Exploring the Future of Work: Impact of Automation and Artificial Intelligence on Employment

Masriadi[1], Dasmadi[2], Nurul Efri Ekaningrum[3], Muhammad Syahrul Hidayat[4], Farida Yuliaty[5]
[1]STIA Puangrimaggalatung Bone, Indonesia
[2]Universitas Slamet Riyadi, Indonesia
[3]National Research and Innovation Agency, Indonesia
[4]UIN Sayyid Ali Rahmatullah Tulungagung, Indonesia
[5]Universitas Sangga Buana, Indonesia
Email: patu.masriadi@yahoo.co.id

Abstract

The presence of Artificial Intelligence (AI) and automation of work provide a revolution in the world of work. But at the same time, this can threaten human potential in employment. This research was conducted to see the influence exerted by AI and automation on human employment. This research will be carried out using a descriptive qualitative approach. The data used in this study comes from various research results and previous studies that still discuss the use of AI and automation in the world of work. This study found that AI and automation are currently replacing many jobs. However, some bits of intelligence belonging to humans, such as intuition and empathy, is still difficult for AI to imitate. Even though the existence of AI and automation can be a threat to humans in the workforce, with the increase in human resource skills; then humans who adapt will not be replaced by machines, but there will be the integration of human-machine work, where AI and automation do not replace humans but become tools for human labor.

Keywords: *Artificial Intelligence, Automation, Work, Humans.*

A. INTRODUCTION

Significant advances in artificial intelligence (AI) and automation have occurred in the last two decades. When it comes to artificial intelligence, this technology is growing rapidly and is expected to change the way things work around the world. AI is hardware or software that is used to demonstrate intelligent human-like behavior. Developing AI aims to make computing systems capable of emulating human intelligence to perform specific tasks without human intervention (Tschang & Almirall, 2021). Even though this technology promises ease and efficiency in work, surveys in the field of human resources show that there is high anxiety from the workforce about this technological trend. They are concerned about the impact of automation on the labor market and productivity. However, some economists suggest that this technological breakthrough will create new jobs, as there is an increasing

demand for skilled workers who can operate and maintain increasingly sophisticated AI and automation systems (Kim et al., 2021).

In addition to artificial intelligence, information technology is also experiencing rapid advances that have led some to claim that the fourth industrial revolution has changed the boundaries between the physical, digital and biological fields. The development of information technology and artificial intelligence has been widely manifested in the services offered by many companies and organizations. For example, robots for household chores, health care, hotels and restaurants are increasingly replacing monotonous and repetitive human tasks (Rotatori et al., 2021). Virtual bots or chatbots are also increasingly popular among large companies to turn customer service into a self-service and help reduce the waiting time that often occurs in human customer service. In addition, big data AI applications are also used to replace the investment portfolio manager's role in making investment decisions. Social robots (social bots) are also increasingly popular with replacing part of customer service and are increasingly being used by companies to help answer common questions and provide solutions to problems faced by customers (Wirtz et al., 2021).

The development of AI and automation in replacing some of these jobs raises concerns that human work will be replaced. This is due to the increasingly sophisticated ability of AI to perform tasks that humans previously could only complete. The impact of automation and the use of AI in various sectors can reduce the number of available jobs, especially in repetitive and easily automated jobs. Experts estimate that the sophistication of AI can take jobs that require technical skills, such as programmers and data analysts, which were previously considered safe jobs from the threat of automation (Willcocks, 2020).

Through the brief explanation above, this research then aims to see how the development of AI and automation in the future will affect human employment.

B. LITERATURE REVIEW

1. Artificial Intelligence (AI)

According to Jogiyanto, AI can be defined as a machine or intelligent device (usually a computer) that can perform a task which, when a human performs the task, requires intelligence to do so. The definition of AI, according to Kusumadewi, is artificial intelligence which is a part of computer science that makes machines (computers) able to do jobs like and as well as those done by humans. According to Suparman, AI is defined as a sub-field of computer knowledge specifically intended to create software and hardware that can fully mimic some of the functions of the human brain (Nahavandi et al., 2022).

According to John McCarthy, artificial intelligence (AI) is a science and technique in creating intelligent machines, brilliant computer programs or applications. AI is a step to develop computers, robots, or applications or programs that work intelligently, just like humans (Cioffi et al., 2020).

The purpose of creating AI itself is to:

a. Creating an expert system, namely a system that can perform intelligent behavior, learn, demonstrate, explain, and advise users.
b. To implement human intelligence into machines, create a system that can understand, think, learn, and behave like humans (Confalonieri et al., 2021).

Things that contribute to AI include Computer Science, Biology, Psychology, Language, Mathematics, and Engineering. One of the significant steps in creating computers related to artificial intelligence is to think logically, learn, and solve problems. Techniques used by AI in solving problems by organizing information and knowledge so that users can easily access and understand it can be easily modified to correct errors and be helpful in various situations even though it is still not perfect or accurate (Nozari & Sadeghi, 2021).

It can be concluded from the several paragraphs above that artificial intelligence is a method for making a computer capable of intelligence and the ability to think like humans in finding solutions to a problem and dividing these thought processes into essential steps in solving a problem (Hoffmann, 2022).

2. Automation

Automation (in Greek means self-study), robotization or industrial automation or numerical control is the use of control systems such as computers to control industrial machines and process controls to replace human operators. Industrialization itself is a stage in the implementation of mechanization, where humans carry out the concept of permanent mechanization of industrial machines as operators by placing machines as assistants following physical work demands, which is a massive decrease in human needs as sensors as well as concerns work mentality (Paśko et al., 2022).

Definition of Automation Automation is a technology that combines the application of mechanics, electronics and computer-based systems through processes or procedures that are usually arranged according to an instruction program and combined with automatic control (feedback) to ensure whether all instructions have been carried out correctly, thereby increasing productivity, efficiency and flexibility. The word automation was first used by Fords in Detroit. This term is used to describe mechanical devices and machine tools so that they become a continuous production line (Wang et al., 2022).

Santoso argues that automation is a process to automatically control a tool's operation, which can replace humans' role in observing and making decisions. The existing control system is starting to shift to control system automation, so human intervention in controlling is very small (Santoso et al., 2020). An equipment system that is controlled automatically is very convenient compared to a manual system because it is more efficient, safe and thorough. Then Ghifari argued that automation is a field of science requiring its users to change manual machines to automatic ones so that automation can simplify existing life processes (Mehmood et al., 2020).

It can be concluded that automation is one of the realizations of technological developments and is an alternative to obtaining a working system that is fast, accurate, effective and efficient so that more optimal results are obtained (Freddy et al., 2022).

3. Employment

The classical view holds that humans are the most influential factor in determining the success of nations. The reason for this is that nature (land) is useless if no human resources are capable of digesting it in a way that is advantageous to life. In this instance, Adam Smith's classical theory also recognizes that the efficient use of human resources is the impetus for economic expansion. After the economy grows, additional (physical) capital accumulation is required to maintain economic growth. In other words, the successful allocation of human resources is a prerequisite for economic progress (Javanmardi et al., 2023).

After Adam Smith, Thomas Robert Malthus is regarded as a classical thinker who contributed greatly to the development of economic concepts. The most well-known book by Malthus is Principles of Population. Although Malthus was one of Adam Smith's followers, it is evident from the book that not all of his ideas were consistent with Smith's. On the one hand, Smith is optimistic that the division of labor and specialization will always have a favorable effect on human wellbeing. Malthus, though, was pessimistic about the future of humanity (Blanco, 2020). The fact that land is one of the primary production elements is quantifiable. In many instances, the area of land available for agriculture has diminished due to the construction of dwellings, factories, and other buildings, as well as roads. According to Malthus, the human population grew considerably faster than agricultural productivity to meet human requirements. Malthus did not believe that technology could expand faster than the population, hence he believed that population control was necessary. Malthus describes this as a moral restriction (Zhou et al., 2021).

According to the classics, an economy founded on the strength of the market mechanism will always achieve equilibrium. In a balanced posture, all resources, including labor, will be utilized to capacity. So, under a system based on market dynamics, unemployment does not exist. If no one is employed, they are willing to work for a lower wage rather than receive no income. This willingness to accept a lesser income will encourage employers to hire more of these individuals (Kretschmer et al., 2022).

One of John Maynard Keynes's criticisms of the classical system was that there was no automatic adjustment mechanism that ensured the economy would achieve equilibrium at full employment. In actuality, the labor market does not function in accordance with the above classical conception. Everywhere workers have a labor union, wage rates will be lowered in an effort to protect workers' interests (Dimand, 2020). Even if the wage rate is lowered, the people's income level may fall. A fall in the income of some members of society will lead to a decline in people's purchasing power, which will result in a decline in the level of consumption as a whole. The

decreased purchasing power of the populace will lead to a decline in prices (Chen et al., 2022).

Employers utilize the marginal value of the labor productivity curve as a benchmark for employing workers; if prices fall, this value will decrease. If the price reduction is negligible, then the productivity-value curve will only decline little. Yet, the number of additional workers is still less than the number of available workers. Worst yet, if prices plummet, the marginal productivity value curve of labor plummets as well, reducing the number of workers who can be accommodated and causing widespread unemployment (Petrosky-Nadeau & Zhang, 2021).

C. METHOD

This research will be carried out using a qualitative approach. Research data will be analyzed using descriptive methods. The data used in this research comes from mixed results of previous studies and studies that still have relevance to the content of this research. After the research data has been collected, these data will be processed immediately so that the results of this research can be found (Sari et al., 2022).

D. RESULT AND DISCUSSION

1. Human Intelligence in AI

There are four types of human intelligence, namely mechanical intelligence, analytical intelligence, intuitive intelligence and emphatic intelligence, that are needed by the workforce when doing the kinds of work in service companies imitated by artificial intelligence/AI.

The first is mechanical intelligence. Mechanical intelligence refers to the capacity to do repetitive or routine operations automatically. Mechanical operations do not demand much innovation from personnel since they have been performed so frequently that they may be completed with little or no high-level reasoning (Spring et al., 2022). Typically, the workforce in machine intelligence consists of unskilled labor that requires no additional training or education. Contact center agents in telecommunications, transportation, and banking service organizations, as well as waitresses, are essentially mechanically skilled occupations. To imitate human-like automation, the mechanical AI employed by service organizations is programmed with limited learning and adaptability skills to preserve consistency. Robots are among the most common applications of artificial intelligence. Service robots are technologies that can execute physical tasks, operate independently without instructions, and are controlled by computers without human intervention. Robots detect and respond to physical and temporal variation in the service environment based on a priori knowledge and continuous sensor perception. Robots do not comprehend the world, and not all robots can automatically adapt, although mechanical AI has relative consistency benefits over humans (for example, being free from human fatigue and responding to the environment in a very reliable way).

The second is analytical intelligence. Analytical intelligence is the ability to process information to solve problems involving information processing, logical

reasoning and mathematical skills. Human analytical intelligence comes from training, expertise, and cognitive specialization, commonly demonstrated by workers in the service sector, such as data scientists, accountants, and financial analysts (Ponomareva, 2021). Machine learning and data analytics are AI-based tools and mechanics that replace human analytical intelligence. Its ability to carry out complex tasks systematically, consistently and predictable manner is widely used in companies with data and information-intensive characteristics. In the world of work, this systematic characteristic makes it easy for marketing departments to carry out mass personalization based on big customer data.

Third, is intuitive intelligence. Intuitive intelligence is thinking creatively and adapting effectively to new situations. This type of intelligence is known as wisdom based on holistic thinking and experience based (Hallo & Nguyen, 2022). Intuitive intelligence requires insight and creative problem-solving; for example, marketing managers, management consultants, lawyers, doctors, sales managers, and senior travel agents are some jobs in the service sector requiring intuitive intelligence. In AI, intuitive intelligence is one of the human bits of intelligence that is still being refined to be imitated because the role of self-awareness, unique feelings and experiences dominates the role in creating instincts that drive intuitive intelligence. In the world of work, the type of work that involves complex, creative, holistic, contextual and experience-based tasks is usually done in the CRM or investment management department, which already uses AI-based chatbots and trading software such as Tech Trader.

Fourth is empathetic intelligence. Empathic intelligence is the ability to recognize and understand the emotions of others, respond appropriately emotionally, and influence the emotions of others, which includes interpersonal, social, and people skills that help humans to be sensitive to the feelings of others and work well with others (van Kleef & Côté, 2022). Empathic intelligence is needed in jobs that require social skills (communication, interaction and relationships), experience in understanding customer emotions, and providing solutions to their problems, such as negotiators, psychiatrists, psychologists and consultants. This intelligence is not easily broken down into elements and binary computational processes due to the limitations of AI to be empathetic towards human emotions, so this emphatic AI becomes the most advanced generation of AI technology today, such as Replica and Sophia bots which resemble and act like humans.

2. Stages of Job Replacement by Artificial Intelligence

At the initial phase, mechanical AI replaces standard, recurring service jobs (mechanics) with cost-effectiveness and consistency advantages. Thus, AI is beginning to replace regular tasks on a wide scale at this time. Sawhney remarked that despite the fact that production has replaced monotonous manual activities, the most skilled individuals have maintained their positions. So, in order to advance into positions requiring greater intelligence/skills, workers must enhance their skills.

In the second stage, AI replaces analytical intelligence is the comparative advantage of human workers. At this stage, AI replaces both mechanical and analytical work. In this stage, AI replaces human intelligence in completing routine work and can assist in making decisions with analytical intelligence.

In stage 3, AI begins to replace mechanical, analytical and intuitive work, where AI not only replaces routine work and performs data analysis for decision-making but also makes decisions that are adaptive to the environment and based on interactions with users. Furthermore, intuitive intelligence recorded in workers' brains (humans) is widely used to complete work or make decisions requiring reconnection with previous experiences, which is not always documented in big data. Big data records limited customer information from microchips, software and sensors integrated into AI devices. So then, the development of high-level AI is directed to be more intuitive by recording various languages and expressions of customers to compile inquiries that will help to provide solutions according to customer needs.

In the fourth stage, AI replaces mechanical, analytical and empathic work. For instance, sympathetic AI systems can give emotional insights for user experience and engagement to help the work of back-end engineers. Affectiva, for instance, measures and analyzes human expressions and classifies them into emotions (sadness, happiness, anxiety, and delight), which is used to monitor what clients are saying and how they are feeling. So that staff can know the appropriate answer or the business can give the appropriate service at the appropriate moment.

The last (fifth) stage is AI which completely replaces human work because it replicates all types of intelligence. This AI implementation can take the form of machines serving humans, with AI performing tasks/work that humans don't want to do so that humans can choose the tasks/jobs they want to retain and have a higher quality of life. Humans who are physically or biologically integrated with AI-based machines provide a second method of implementation. Internet of brains (the use of the human brain to govern internet use) illustrates the connection between the human brain and the Internet of Things (IoT) networked with AI. These scenarios emulate AI connectivity for collective intelligence that greatly accelerate learning in service enterprise environments.

3. Replacement of Human Intelligence by AI

Automation and artificial intelligence (AI) are altering industries and will contribute to economic growth via productivity gains. Concurrently, these technologies will alter the character of employment and the nature of the workplace itself. This technology has added value to a wide range of products and services, and service-sector businesses utilize it in a variety of ways to personalize product suggestions, detect manufacturing abnormalities, identify fraudulent transactions, and more. Techniques addressing categorization, estimation, and grouping issues are among the most recent AI improvements that are advancing. The development of AI in replacing human work has reached its third stage, which means that AI can replicate mechanical, analytical and intuitive intelligence. The jobs replaced include

health services (robots for checking blood samples, delivering food and medicine for Covid-19 patients); AI-based financial software services for data selection of prospective debtors and assessment of investment portfolios; customer service and ticket booking in tourism and hospitality.

The limitations of AI are partly technical, such as the need for massive training data and the difficulty of generalizing algorithms across multiple types of services that require intuitive and empathetic decision-making. Another challenge in implementing AI concerns the ability of organizations to adopt AI technology, including aspects of human data sources, availability of big data, hardware and software. The financial, healthcare and telecommunications sectors are leading the adoption of AI due to their predictable and structured environmental characteristics, easily accessible data collection and data processing. Other factors include implementation costs, labor market dynamics, quantity, quality, wages related to labor supply, corporate culture and social acceptance. As a result, AI systems are increasingly incorporating partial automation as machines supplement human labor. For instance, an AI algorithm that can accurately interpret diagnostic scans can assist physicians in diagnosing patient instances and identifying appropriate treatments. Job replacement AI is causing a shift in the demand for stage 4 jobs requiring analytical, intuitive, and empathic intelligence with activities that are difficult to automate, such as managers, healthcare professionals, technologists, and jobs in unpredictable physical environments, such as residential plumbing services. Workflows and workspaces will continue to adapt as a result of the incorporation of AI in the workplace (stage 5), allowing humans and robots to work together. Before self-checkout machines were introduced in retail, for instance, cashiers were allowed to assist with the checkout process if the equipment failed.

4. Job Replacement AI In Employment

Viewed from the aspect of human intelligence, AI technology has reached level 3 of job replacement, where AI can replace mechanical, analytical and intuitive work. Routine and repetitive mechanical tasks, such as using telephone voice recognition to automate service delivery, utilizing process technology to streamline service processes, and providing consistent services, as pepper, a humanoid robot with facial recognition capabilities, are examples of autonomous AI used in industries that rely on customer service interactions, such as hotels, cruise ships, and airports. Workers in service firms, for whom the analytical role is being replaced, can secure their jobs with intuitive skills. For example, front-end developer services that develop displays or applications through HTML, CSS and Javascript involve analytical skills that AI can replace, but more complex services to ensure sites and applications can continue to work well, for example, back-end developers need more intuitive intelligence (stage 3). Another example is in hospitals, where neural network image recognition by AI can replace the work of dermatologists in classifying skin cancer and the type of treatment with mechanical-analytical intelligence. Meanwhile, an example of intuitive intelligence is a hotel in the United States that launched a customer application that

can be used to open hotel doors and personalize entertainment and room service services. Another example is a chatbot in e-commerce which is built in with a buyer-seller messaging feature supported by an extensive database, not limited to serving customers and sellers but also answering customer questions (with a response duration of under 30 minutes for 24 hours). Likewise, using AI in investment management companies can provide recommendations for trading decisions based on historical data, trends and decisions to produce the right trading or investment decisions.

As for empathic intelligence, several studies state that its development stage is still early and requires further refinement. For example, Xiao and Ding's research says that artificial empathy requires a model-based approach to infer consumers' internal states (cognitive, affective, physical) based on information (audio, video, or other abundant formats). An example is the use of AI with face-mapping to conclude consumer reactions and recommend them for companies to determine interesting things to include in advertisements to attract more consumers and revenue; or an experimental technology for medical services that connect the brains of paralyzed people to mechanical devices with implants or brain monitors to help them write and move, using only their minds. From this previous research, it can be analyzed that AI can be more effective in increasing company productivity and performance if applied from the task level, not just from the job level. This is to give the company time to prepare for the automation transition period, which is more cost-effective and less detrimental to employees by rationalizing the workforce. For example, companies may consider implementing AI based on the following:

a. The nature of the task. Tasks that require lower intelligence can be replaced by AI first. The more tasks that can be replaced by AI, the less unskilled labor.
b. Nature of service. In the short term, transactional services that are routine, repetitive, and have homogeneous consumer preferences will be more effectively replaced by AI technology, while relational services still require a more intuitive and empathetic human workforce. Services that demand human interaction are difficult to replace with AI.
c. The company's strategic emphasis (strategic emphasis of firms). Given that AI applications tend to be driven by considerations of lower operational costs in the long term, companies that implement a cost leadership strategy will use AI, while companies that use a quality leadership resources strategy focus on increasing human capital capabilities so AI does not replace them.

So that the managerial implication for the service industry is the need for workflow design and workspace design to adapt to the AI era. This is an opportunity and a challenge to create a culture, standard operation procedure (SOP), integrative work environment, and AI optimization training for types of work safely and productively. Company organizations are expected to change as work becomes more collaborative and requires non-hierarchical decision-making. The use of company data must always consider the security of company data and consumer privacy. In implementing AI, service companies can start by increasing the connectivity of human

resources with collective intelligence, namely the ability of people within the company to share knowledge, think and act in harmony and coordinate with each other to achieve company goals.

5. Adaptation of Work Skills in the Age of Artificial Intelligence

Workers must equip themselves with the right skills according to industry needs and understand what intelligence companies need to implement job replacement AI. Several studies suggest that service companies should provide business analytics training in decision-making and focus on developing analytical skills by optimizing AI-based machine learning. The development of analytical decision-making skills should emphasize creative thinking, intuition and empathy in interpreting data.

This research supports the underlying theory and applications in dynamic individual and organizational development approaches. The two 'dynamic' approaches demonstrate critical skills for employees in staying in the company and growing. The first is dynamic capability, which offers a methodology for organizations to measure change and how their employees adapt to changing and complex challenges; and the second is career dynamism, which provides a career development model that enables employees to develop adaptive qualities to career uncertainties. So that the managerial implication is service companies need to have adaptive skills that will allow them to integrate, build, and reconfigure internal and external competencies to cope with rapidly changing environments. Skills such as career resilience enable people to be adaptive and proactive, demonstrating abilities such as independence and motivation to learn and a positive self-concept. Career dynamism highlights essential qualities such as human skills in creativity, openness, and the ability to build positive relationships that machines/robots tend to be irreplaceable. In collaboration with universities, companies can also organize special skills training programs such as emotional intelligence, creativity, and communication in STEM (Science, Technology, Engineering, and Mathematics) education so that it is hoped that universities can produce graduates who understand the opportunities and challenges of automation.

E. CONCLUSION

Various jobs that usually rely on human labor have begun to be replaced by machines/robots, for example, in telecommunications, banking, and even health. However, not all activities and types of work in the service industry can be replaced by AI and automation because human intelligence's intuitive and empathetic characteristics still require improvement to be emulated by artificial intelligence-based applications. This intuitive and empathic intelligence is heavily influenced by the unique ability of humans to adapt to their environment. This AI job replacement theory is anticipated to provide a road map for how AI takes over activities requiring varied intellect, how AI can and should be used to do service tasks, and how employees can and should modify their abilities to achieve the integration of human

and machine labor. Innovative human-machine service delivery is made possible by the progress of AI across all four intelligence components. Although the technical viability of automation is crucial, it is not the sole element influencing its pace and rate of adoption. Other elements, such as the costs of designing and deploying automation solutions for the particular workplace, usage, labor market dynamics (including the quality and quantity of workers and associated wages), business culture, and workforce preparation, play a key influence.

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