is the fourth phase in the Industrial Revolution's historical journey in the 18th century. The world underwent four industrial revolutions. The steam engine's invention marked the 1.0 industrial revolution to support production engines, trains, and sailing ships. The discovery of electrical energy and the concept of labor division to produce products in large numbers in the early 19th century marked the birth of the industrial revolution 2.0. Revolution Industry 3.0 was marked by computer programs' development and the early stages of production-based automation. Meanwhile, the industrial revolution 4.0 is an industrial era characterized by using the internet of things (IoT), artificial intelligence, and extreme automation such as autonomous vehicles (Laka & Gonzalez, 2015; Roblek, Meško, & Krapež, 2016).

The development of technology in the swift industrial revolution 4.0 has changed many basic things ranging from lifestyle, social interactions to basic people's behavior. Advances in information technology through the internet and trends in automation

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through artificial intelligence is the main driver of these fundamental changes. Automation through artificial intelligence is now widely used by many companies to do efficiency and increase productivity; this can be seen with large companies that use smart robot technology, artificial intelligence-based customer service, and Artificial intelligence-based personal assistants commonly used (Ghahramani, 2015).

Meanwhile, since the late 90's the internet has been predicted to become an important technology in economic and business growth. The internet can facilitate starting a business, from the marketing of goods and services, better accounting standards. On the consumer side, consumers will get a more competitive price. Studies in China show that the internet has a significant impact on economic growth (Hasan, Wachtel, & Zhou, 2009). Other studies also show the internet has an important role in the aftermath of the economic investment ratio, governance, and inflation (Lio, Liu, & Ou, 2011).

The 2011 McKinsey Study revealed that the internet in developed countries could support its GDP of 3.4 percent, with the household consumption sector as the main driver. The global internet-based household consumption sector for developed countries contributed 1.8%. This study also shows that the internet opens up opportunities for greater entrepreneurship. The SME sector is one of the sectors that is greatly helped by the internet, the internet in developed countries makes SMEs grow faster and more capable of expanding their market (Manyika & Roxburgh, 2011). In the midst of the potential for creating new jobs due to the development of artificial intelligence and the internet, some studies also reveal if technological developments are not balanced with good management and planning, this technology is possible can be destructive. (Michelacci & Lopez-Salido, 2007). Hence, identifying against the opportunities and challenges of the 4.0 industrial revolution era must be mapped as a deep foothold developing a sustainable economy, especially in human resources (HR).

Especially in the HR sector in the era of the industrial revolution 4.0 due to technological developments which are fast and the economy is developing with a very dynamic and fluctuating way of preparation HR can no longer be done in classical ways. Technological developments led to job opportunities, and the skills required are also developing very dynamically. Therefore that. HR in the industrial revolution 4.0 must have the basic ability to continue learning to adapt quickly.

Research Method

This research is a descriptive study with a literature study approach. The focus of the problems offered is obtained from observation and analysis of the literature. This critical analysis-based literature study puts forward the concept of ideal human resource skills in the era of the industrial revolution 4.0. Triangulation methods to check the correctness of the data or information obtained are also carried out from different perspectives. Triangulation is expected to reduce the possibility of bias during data collection and analysis.

Result and Discussion

It is believed that the Industrial Revolution 4.0 will be able to increase the inclusiveness of growth global economy but not the least that is worrying if the

industrial revolution 4.0 will further widening the balance between developed and developing countries (Sommer, 2015; Weyer, Schmitt, Ohmer, & Gorecky, 2015). This concern is not without reason; the industry's foundation and the incubation of qualified technology have made opportunities for developed countries to become leaders in the era of the industrial revolution 4.0 more wide open. Thus, it is natural to raise the concern that the industrial revolution 4.0 is a real threat to developing countries. Therefore, the preparation of human resources oriented towards the 4.0 industrial revolution, especially for the country developing, is a must that cannot be debated.

Challenges are the distance between things that are considered ideal with existing reality; challenges in the era of the industrial revolution 4.0, especially in HR, can be interpreted as things that must be owned by every individual so that HR has competitive competitiveness. Yahya (2018) identifies challenges for industry 4.0, ranging from security issues, stability to the lack of skilled human resources. In more detail, Yahya's opinion will be described as follows: a) The development of IoT makes security issues a very crucial issue, Starting from information theft to theft of digital money is an issue that must be the focus of all parties, especially for IoT-based developers; b) Reliability and stability of the production machine, Because most production machines have been set up automatically using artificial intelligence, reliability in dealing with emergency and unusual conditions also need attention; c) Lack of adequate skills, There are still many college graduates, and vocational schools who are not ready for the development of the industrial world, so fresh graduates need additional training; d) Reluctance to change by stakeholders, the attitude of regulators and the world of education, which is quite slow in responding to developments in the industrial world, is also a real challenge. If left unchecked, the gap between the academic world and industry will be further away, which will reduce the competitiveness of human resources; e) the loss of a lot of work due to turning into automation, On the other hand, the industrial revolution creates job opportunities that have never existed before. With the nature of automation, many jobs at the administrative and operational levels are being eroded by smart machines. Due to this, the basic scientific knowledge, technology, and innovation need to be continuously improved. Information technology security issues.

Furthermore, Sung (2018) explains Industry 4.0 as follows: Economic, social, technological, and environmental challenges. Globalization that continues to increase the ability of individuals ranging from language skills, innovation power, and collaboration to better service is a challenge that HR faces in this era. The internet is increasingly making boundaries that used to be barriers disappear by themselves. Learning processes, social interactions, and the quality of service demanded by customers are also increasingly complex. At this time, it seems impossible to live without technology, so that basic knowledge of technology is a basic ability that must be possessed by every individual. Awareness of the importance of protecting the environment has also increased in the era of the industrial revolution 4.0; this has resulted in solutions and innovations being offered apart from considering convenience, productivity, efficiency, and environmental issues.

Meanwhile, opportunities are conditions or phenomena that can be used to increase productivity. The opportunities created by the development of technology ranging from artificial intelligence to IoT generally include the opening of barriers to

productivity and the need for experts, and creating new job opportunities that arise from collaborative innovations. There are at least four main opportunities that must be utilized as much as possible, according to Yahya (2018). The industrial ecosystem in industrial revolution 4.0 is very different from the previous era; in the industrial revolution, 4.0 work can be done anywhere, even without a physical office, because everything can be done digitally through cloud-based internet technology. Developing industrial ecosystems also tend to be profit-oriented and very considerate of the social impacts and passions of industry 4.0 players.

The development of information technology, especially the internet, makes the world more open; barriers ranging from distance to costs can be minimized using technology. This encourages a healthy climate of competition among business actors and industry players. If they want to continue to survive, they must continue to innovate. Take Go-Jek, for example, originally just an online transportation application, now Go-Jek already has dozens of services ranging from delivery to digital payments. For the company's sustainability to be maintained, high technology-based companies are willing to invest in technology. A competitive climate increasingly competitive makes companies inevitably have to continue to innovate so that investment in technology cannot be avoided. The company's strong willingness to invest in technology will certainly impact the high demand for experts in this field. With the development of an increasingly fierce competition climate, sometimes companies cannot stand alone, so integration and collaboration between companies is one option in winning the competition in the 4.0 industrial revolution. A clear example of this phenomenon is the collaboration between Grab and Ovo to develop their markets further. This collaboration and integration between companies create new economic value, expand markets, and increases efficiency.

The characteristics of opportunities in the era of the industrial revolution 4.0 indicate that production constraints such as limited space, access to capital sources, and limited markets can be overcome with technological developments. The company's focus on technology investment has also made the engineering profession, data scientist, and internet expert even more valuable. The opportunities created are also more collaborative in nature so that individual, interpersonal abilities also play a major role in the 4.0 industrial revolution. In addition to the existing collaborations and creating more innovative and competitive products, a collaboration between disciplines and companies is also increasingly creating increasingly complex challenges that require human resources with high-level thinking skills who have problem-solving abilities.

The World Bank (2017) informs that the job market requires multiskill graduates made by educational units and systems, both secondary and higher. Indonesia is also predicted to experience a demographic bonus in 2030-2040. Namely, the population of productive age is more than the non-productive population. The population of productive age is estimated at 64% of Indonesia's total population, which is estimated at 297 million people. BPS 2017 data shows the number of unemployed coming from vocational high schools (SMK) is in the top rank at 9.27%, followed by senior high school graduates (SMA) at 7.03%, Diploma III (D3) at 6.35%, and universities 4.98%.

BPS data shows that the unemployment rate for higher education graduates (PT) is also quite high; this is inversely proportional to the university's main function, which

is one of the main pillars in improving the quality of human resources and developing technology. Therefore, universities must be adaptive to global industrial development, including facing the industrial revolution 4.0. Based on the characteristics of the challenges and opportunities in the 4.0 industrial revolution, universities should direct the curriculum and learning approach based on the challenges and opportunities in the era of the industrial revolution 4.0.

The characteristics of challenges and opportunities described earlier show that the challenge faced by the industrial world is the availability of qualified human resources, especially in the field of technology. Likewise, with the opportunities that exist, the Industrial Revolution opportunities 4.0 tend to develop a healthy ecosystem and an increasingly competitive industrial climate so that technology-based innovation is the answer. This paper recommends 4 main pillars that universities must do to prepare human resources who are ready to compete in the 4.0 industrial revolution.

Conclusions

Based on the analysis and discussion stated, in general, the opportunities and challenges for human resources in the era of the industrial revolution 4.0 are the openings of opportunities for greater economic value, but this can only be used if human resources have technological literacy and good adaptability. Therefore, to achieve these goals, Tertiary Education Institutions are encouraged to implement learning based on a) inter-multi discipline; b) problem-solving, c) interpersonal skills, and d) innovation based on technology.

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