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Implementation of Artificial Intelligence (AI) in Public Administration in the Era of the Industrial Revolution 4.0

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Abstract. The use of Artificial Intelligence is quite commonly used by people, both to help with their daily lives and to help with their work. The development of artificial intelligence can then be applied in the use of public administration by the government, especially in the era of the industrial revolution 4.0. This research then aims to see how the implementation of artificial intelligence in the field of public administration in Indonesia. This research will be carried out using a descriptive qualitative approach. The method of this research uses literature study which comes from various research results and previous studies. The results of this study then found that the existence of artificial intelligence can already be felt in public administration. This can be seen from the various applications that have been issued by the government in helping people's needs. But unfortunately, the use of artificial intelligence cannot be felt by all government agencies, due to various factors, such as the large budget required. Therefore, the government as a responsible party needs to be able to overcome these various problems.

Keywords: *Implementation, Artificial Intelligence, Public Administration, Industrial Revolution 4.0.*

A. INTRODUCTION

Today's society is very accustomed with the term Industrial Revolution 4.0. The presence of industrial revolution 4.0 has had a significant impact on the development and application of technology in numerous sectors, including government, health, education, social, and economic sectors, among others (Ellitan, 2020). Industrial Revolution 4.0 is the fourth industrial revolution characterized by the rapid development of technology and the interconnection between technological advancements and their applications. This innovation may lead to the emergence of artificial intelligence technology or what we know as artificial intelligence, which has never occurred during the previous industrial revolution (Bradu et al., 2022).

In addition to having a significant impact on a variety of industries, the increasing role and use of technology in the industrial revolution 4.0, particularly the use of artificial intelligence technology, are also having a significant impact. Also influence changes in people's lifestyles and habits, which can result in the emergence of complex social requirements and issues (Mhlanga, 2021). The government, as the entity responsible for providing services based on the requirements of the community, is adhering to the mandate of law no. 25 of 2009 regarding public services chapter III, part one, paragraphs (1) and (2), which states:

(1) “To guarantee the smooth running of public administration, a supervisor and person in charge is needed”
(2) The coach as referred to in paragraph (1) consists of
“Heads of State Institutions, Heads of Ministries, Heads of non-Ministerial Institutions, Heads of State Commission Institutions or the like, and Heads of other Institutions”.
“Governor at the provincial level”
“Regent at the district level”
“The mayor at City level” (Pratiwi et al., 2020).

The meaning of the term "person in charge" is defined in Law No. 25 of 2009 regarding public services CHAPTER III Article 7 paragraph (1), which states that “the person in charge is either the head of the secretarial institution referred to in Article 6 paragraph (2) or an official appointed by the coach”. From the above explanation of the law, it is clear that the Government is responsible for providing services that meet the needs of the community; therefore, with the advent of the fourth industrial revolution, the government has a crucial role to play in order to be able to provide technology-based services that meet the needs of the community (Herawati et al., 2022).

To effectively carry out its functions and roles in the 4.0 revolution, the government is expected to undergo a transformation in order to adapt to technological advancements, including the application of artificial intelligence technology in the field of public administration (Anshari & Almunawar, 2022). This research will examine how to implement artificial intelligence technology to solve and meet community needs through the use of technology-based applications in public services, as well as the preparedness of human resources in the application of artificial intelligence in the field of public administration.

B. LITERATURE REVIEW

1. Artificial Intelligence

Artificial Intelligence is intelligence that is made by humans and implanted in a particular machine or technology so that the machine can do a job like what humans can do. There are 4 approaches to Artificial Intelligence, namely being able to think like humans, act like humans, think rationally, and act rationally (Kaplan & Haenlein, 2020).

Based on the 4 approaches to Artificial Intelligence above, it can be classified into 2 parts, namely: an approach that is centered around humans and an approach that is centered on rational things. The human-centered approach should be an empirical science involving hypothesis and experimental confirmation. Whereas the rationalist approach involves a combination of mathematics and engineering (Ozmen Garibay et al., 2023). In today's technology, system applications that have artificial intelligence or commonly called Artificial Intelligence (AI) are widely used. So, it's no longer surprising that many people are familiar with the capabilities of this artificial intelligence system. For example, technology that has an artificial intelligence system or Artificial Intelligence which is commonly used in household appliances, including: Air conditioners, washing machines, refrigerators, and others (Briganti & Le Moine, 2020).

Artificial Intelligence has a scope based on the output provided, including:

a. Expert systems. Here the computer is used as a means of storing expert knowledge. So that computers can take advantage of this knowledge to solve problems according to the abilities of experts.
b. Natural Language Processing. Here the computer is given the ability to process human natural language, so it is hoped that the user can communicate with the computer in everyday language.
c. Speech Recognition. Here the computer is expected to be able to recognize the speech issued by the user, which is then processed to facilitate communication between the user and the computer using voice.
d. Robotics & Sensory Systems. Here computers are expected to be able to do things like humans, assisted by hardware support as agents and sensors as senses.
e. Computer Vision. Here the computer tries to be able to interpret images or objects that appear through the computer.
f. Intelligent Computer-aided Instruction. Here the computer is used to become a trainer and teacher (Jan et al., 2022).

2. Public Administration

According to Chandler and Plano, public administration is the process by which public resources and personnel are organized and coordinated in order to formulate, implement, and manage public policy decisions. In addition, Keban stated that the term Public Administration illustrates how the government acts as the sole agent of power or as a regulator, who is active and always takes the initiative in regulating or taking steps and initiatives; what they deem to be important or beneficial for society because it is assumed that people are passive, less capable, and must submit to and accept whatever is regulated by the government (Fikri et al., 2021).

Administration Theory describes attempts to define the universal functions conducted by leaders and the underlying principles that constitute effective leadership practices. Henry Fayol utilized an approach to administrative management, namely an approach from the highest level of leadership to the lowest level of leadership. Fayol made three significant contributions to administration and management: (1) organizational activities, (2) leadership functions or responsibilities, and (3) administration or management principles (Suarez-Barraza & Miguel Davila, 2021).

While Herbert Simon divides four more general administrative principles, namely:

a. Administrative efficiency can be increased through the specialization of tasks among groups.
b. Administrative efficiency is increased by group members in a definite hierarchy
c. Administrative efficiency can be increased by limiting the supervisory distance in each sector within the organization so that the number becomes small.
d. Administrative efficiency is increased by grouping work, for supervisory purposes by purpose, process, customer, and place (Dosi et al., 2021).

Furthermore, the administrative theory according to William L. Morrow is as follows:

a. Descriptive theory is a theory that describes what is real in an organization and provides postulates about the factors that drive people to behave.
b. Perspective Theory is a theory that describes changes in the direction of public policy, by exploiting the expertise of the bureaucracy. The emphasis of this theory is to renew, make corrections, and improve government processes.
c. The normative theory is a theory that questions the role of the bureaucracy. Is the role of the bureaucracy seen in policy development and political development, or is the role of the bureaucracy strengthened, expanded, or limited.
d. Assumptive theory is a theory that focuses on efforts to improve administrative practices. To achieve this goal, the assumption theory seeks to understand human nature that occurs in a bureaucratic environment.
e. Instrumental theory is a theory that intends to conceptualize ways to improve management techniques so that policy targets can be made more realistically. This theory emphasizes the tools, techniques, and opportunities to carry out predetermined values (Camargo-Henriquez & Silva, 2022).

It can be said that administration is the entire process of implementing decisions that have been taken and organized by two or more people to achieve predetermined goals.

3. Industrial Revolution 4.0

The concept of the fourth industrial revolution gave rise to the concept of Industry 4.0. Its existence provides numerous prospective benefits, particularly for 21st-century education. According to Kagermann, industry 4.0 is the incorporation of Cyber-Physical Systems (CPS) and the Internet of Things and Services (IoT and IoS) into industrial processes, such as manufacturing and logistics, among others. CPS is a technology that integrates the physical

world with the virtual world. This merger is possible through the integration of physical and computational processes (embedded processors and network technologies) within a closed loop (Saravanan et al., 2022).

The Industrial Revolution 4.0 can bring together the digital and physical worlds and offer new opportunities to collect, disseminate and use information. This has the potential to increase efficiency and drive innovation at scale within the enterprise. According to Savitri, with the emergence of the Industrial Revolution 4.0, there will be a lot of technology to help human jobs to increase production within the company and can speed up work processes, and maximize working hours (Mourtzis et al., 2022). From this explanation the Industrial Revolution 4.0 is a new revolution that has emerged, a technology-based revolution that can directly assist humans in completing their work, with the emergence of new technology it will have an impact on the world of industry, business, and human resources. It is not only the technology in the factory that will change, but the management system of a company such as technology, business, and human resource systems will also change (Ivaldi et al., 2022).

According to Savitri, industrial revolution 4.0 is the fourth industrial era since the first industrial revolution in the 18th century. The era of the industrial revolution 4.0 was marked by a combination of technologies that blurred the boundaries between the physical, digital, and biological fields, collectively referred to as cyber-physical systems (CPS). Such world developments will change the order of almost every industry, production system, management, to human resources. In this era, every company is preparing to face the industrial revolution 4.0 to be able to improve so as not to be drowned by the times (Sila & Martini, 2020).

According to other experts, the industrial revolution 4.0 is the speed of change experienced by organizations and individuals because emerging technological innovations create ways to develop, exchange and distribute value throughout society. The industrial revolution 4.0 provides space for every human being to think creatively and innovatively to develop a revolutionary era that requires quick, precise, and easy thinking (Sima et al., 2020).

According to Tjandrawinata, the fourth industrial revolution is a continuation of the third industrial revolution, also known as the digital revolution, which was characterized by the proliferation of computers and the automation of records in all disciplines. The visible evidence of the fourth Industrial Revolution are pervasive automation and connectivity. The application of artificial intelligence (AI) is one of the distinguishing features of the fourth industrial revolution. The 4th industrial revolution concludes the 3rd revolution by automating records in all disciplines through a variety of methods (Harahap & Rafika, 2020).

According to Schwab, the Industrial Revolution 4.0 emerged marked by breakthroughs in the field of technology covering broad fields such as artificial intelligence (AI), internet for everything (Internet of Things-IoT), automated vehicles, 3-dimensional (3D) printing, nanotechnology, biotechnology, materials science, energy storage, and quantum computing (Ulnicane et al., 2021). From this explanation, the development of the Industrial Revolution 4.0 will create new, sophisticated technologies that can help work within the company. With the creation of this new technology, it will help human resources in dealing with various types of work, as well as doing tasks faster. With breakthroughs and new sophistication in technology, there will be many new things that must be learned to be able to apply them to the daily life of human resources (Mahmood & Mubarik, 2020).

C. METHOD

This research is qualitative research that aims to explore an in-depth understanding of the implementation of artificial intelligence (AI) in the field of public administration during the Industrial Revolution 4.0 era. The research method used is the literature study method, in which research data comes from various sources of research results and previous studies that

are relevant to the scope of this research. The data collection process involves searching scientific literature, journals, articles, and other documents that have been published. The collected research data will then be analyzed carefully to gain a comprehensive understanding of the application of AI in public administration. Through the use of the literature study method, it is hoped that this research will be able to identify the latest trends, challenges, potential successes, and the impact of implementing AI in public administration. The results of this research are expected to provide valuable insights and recommendations for practitioners, policymakers, and academics in dealing with challenges and opportunities in the Industrial Revolution 4.0 era. Thus, this research seeks to contribute to a better understanding of the intelligent and effective use of AI technology in creating positive transformations in public administration.

D. RESULT AND DISCUSSION

1. Implementation of Artificial Intelligence in Government Administration During the Industrial Revolution 4.0

The term artificial intelligence was coined at the Dartmouth conference in 1956. Since then, artificial intelligence has continued to be developed through numerous studies that generate artificial intelligence-related theories and principles. Despite the fact that artificial intelligence became known in 1956, research and discussion of artificial intelligence theories have existed since 1944 (Zhang & Lu, 2021). Both hardware and software advancements within the field of artificial intelligence are advancing at an accelerated rate at present. It has been possible to create products that are used in daily life with the help of artificial intelligence. These products are categorized into four techniques of artificial intelligence: searching, reasoning, planning, and learning. These four strategies have been utilized in a variety of fields, including public administration.

Several public service applications in the city of Bandung serve as an example of the application of artificial intelligence in the field of public administration, with the following applications serving as examples:

a. e-SATRiA (Electronic Self Assessment Tax Reporting Apps) is a web-based tax reporting platform designed for Self Assessment Taxpayers, enabling them to submit their tax returns conveniently without the need to physically visit the local tax office. By accessing the application online, users can easily log in, report their taxes, receive a unique payment number, and finalize the process by submitting their payment electronically.
b. GAMPIL (Gadget Application Mobile for License) serves as a mobile application designed to streamline the process of obtaining licenses. As a complementary service to HAYU Bandung, it stands out as the sole mobile-based licensing application in Indonesia, offering unparalleled convenience in the licensing procedures. The core belief behind GAMPIL is that smartphones are ubiquitous, ensuring equal access to licensing services for individuals from all walks of life. With this inclusive approach, GAMPIL aims to promote fairness and accessibility in the licensing system, revolutionizing how licenses are acquired in Indonesia. At the launching of this application on 25 February 2016, the Minister of Cooperatives attended, because simultaneously with the addition of two non-licensing services for micro and small business actors in the city of Bandung to start a business by submitting a TDUM/TDUK application with four easy conditions. The four requirements include a KTP and Family Card for the City of Bandung, a Statement of doing business, and a photo of the business location. To provide services to the people who use permits to make it even easier to

get licensing services. This GAMPIL application can be used for the entire licensing application.

c. LAYAD RAWAT aims to ensure that health becomes a fundamental right accessible to all, especially vulnerable community segments, such as the impoverished, remote, and the sick. These groups often lack sufficient health services and knowledge. The program is specifically designed to address this issue by offering essential health services, including preventive, promotive, and curative care, in the assisted areas of Puskesmas in Bandung City. To enhance the effectiveness and efficiency of the program, it is supported by the online-based IMPILO application.
d. The Moovit application is a GPS-integrated system designed to help users track the real-time location of public transportation vehicles. By utilizing the GPS technology installed on these vehicles, Moovit empowers users to conveniently access accurate information about the whereabouts of the public transportation they intend to use. This user-friendly application enhances the overall travel experience by providing up-to-date and reliable data, enabling commuters to efficiently plan their journeys, minimize waiting times, and optimize their routes based on the live locations of buses, trains, or other public transit options. With Moovit, users can stay informed and make informed decisions, ensuring a more seamless and convenient public transportation experience.
e. The BIMMA application (Bandung Integrated Manpower Management Application) is a comprehensive initiative aimed at providing accessible employment information to both the public and employers (companies). Through the littlebandung.co.id website, BIMMA facilitates the guidance and development of export products, empowering local entrepreneurs and Small and Medium Enterprises (SMEs) in Bandung City. One of the primary objectives of the program is to promote and organize trade missions for SME products from Bandung City. These trade missions are strategically designed to target Bandung City entrepreneurs, enabling them to showcase their products and services to a broader audience. By participating in these missions, business actors in Bandung City can secure their spot in the Little Bandung book, a curated platform that registers and highlights the diverse range of enterprises and export products from the city.
f. SITARUNG is a cutting-edge database application developed to efficiently plan, structure, and manage the spatial use of the City of Bandung. This innovative application presents data in a spatial data/map format, offering a user-friendly interface that provides easy access to valuable information for the community, businesses, government officials, and other interested parties. By integrating comprehensive spatial data, SITARUNG serves as a powerful tool to access essential information about the city's development plans, land use regulations, infrastructure projects, and urban growth strategies. This data-driven platform empowers users to make well-informed decisions, whether they are potential investors looking to understand development opportunities, local businesses seeking strategic locations, or residents interested in urban planning initiatives.

The mentioned financial applications serve as some instances of how artificial intelligence is utilized in public administration. The government's introduction of technology-based public service applications demonstrates its commitment to enhancing public services that cater to the evolving needs of society during the Fourth Industrial Revolution.

2. The Impact of Artificial Intelligence Implementation in the Field of Public Administration

In every program's application, whether in the private or public sector, there will inevitably be both advantages and disadvantages that can influence human life positively or negatively. This includes the integration of artificial intelligence in the domain of public administration (Flechsig et al., 2022). The implementation of artificial intelligence (AI) indeed comes with several advantages and disadvantages that can significantly impact people's lives.

The following are the advantages and disadvantages of implementing artificial intelligence:

a. The benefits of artificial intelligence implementation in the field of public administration
   1). Increasing the efficiency of government operations by accelerating the bureaucratic process to save time and money.
   2). Assisting the government in meeting the requirements of the community in numerous ways, particularly in relation to the provision of public services
b. Disadvantages of artificial intelligence implementation in the sphere of public administration
   1). Decreased direct social interaction between the government (service providers) and the community (service recipients), resulting in increased social distance between the government and the community.
   2). The emergence of cybercriminals or hackers who obtain passwords and data from government websites frequently results in the criminal use of data.
   3). The exorbitant price of acquiring hardware and software Artificial Intelligence infrastructure.

While the implementation of artificial intelligence in public administration has the following effects:

a. The positive impact of artificial intelligence implementation in the field of public administration
   1). Many of the government's duties can be delegated using technological devices, resulting in an increase in government productivity.
   2). The bureaucratic process becomes more efficient because the service is an integrated one-stop service.
   3). Increased contentment with public services among the public.
b. The negative impact of Artificial Intelligence implementation in the field of public administration

   In his inaugural address, President Joko Widodo of the Republic of Indonesia stated that the government apparatus is being reduced, particularly at the echelons III and IV levels. In his speech, President Joko Widodo revealed that this streamlining was carried out to expedite the bureaucratic process, which is currently required to be completed swiftly, and to achieve this, the government will implement the use of Artificial Intelligence in administrative tasks and data processing that are typically performed manually.

   This statement by President Joko Widodo indicates that the presence of artificial intelligence in this era will alter the role of humans in a variety of sectors, including the government. This can serve as a lesson for the government and all levels of society to prepare themselves to be able to acclimate to technological developments in the era of the 4.0 industrial revolution.

3. Readiness of Government Human Resources (HR) in the Implementation of Artificial Intelligence in the Field of Public Administration

At the ASEAN level, the Indonesian government ranks fifth in its readiness for the implementation of Artificial Intelligence, while at the global level, it ranks 57th out of 194 countries with a score of 5,420. This accomplishment continues to be in the lowest tier. The low level of readiness of the Government of Indonesia to implement Artificial Intelligence is influenced by a number of factors, including the high cost of procuring infrastructure, both software and hardware, as well as the readiness of human resources in the government sector, which can be described as "technologically illiterate" In the meantime, we need human resources that can lead to digital technology mastery in order to implement artificial intelligence.

According to Abdillah, evaluating the competence of human resources skills in Indonesia is one of the most important factors in driving the industry toward digital transformation in accordance with the trend of the 4.0 industrial revolution. "Each industrial revolution requires different skill competencies, whereas the industrial revolution 4.0 requires capabilities that lead to digital technology such as artificial intelligence, cloud computing, machine learning". In addition to being required to be adaptable through the development of technical competence (technical skills), i.e. the mastery of digital mastery of human resources in the government sector, they must also possess non-technical skills (soft skills) (Berampu & Sari, 2020).

Through vocational education, training, and technical certification programs, one can acquire technical skills. In the meantime, the development of soft skills can be attained through organizational experience, bonding, professionalism at work, and discipline-specific training. According to the World Economic Forum, the soft skills that human resources must possess in order to implement artificial intelligence in the 4.0 industrial revolution are as follows:

a. Complex Problem Solving
   The ability to solve complex problems by identifying and determining the primary elements of the problem, considering a variety of possible solutions, taking action/actions to solve the problem, and searching for lessons to be learned within the context of problem-solving.
b. Critical Thinking
   The ability to think logically, cognitively, and formulate strategies that will increase the likelihood of the desired outcomes. Critical thinking is also referred to as reasoning with clear objectives, rational, and goal-oriented.
c. Creativity and Innovative
   Capacity and inclination to continue innovating, to discover something novel and advantageous to society and the environment. Creativity in this context can also be interpreted as improving something that already exists.
d. People Management and Leadership
   Capacity to organize, direct, and utilize human resources in a focused and efficient manner. Leaders who can optimize working hours by delegating, prioritizing, and attempting to simplify problems are intelligent.
e. Coordinating with Others or Teamwork
   Capacity to work in groups or with individuals outside of the group. The purpose of forming a team to solve a problem is not only so that the problem can be resolved swiftly, but also so that a corporation will be more resilient and success will be easier to attain.

f. Emotional Intelligence
Emotional intelligence is a person's capacity to manage, evaluate, embrace, and exert control over his or her own and others' emotions.
g. Judgment and Decision Making
The capacity to conclude the situation at hand and the ability to make decisions under any conditions, including when under duress.
h. Service Orientation
The desire to assist and serve others to satisfy their requirements. By having a service-oriented mindset, we will always strive to provide the finest service possible to our customers without expecting mere gratitude.
i. Negotiations and Presentations
The skill of speaking, negotiating, and persuading others to enter into agreements that produce the desired outcomes. During presentations, it's also crucial to be able to communicate creative ideas and input.
j. Cognitive Flexibility
Cognitive flexibility is the capacity to construct knowledge in a variety of ways in response to profoundly shifting situational demands.

E. CONCLUSION

Industrial revolution 4.0 is the fourth stage in the evolution of the industrial revolution. During this revolution, numerous technological advancements were discovered, including Artificial Intelligence (AI), the Internet of Things (IoT), big data, autonomous vehicles, 3D printing, nanotechnology, biotechnology, materials science, energy storage, and quantum computing. The emphasis of industrial revolution 4.0 is on automation and the integration of the physical and digital realms. Artificial intelligence, one of the byproducts of the 4.0 industrial revolution, is a technology whose development and use are already perceptible in humans' daily lives, including the implementation of digital-based public services in the realm of public administration. The implementation of artificial intelligence in the field of public administration has aided the government in managing and meeting the requirements of a technologically permeated society that has undergone numerous changes. The implementation of artificial intelligence cannot, however, be utilized by all Indonesian government agencies. This is due to a number of factors, including the high cost of providing technological infrastructure and the dearth of preparedness of human resources in the government sector, both in terms of technical and non-technical skills. The government, as the entity with the authority to manage the country, is not only responsible for providing public services that meet the needs of the community, but also for enhancing the technical and non-technical skills of human resources, particularly in the government sector.

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