Perception and Prospective Analysis of Artificial Intelligence on Human Capital and its Impact on Human Resources in The Industrial Revolution Era 4.0

Btari Mariska Purwaamijaya[1], Yogi Prasetyo[2], Fadhilah[3]

[1,2]Universitas Pendidikan Indonesia
[3]Universitas Sultan Ageng Tirtayasa

ARTICLE INFO	ABSTRACT
Keywords: *Artificial Intelligence, Human Resources, Industrial Revolution, Industry 4.0.*	In the current global Industry 4.0 era, competent and highly competitive human resources are an absolute requirement for increasingly fierce global competition, to deal with this the Indonesian government has implemented policies to deal with Indonesia's Industry 4.0. One of them is carried out by the Ministry of Research and Technology, over the last four years, around 100 new study programs have been opened to produce human resources who are ready to face challenges in Indonesia's Industry 4.0. The depiction of the global era of Industry 4.0 can be described as follows: automation and robotics are considered as muscles, AR / VR, cameras and other sensors are considered as senses, data and connectivity are considered as a central nervous system. But the real brain behind it is Artificial Intelligence (AI). AI is a science in the field of computer science that studies the creation of computer systems with the ability to have human-like intelligence. People who have AI skills are highly targeted nowadays. Demand for artificial intelligence capabilities in the focused area of machine learning has increased sharply in the UK. Research is needed with a comprehensive qualitative approach, and exploration of the needs anticipated by universities to become centers of excellence and contribute to the real world by producing human resources to be able to work and win the competition in the global business industry, both as practitioners and academics. The results of the study are useful for improvement and aim to evaluate the strategies that have been implemented previously based on the results of research related to perceptions and prospective analysis of artificial intelligence to produce the human resources needed in Industry 4.0 in Indonesia.
E-mail: btarimariska@upi.edu, yogiprasetyo@upi.edu fadhilah@untirta.ac.id	

1. Introduction

The industrial revolution is a change in the economic and production sectors in the form of efficiency aspects that affect other sectors. This century, the era of the Industrial Revolution 4.0 is underway with the rapid development of technology to digitize aspects of human life and connect it to the Internet of Things (IoT) and its supporting technology which forms the backbone of Cyber-Physical Systems (CPS). and smart machines are used as promoters to optimize the production chain [1].

Artificial Intelligence (AI) is the driving force of the industrial revolution 4.0 which promises many conveniences for the government and the industrial sector, especially regarding the integration of AI in Human Resources [2]. In the midst of the massive development of industry 4.0, the government must move quickly in adopting this platform. Therefore, it is necessary to have the right knowledge and understanding for the government in facing the Industrial 4.0 era by combining research and business, one of which is in the field of Education [3]. The high need for expertise in the field of AI, has made several Universities as Centers of Excellence to produce graduates who can understand AI, by adding AI courses as objects of study in the teaching and learning process at the University.

2. Literature Review

2.1 Artificial intelligence

Artificial Intelligence (AI) is a computer system formed to identify, model human thought processes and design machines so that they can imitate human behavior. AI continues to develop along with technological developments and innovations that are found, so it is expected to change the business world because of the efficiency of AI processes [5].

One of the Artificial Intelligence (AI) in the IT field that is very familiar to use in Indonesia is a chatbot. A chatbot is a computer program designed with artificial intelligence and natural language processing that makes a chatbot an intelligent computer program that can answer questions posed by humans. These chatbots can be used in small industries or businesses to automate customer service because user requests will be handled by chatbots thereby reducing labor requirements and human costs [6].

2.2 AI in Industry 4.0 Indonesia

According to Asia Business Council 2017 research on Artificial Intelligence in Asia: Preparedness and Resilience, revealing data that Indonesia is home to more than 100 million internet users and 80 million smartphone users, which means a huge amount of potential data for companies that can break the market for AI-enabled products and services. However, Indonesia is still trying to fully enter the digital era, with the "National Movement Program for 1,000 Digital Startups". Although Indonesia has yet to produce a well-known AI startup, Ematic Solutions as a digital marketing startup based in Singapore has focused on the Indonesian market. Ematic uses AI to capture data about company website visitors. It then

reflects data about customer interactions with the site to build a database of potential customers and create more effective digital advertising campaigns. Additionally, BLOCK71 as the third in a growing global network of incubation hubs managed by NUS, which includes ventures in Singapore, San Francisco, and plans to expand to Suzhou in China will provide an ecosystem for disruptive technology startups [7].

2.3 AI for Human Resources Opportunities and Functions

A survey conducted by IBM of 6,000 executives in 2017 revealed that 66% of business owners (CEOs) trust cognitive computing and AI, which can transform and drive significant new values in the Human Resources (HR) field. Even 54% of CEOs believe AI will fill and influence a vital role in HR. So far, Artificial Intelligence has played a role in several fields of work in order to help increase efficiency in various fields and now AI can be widely applied in various fields, such as health, telecommunications, retail and education [8].

As explained in the paragraph above, the potential of AI embodies a new paradigm. For example in the health sector, it has an impact on health workers, researchers, and the community. Certain AI technologies that are critical to healthcare have an important role to play in future healthcare offerings. AI systems will not replace human doctors on a large scale, but will increase their efforts to treat patients. Over time, human physicians may move toward assignments and job designs that take advantage of unique human skills such as empathy, persuasion, and big picture integration. Perhaps the only healthcare providers who will lose their jobs over time are those who refuse to work with AI [9].

Based on the results of a paper from EY as a global leader in assurance, tax, transaction and consulting services, AI-based HR applications have strong potential to increase employee productivity and help HR professionals become knowledgeable consultants that improve employee performance. AI-powered HR applications have the ability to analyze, predict, diagnose and become more powerful and capable resources. Decide what you want to see and how it fits into your company culture before adopting a solution. Employees will be affected by the functioning of AI in various ways, so it is important to focus on employee needs and possible outcomes [10].

2.4 Impact of AI on Education

It can be understood that AI has reached all business sectors, even the education and HR sectors are feeling the impact of the presence of AI which will continue to grow. To deal with this, the Indonesian government has implemented policies to deal with Indonesia's Industry 4.0. One of them is carried out by the Ministry of Research and Technology, for four years, around 100 new study programs have been opened to produce human resources who are ready to face challenges in Indonesia's Industry 4.0. Universities as Centers of Excellence must be adaptive and develop continuously, as in The two main areas are curriculum and enrollment. The strengths of AI are its speed, accuracy and consistency. However, on the other hand, AI is still weak in soft skills such as creativity, innovation, critical thinking, problem solving, socialization, leadership, empathy, collaboration, and communication. So that the basic science and mathematics training can still run at the University, and at the same time the University must improve the soft skills of students. This anticipation has been made by several universities that offer AI and Machine Learning courses, which are not only limited to computer science students, but also currently business students as managers and business executives need to understand the capabilities, limitations, and implications of AI in the business world. Another impact of AI in higher education is enrollment. Liberal arts and humanities majors may become more popular because these areas are less vulnerable to "AI invasion." Areas like accounting and financial analysis that may be hit hard by AI may experience a drastic drop in enrollment. [11].

2.5 AI on Human Capital

One of the most important things in the development of a company is intellectual capital. Intellectual capital is a vital part for the company because it can determine the company's competitiveness, production technology, and efficiency of the workforce. In addition, intellectual capital also plays a role in creating ideas and developing innovations. In this Industry 4.0 era, there is a new supporter for intellectual capital, namely artificial intelligence (AI). AI is a machine information processing technology (automation), but it is contrary to human intellect. Today's AI capabilities are not so sophisticated, but tend to continue to increase, so it is likely that AI will have the same capabilities as human intelligence in 2028-2030. Thus, a scientific work and practical problem emerged to determine the variant of the use of human intelligence and AI in Industry 4.0 in the future which plans to increase the competitiveness of enterprises, reduce, the influence of the "human factor" on production and ensure the quality assurance of the company's products.

Feng (2019) writes that AI cognitive abilities (e.g. studying literature and creative activities) are high and are constantly evolving. However, the capabilities of AI are limited and will always be limited, based on which scholars believe that competition between human and artificial intellectual capital is impossible (because it goes against common sense). The social enterprise specification does not allow for automation at the scale and average level desired by commercial enterprises. At the same time, social enterprises can increase AI-based activities and create additional benefits for all interested parties. Digital modernization of social enterprises based on AI is desirable and accessible – but should take into account the specifics of social entrepreneurship. Human and artificial intellectual capital are equally important for social enterprises. The growth in the level of automation will lead to a slight expansion of the value of AI. The current level of automation of social enterprises in Russia, according to interested parties, varies:

a.   1.28 points out of 10 (according to consumers);
b.   3.19 points out of 10 (according to employee); and low overall.
     NS perspectives on further automation of social enterprises, according to interested parties, vary:
a.   5.10 points out of 10 (according to employers);
b.   6.55 points out of 10 (according to consumers); and moderate overall

AI's share should not exceed 44.11% in intellectual capital structure. The most promising perspectives for applying AI in social enterprises include: collection of orders for social goods and services and the study of marketing and promotion of social goods and services. Neither the convergence nor the divergence of human and artificial intellectual capital is fully in accordance with the interests of the interested parties. The most preferred (optimal) variant of using human intelligence and AI in social entrepreneurship in Industry 4.0 to 2030 is human intellectual decision support.

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3.   Research Methods

This research was conducted with a comprehensive and exploratory qualitative approach. The research is based on secondary data from previous research by digging up various articles, papers from company research and other literature. This study also adopted an interview method with the help of a structured questionnaire focused on students and faculty at the University, entrepreneurs and HR professionals working in companies. The Study of Perception and Prospective Analysis of Artificial Intelligence on Human Capital and Its Impact on Human Resources in the Industrial Revolution 4.0 Era conducted primary data collection from around 200 respondents from various educational backgrounds in Indonesia, both students, academics and practitioners.

4.   Results and Discussion

4.1   Perception of Artificial Intelligence and its Impact on Human Resources in Industry 4.0 Indonesia

Perception is a response or discovery of a direct image of something or the discovery of a direct image of a person's absorption in knowing things through the five senses. In this sense it is clear that perception is the impression of an image or response that a person has after that person absorbs to know some things (objects), through his five senses. Meanwhile, in this study, the perception indicators are presented as the acceptance or absorption of information, understanding, and evaluation.

4.2   Receiving information about the Perception and Prospective Analysis of Artificial Intelligence on Human Capital and Its Impact on Human Resources in the Industrial Revolution Era 4.0

From the results of questionnaire data distributed to 200 respondents from various educational backgrounds in Indonesia, 74% of respondents know about artificial intelligence and its impact on HR in Industry 4.0 in Indonesia.

72.72% of 165 students know about artificial intelligence, of which 10.83% get information from newspaper or television news, 50.83% get it from social media such as news websites, Twitter, YouTube, line, Instagram, and Facebook . Meanwhile, only 20.83% got information from universities, 14.16%, from seminars and 3.333% got it from other sources, such as international journals, articles and forums.

79.16% of 22 respondents who are entrepreneurs and employees know about artificial intelligence. Only 26.31% got information from the University, 21.05% got it from news sources in newspapers or television, 10.52% got it from seminars. 36.84% got it from social media. And unfortunately, only 5.26% get it from direct experience while working. 69.23% of the 13 respondents are civil servants, teaching staff, and others, knowing about artificial intelligence and its impact on human resources in Industry 4.0 in Indonesia. 11.11% of them get information from the University, 22.22% get it from news sources in newspapers or television, 22.22% get it from seminars, 22.22% get it from social media, and 22.22% get it from articles .
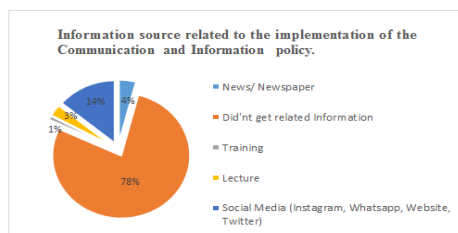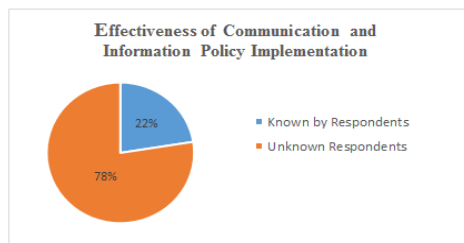
4.3   Understanding and Evaluating the Perception and Prospective Analysis of Artificial Intelligence on Human Capital and Its Impact on Human Resources in the Industrial Revolution Era 4.0

Regarding the perception of the importance of understanding IoT, big data, cloud computing and AI in Industry 4.0 in Indonesia in 200 respondents, 89.5% thought it was important to understand it, 7% thought it was mediocre, and 3.5% did not know it was important. Regarding understanding what has the most influence on HR in Industry 4.0 in Indonesia, 15% answered renewable energy, 2.5% answered AR/VR, 28.5% answered data and connectivity and 54% answered AI. Respondents' assessment of the difficulty of learning and utilizing AI in Industry 4.0 in Indonesia, 49.5% considered it difficult, 29.5% considered it normal, 7.5% considered it not difficult, and 13.5% said they did not know.

4.4   Prospects of Government Policy and the Role of the Business World in Artificial Intelligence and Its Impact on Human Resources in Industry 4.0 Indonesia

Prospective analysis in terms of how the policy or implementation by the government is accepted by the public

From the final results of the questionnaire data with a total of 200 respondents, the known information can be seen in the following diagram. Regarding the effectiveness of implementing policies from the Ministry of Communication and Informatics, 78% or it can be said that most of the people do not know about these policies and about sources of information related to policy implementation from the Ministry of Communications and Information Technology. Information Technology, it is known that social media is the largest source of information by 14%.


Effectiveness of Communication and Information Policy Implementation

- 22% Known by Respondents
- 78% Unknown Respondents

Information source related to the implementation of the Communication and Information policy.

- News/ Newspaper
- Did'nt get related Information
- Training
- Lecture
- Social Media (Instagram, Whatsapp, Website, Twitter)

Based on the data we have obtained, it is known that the new regulations regarding the opening of new relevant study programs have balanced results. Based on the relevance of government programs to produce human resources in Industry 4.0, the opening of new study programs is the most relevant government commons program, which is 51%.
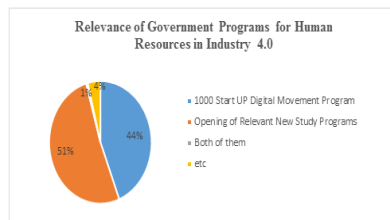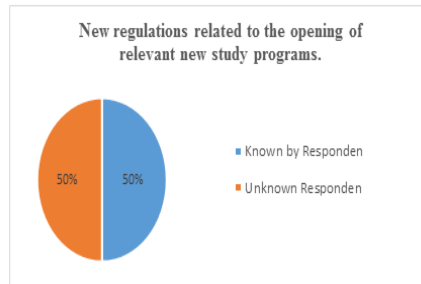
Based on the data we obtained, respondents' responses to the statement "The role of the government to produce human resources in industry 4.0 in Indonesia" stated that the government's role was important at 90%. Regarding the effectiveness of implementing government policies, 82% of respondents stated that government policies were not effective. Based on the data above, the lack of program socialization and the lack of adequate infrastructure (60%) are mutually sustainable towards the lack of implementation of government policies to produce human resources in Industry 4.0.
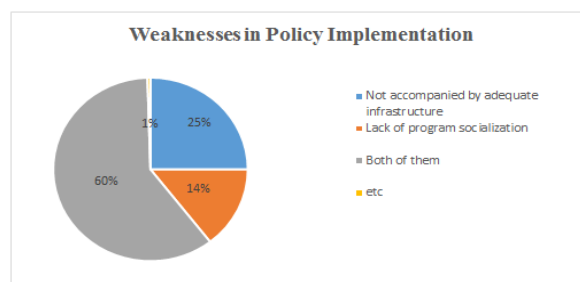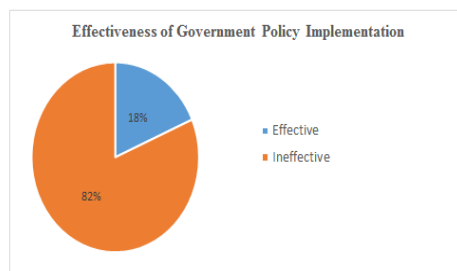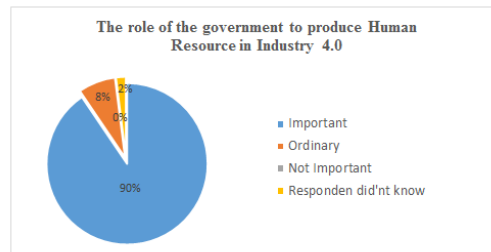
4.5   Prospective analysis of industry interview results

In this study, industry interviews were conducted on five companies. PT. Centratama Telekomunikasi Indonesia Tbk, Permata Lippo Cikarang Family Hospital, CV. Son of Dirgantara Jaya, PK. Indah Jaya, and PT. Yuditama Mandiri, the five are private companies. One company has less than 10 workers, one company has 10-20 workers, and the other three companies

have more than 20 workers. Based on the results of a questionnaire on HR who have an understanding of AI, several companies have their own answers. 66.7% of companies agreed to implement AI in their company and 33.3% said they did not agree to implement AI in their company.

PT. Centratama Telekomunikasi Indonesia Tbk and PT. Yuditama Mandiri said that human resources who have an understanding of AI have the opportunity to work in companies with different percentages. The large percentage of undergraduate graduates who understand AI, at PT. Centratama Telekomunikasi Indonesia Tbk, has a percentage to be recruited in companies <10%, while PT. Yuditama Mandiri has a percentage of 10-25% to be recruited in the company. For the recruitment of new graduates with a bachelor's degree in the company PT. Centratama Telekomunikasi Indonesia Tbk, PK. Indah Jaya and PT. Yuditama Mandiri is conducted more than every two years and regarding salaries for HR who understand AI is not special, only standard, for initial entry into PT. Centratama Telekomunikasi Indonesia Tbk will get a salary of > 6 million rupiah. Meanwhile at PT. Yuditama Mandiri earns between 4-6 million rupiah. Meanwhile, Permata Lippo Cikarang Family Hospital, CV. Putra Dirgantara Jaya, and PK. Indah Jaya, does not need human resources who understand AI.

4.6   The role of universities to produce competent students in the era of the Industrial Revolution 4.0

Regarding the importance of the role of universities in producing human resources who are ready to compete in industry 4.0 in Indonesia, 73.5% of 200 respondents answered very important, 23.5% answered important, 3% answered mediocre, and 0.5% answer is not important. Regarding the implementation of curriculum and career guidance that has been carried out by the University to produce Human Resources (HR) who are ready to compete in Industry 4.0, 16.5% of 200 respondents answered very helpful, 60.5% answered quite helpful, 5% answered not helpful, and 18% want curriculum changes or adjustments that are in line with industry 4.0.

Regarding what universities should do in producing competent human resources in industry 4.0, 16.5% of the 200 respondents proposed opening an artificial intelligence study program, 60.5% considered additional courses such as entrepreneurship, digital business, and artificial intelligence necessary. 20% stated that universities needed to hold work seminars needed by companies in industry 4.0 and 3% thought that what the University was doing was enough so that there was no need to do anything.

Regarding the role of lecturers from practitioners to prepare students. 89.5% answered very important. While 10% answered mediocre and 0.5% answered no need. Regarding lecturers' knowledge of IT, especially artificial intelligence to help students find jobs in the future, 86.5% said it was very necessary. 12.5% answered normal and 1% answered it was not necessary for the lecturer to understand this.

Regarding the study program that can be replaced with artificial intelligence, 18.5% answered that it could be replaced by artificial intelligence, 9.5% answered that it could not be replaced and 72% answered that it could be replaced by artificial intelligence. Regarding the infrastructure needed to support industry 4.0, 54% think an IT/multimedia lab is needed. On the other hand 27% answered that a business incubator is needed, 6% considers the wifi angle, and 13% thinks digital libraries are needed to support Industry 4.0.

From the results of our short interviews with respondents, that respondents' expectations for the government or universities in developing the Business Industry sector related to the development of artificial intelligence and human resources to face Industry 4.0, it can be seen that there is progress in the application of artificial intelligence technology, universities must be able to adapt to the development and application of artificial intelligence or automation, the application of the right curriculum to be applied in industry 4.0 that artificial intelligence is used as general knowledge material, especially the learning process is supported by infrastructure that is in accordance with learning specifications, the government must be able to make policies that are expected to encourage and digitize SMEs or business actors by implementing artificial intelligence to support industry 4.0.

4.7   Implications Of The Study

Although there are many articles about AI and its impact on human resources, research-based articles in Indonesia are still limited. Therefore, there are limitations of academic research conducted to reveal how the relationship between AI, HR and its benefits in the Industrial Revolution 4.0. This qualitative research-based study contributes to the development of AI and HR. The findings of this study show how HR can actually be more competent with integrated AI and how to make it more effective and systematic. This study also highlights the various needs in generating human resources to be able to integrate AI. These findings illustrate the rationale for how AI should be integrated into HR functions by all companies and how collaboration between government and universities is needed [13].

5.   Conclusions

The industrial revolution 4.0 brought many developments, the automation era has been applied in several sectors to streamline activities and artificial intelligence as a driving force in an era that promises many conveniences in various fields. Based on the results of the study, Indonesian people are familiar with artificial intelligence but only in general from various sources. However, they do not yet know how to implement artificial intelligence in various sectors. The awareness of the Indonesian people already exists that artificial intelligence is an important thing that must be understood in the industrial era 4.0, it's just that their perception of how difficult it is to learn artificial intelligence has hindered a deeper understanding of artificial intelligence itself.

Based on research that the policies made by the government, one of them by the Ministry of Information and Communication Technology, has not been spread well and cannot be known by the wider community. In fact, the policy to facilitate universities in opening new study programs to meet the needs of human resources in industry 4.0 in the future is also the same challenge. The Indonesian people think that the role of the government must exist, but this role has become less targeted, because of the unequal distribution of information to the Indonesian people themselves. On the other hand, the results of research involving industry are not ready to accept human resources who understand artificial intelligence and there is an assumption that character is more important to face industry 4.0,

HR is an important variable in Indonesia's change movement to prepare for industry 4.0. The authorized agency for this is the Ministry of Education and Culture. Education is the beginning to produce competent human resources in dealing with and meeting all needs in Industry 4.0. According to research results, the Indonesian people want curriculum changes at

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universities to adapt to the demands of industry 4.0, such as adding additional courses and applying information technology, especially artificial intelligence, to help them professionally. They also realize the importance of lecturers from practitioners to increase knowledge about professional work. Infrastructure is needed by the University to produce competent human resources in industry 4.0, to help students more easily express and form ideas with supporting infrastructure.

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