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# Artificial Intelligence Capability in Education to Enhance Human Resources Quality from Economic Perspective

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## Abstract

Application of artificial intelligence (AI) in education contributes significantly to improving the quality of human resources (HR). This study aims to analyze the relationship between AI technology and HR quality from an economic perspective. Using a qualitative approach based on literature studies, this study explores the contribution of AI in supporting interactive learning, operational efficiency, and improving critical skills. The results show that AI accelerates the learning process, personalizes learning experiences, and prepares students to face the challenges of the digital job market. At the company level, AI implementation improves productivity, efficiency, and data-driven decision-making. This study recommends the development of a curriculum that supports technological literacy and collaboration between educational institutions, the government, and the private sector to ensure HR readiness to face the demands of the digital era. Practical implications include sustainable training strategies and AI integration to support adaptive digital transformation. This study emphasizes the importance of investing in education and training to optimize technological potential, improve business performance, and support sustainable economic growth.

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## 1. Introduction

Development of technology is a significant boost to various aspects of life in the modern era. The presence of technology reflects the development of science and the creation of innovation. Not only can it be seen in absolute terms, but technology can also be used to improve productivity and human performance in various activities (Al-Mursyid, 2019). Several forms of technology are applied and implemented to encourage production, marketing, and product distribution activities. However, technology does not only benefit one sector but is universal and adaptive, allowing it to be used in various sectors. One of the sectors in question is the education sector; technology has the capability to collect large amounts of information, known as big data (Hasibuan & Nasution, 2023). This function allows technology to access information faster; with this function, technology is considered capable of improving the quality of education.

Education is an essential factor that plays a significant role in creating quality human resources. Abilities such as creativity, innovation, and the capacity to diffuse various knowledge require a process, and education becomes a medium to create these abilities and skills (Sanga & Wangdra, 2023). Education traditionally has a mechanism that creates various obstacles, especially in the context of accessibility; many remote areas do not have physical schools or infrastructure that support online education. The presence of technology reduces some of the obstacles in question, one of which is normalizing online education, which increases the flexibility of education. This method allows more levels of society to obtain education. However, remote areas still experience problems caused by lack of accessibility and connectivity (Nurharirah & Effane, 2022). This problem is created because of the lack of facilities that support direct education in the classroom, and it is yet to be possible to implement online education with the poor digital infrastructure in the area.

Maximizing educational activities can also be supported by various types of technology; one form is artificial intelligence, or AI. Implementing AI in education brings many changes in helping teachers and improving students' learning experiences (Kholifaturohmah et al., 2022). The diverse functions of AI can help teachers improve the quality of learning through interactive learning media and the development of learning methods designed by AI. Meanwhile, for students, the presence of AI gives them the capability to learn faster, both by speeding up the summary of the material and by explaining in simple terms how to solve various problems. Research by Agit and Muharram (2023) provides an overview of the contribution of AI to the learning process. AI is considered to help students with learning activities, especially by arranging schedules and storing various materials students receive. However, the convenience created by technology reduces students' interactive experience in the learning process, which should be more effective if teachers can maximize the function of AI. Meanwhile, research by Mujahidin et al. (2024) explains that learning using technology significantly impacts students' ability to absorb learning. Interactive learning media created with the help of AI are essential elements that significantly improve students' learning abilities.

The critical role of AI in education is just one of the many contributions that have led to improving the quality of human resources. Human resources can be developed through many things besides education; they can also be developed through training in workshops, seminars, and other activities (Zakaria et al., 2023). Improving the ability and quality of human resources can also be honed through experience. Technological developments affect several types of jobs that will sooner or later require the implementation of technology (Susanto, 2023). This condition encourages workers in specific sectors to adapt through repeated experiences in using technology, encouraging the creation of natural skills that can be taught to colleagues or their closest relatives. Technology also creates easy access to knowledge, such as digital books, learning videos, and practical videos that allow anyone to learn from anywhere.

### **1.1 Literature Review**

The rapid advancement of technology, particularly artificial intelligence, has redefined the landscape of education and human resource development. Agit et al. (2023) highlight how technology improves the quality of learning in education by enabling effective absorption of materials, which translates into enhanced human resources. This connection between technology and human resource development is further supported by Abbas et al. (2022), who argue that technological innovation in the workplace significantly boosts human resource performance. The incorporation of AI in education leads to improved cognitive abilities and practical skills, laying a foundation for enhanced productivity and innovation in professional environments.

Human resources' quality is a vital determinant of business performance. According to Prastiwi et al. (2022), the ability to adapt to technological changes, critical thinking in problem-solving, and creativity are essential attributes for modern workplaces. Companies invest in training and development programs to cultivate these attributes, recognizing their long-term benefits. Budiani and Asyik (2021) emphasize that skilled human resources contribute to high productivity, which reflects in improved sales performance, operational efficiency, and overall organizational effectiveness.

The interplay between technology, human resources, and business performance is well-documented. Research by Indriani (2021) and Nur et al. (2020) underscores the role of skilled human resources in driving productivity and maintaining competitive advantages. Skilled employees foster innovation and adaptability, critical for navigating rapid market changes. Atika and Mafra (2021) extend this argument by highlighting the collaborative and dynamic work environments created by technologically adept human resources.

The role of technology in enhancing company performance is further corroborated by Sibuea and Sriyanto (2023), who discuss how work computerization accelerates tasks, reduces errors, and boosts efficiency. Similarly, Iskandar and Jayanto (2022) show that technology reduces production costs, improves time management, and enhances product development. The synergy between education, training, and technology is evident in Haeranah et al.'s (2024) research, which reveals that integrating technology through educational initiatives directly impacts organizational performance.

In conclusion, the reviewed literature collectively illustrates the transformative potential of artificial intelligence in education and its cascading effects on human resource development and economic productivity. This study builds upon these findings by exploring AI's contributions to enhancing human resource quality, ultimately leading to improved business performance and economic growth.

## 2. Research Methods

This study applies to a qualitative approach; with the type of literature study research, this study aims to analyze the relationship between technology and the quality of human resources that specifically lead to artificial intelligence. In addition, the approach chosen is considered in line with the objectives of this study, which is to analyze and explain the relationship. The data used in this study are research articles and review articles rich in relevant information. Thus, the selection of data sources is carried out by applying criteria that require the selected articles to meet the following criteria: (1) Articles are research articles or review articles; (2) Articles published in the last ten years; (3) Articles through Peer-Review; and (4) Articles discussing artificial intelligence and the quality of human resources. To ensure the relevance of the articles we used the following keywords: (1) Artificial Intelligence; (2) HR Quality; (3) Performance; and (4) Technology. The description of the method and flow of this research can be seen in the following image:

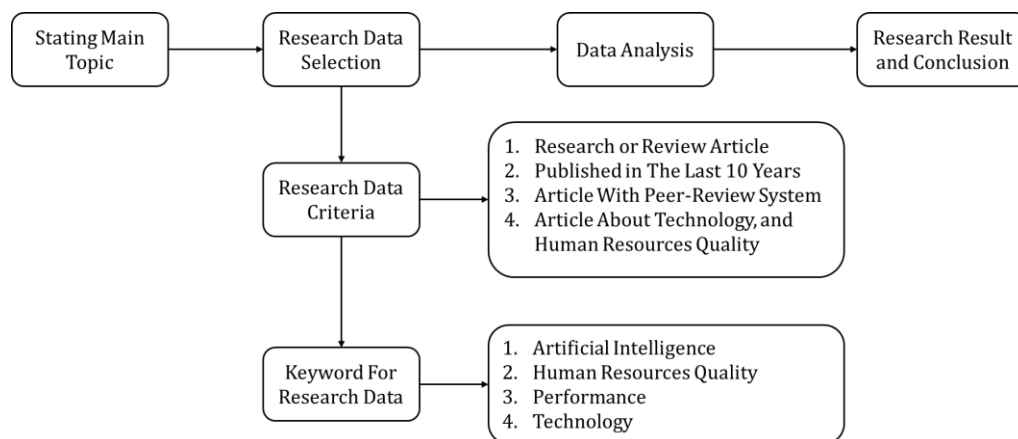


Fig 1. Research Conceptual Framework

Data analysis in this study was carried out by applying deductive reasoning; the analysis method used was considered appropriate to the objectives to be achieved in this study, namely to analyze in depth the relationship between artificial intelligence and the quality of human resources and their impact on the economy. The analysis method used was also considered appropriate for extracting relevant and important information with the diversity of information created from the many articles that became data in this study. The data obtained was then used to formulate research results, detect potential implications, and provide future suggestions and developments for similar research.

### 3. Result and Discussion

After conducting this research, results were found that showed the important role of technology on human resources, in the research, it was clarified that technology in the form of artificial intelligence has a significant impact on human resources in terms of performance. Technology supports improving human resource performance in companies and businesses; good human resource performance is obtained through technological assistance that facilitates various operational activities in business; several other benefits are effectiveness, efficiency, and reduced operational costs. To clarify the results of this study, the relationship between technology and human resources is described in the following table.

Table 1. Technology and Human Resources

Researcher	Research Result	Research Implication
Nawaz et.al (2024)	Artificial intelligence can increase accuracy, automate processes, and strengthen data analysis capacity, saving time and money.	Companies need to develop technology implementation strategies and employee education to maximize the use of technology.
Shahzad et.al (2023)	AI adoption can be achieved by increasing technology awareness, leading to innovation and positive contributions to business.	The availability of employee training and engagement is key to achieving innovation and risk management that maximizes business performance.
Ali & Kallach (2024)	Artificial intelligence drives the transformation of HR performance in terms of administration into strategy, performance becomes efficient, and HR can improve its quality through technology.	Policies supporting technology implementation in business encourage maximum HR performance, which can be achieved through education and training.
Gao (2024)	Adapting to changes in organizational structure and job demands in the digital era allows companies to remain competitive if they are able to meet these demands.	Companies must continuously invest in training and education to develop employee skills, especially in this competitive era.
Guggemos (2024)	Collaboration between the use of artificial intelligence and competent human resources is a more effective force than just strengthening one aspect, such as only developing technology or human resources.	A deep understanding of how artificial intelligence works is gained through education and training, so companies need to maximize both of these factors.
Jatoba et.al (2019)	The application of artificial intelligence, in addition to maximizing HR management, also has an impact on company performance, which is maximized with a fast and accurate decision-making process.	There is a need for further study of the factors that may influence the contribution of technology to companies in the future.
Votto et.al (2021)	AI helps employees with in-depth data analysis and responsive assistance that drives performance improvements, leading to higher productivity and profitability.	Companies need to make efforts to find out the maximum potential of AI that can support the company's strategic goals.
Murugesan et.al (2023)	Company performance is supported by AI capabilities to drive business adaptability to increasingly rapid and competitive market changes.	Maximizing the use of AI results in significant efficiency and effectiveness for company performance, especially in the era of Industry 4.0.
Li et.al (2023)	Company performance is achieved through automation, skills development, and increasing the company's competitive	Technology integration is an important aspect needed to maximize human

<b>Researcher</b>	<b>Research Result</b>	<b>Research Implication</b>
	advantage, all of which are aided by the presence of artificial intelligence.	resource performance as part of a strategy.
Bankins et.al (2024)	Company performance can be maximized by AI, an AI system that can help HR in various jobs and reduce HR stress, allowing them to do more tasks than before using AI.	Enterprises need to support this transition with various efforts so that companies can fully utilize AI in various operational activities that can lead to improved performance.

Sources: Empirical Research (2024)

Based on the research results that can be seen in Table 1, it is known that artificial intelligence has become an innovation that many companies have widely used; artificial intelligence has much potential that can be utilized optimally by companies, businesses, and organizations. The capability to maximize the function of artificial intelligence is, of course, supported by various aspects in each company; natural resources are one of the factors that can support the digital transformation transition process. Many processes can be made more efficient and effective by the presence of artificial intelligence; this increases the company's performance in general and the individual performance of human resources in the company. The advantages created by maximizing the use of artificial intelligence in the company are the ability to automate several operational processes, analyze large amounts of data, and make more accurate decisions. The reflection obtained from the accumulation of this information is a picture that shows the capability of technology to maximize the performance of companies that require assistance and collaboration from human resources to be able to achieve their maximum potential, indicating that artificial intelligence can be used for various operational activities, but with human assistance, technology can achieve its maximum potential.

It is further explained that in order to fully utilize and gain maximum benefits from the use of technology, human resources in a company require qualified skills and abilities; thus, the company must provide or facilitate its human resources to participate in various educational activities and training that can improve their ability to use technology, especially artificial intelligence which is considered more straightforward to use with its more straightforward system but more effective with its capability to interpret commands like humans. In addition, the desire of companies or businesses to improve performance is also needed so that they have optimism to apply artificial intelligence or other technologies in their business. In a larger context, policies that can support the provision of digital infrastructure can also help various types of businesses maximize the use of technology and digital transformation, as well as help human resources easily access various materials or media that help them to learn autodidactically. Furthermore, the relationship that explains how artificial intelligence has had a significant impact on the education sector and significantly contributed to the creation of quality human resources, this relationship can be seen in the following table.

*Table 2. Technology and Education Enhancement*

<b>Researcher</b>	<b>Research Result</b>	<b>Research Implication</b>
Islam et.al (2024)	Technology increases learning effectiveness and facilitates access to information, which prepares students with adequate skills to compete in the job market.	Integrating AI technology in education requires adjusting the curriculum and teacher skills to maximize its goal of creating skilled human resources.
Benvenuti et.al (2024)	Many learning processes are enhanced by integrating technology, including problem-solving problems, thinking critically, and creativity, demonstrating skills in high demand in the workplace.	Maximizing technology's application in education can improve students' academic and practical abilities, preparing them for a competitive world of work.

<b>Researcher</b>	<b>Research Result</b>	<b>Research Implication</b>
Giwa & Ngepah (2024)	Technology drives changes in the need for human resources in various companies but simultaneously opens up space for developing and creating skilled and expert human resources.	Technology integration in education is necessary to prepare a skilled and adaptive workforce, which can be achieved by developing an applied curriculum.
Guan et.al (2020)	Improving the quality of learning encourages improving the quality of human resources as an output of effective technology integration in the education sector.	Technology increases the effectiveness of learning and enables the development of human resources through a more adaptive and responsive approach to industry needs in the modern era.
Colther & Doussoulin (2024)	Integration of artificial intelligence in education can improve the quality of human resources by accelerating learning and personalizing learning experiences.	The need for curriculum development that utilizes technology and training for educators to create an interactive learning environment.
Chiu et.al (2023)	AI can support learning, teaching, assessment, and administration processes by providing more personalized feedback and increasing interactivity in digital environments.	Development of new pedagogical frameworks and training for teachers to effectively utilize AI to create inclusive and adaptive education.
Vecchiarini & Somia (2023)	Artificial intelligence helps students be more creative and accelerates the learning process to be more responsive, ultimately leading to better HR skills after graduation.	Education that utilizes technology creates an interactive learning environment that effectively prepares graduates to face the world of work better.
Stolpe & Hallstrom (2024)	AI literacy in technology education can improve the quality of human resources by preparing students to understand and use technology critically and ethically.	There is a need to integrate AI literacy into the education curriculum so that students can use technology and understand its impact on their lives.
Tzirides et.al (2024)	The ability to critically evaluate and use artificial intelligence strengthens understanding technology and its impact on life.	Education that utilizes technology, such as AI, can create human resources that are more competent and ready to face challenges in the digital era.
Sanusi et.al (2024)	AI integration in education can improve the quality of human resources through collaboration and the development of relevant curricula.	The need for collaboration between educational institutions, government, and the private sector to develop effective training programs, provide adequate resources, and design relevant curricula.

Sources: Empirical Research (2024)

Based on the research results in Table 2, it can be concluded that technology, especially artificial intelligence (AI), has significantly contributed to improving the effectiveness of learning and accessibility of information in education. These studies show that the integration of technology in education not only improves the teaching and learning process through the personalization of learning experiences but also hones critical skills such as problem-solving, creativity, and critical thinking skills that are highly needed in the world of work. Technology enables students to learn more responsively and adaptively to changing industry needs while helping to accelerate the learning process and develop practical skills. Thus, technology plays a vital role in creating better quality education and preparing students to face the challenges of the global job market.

The implications of these studies emphasize the urgency of integrating technology into education to create better-quality human resources systematically. To achieve this goal, there needs to be a curriculum

development that utilizes technology and training for educators to create interactive and inclusive learning environments. Research shows that collaboration between educational institutions, the government, and the private sector is essential to designing relevant training programs and providing adequate resources. Integrating AI literacy into the curriculum is also essential to ensure students are skilled in using technology and understand its impact on their lives. Thus, applying technology in education is critical to producing a skilled, adaptive workforce ready to face the demands of the ever-evolving digital world.

#### 4. Conclusions

This study shows that applying technology, especially artificial intelligence (AI), significantly improves the quality of human resources (HR) and company performance. This study emphasizes that companies must invest in employee education and training to maximize the benefits of technology. Thus, skilled and trained HR can utilize technology optimally, increasing efficiency, effectiveness, and fast and accurate decision-making in business operations. Meanwhile, potential implications of this study include:

- a. Education Policy Development: Educational institutions must integrate curricula focusing on technological literacy and artificial intelligence to prepare students for the increasingly digital job market demands.
- b. Technology Implementation Strategy: Companies must formulate a clear strategy for implementing AI technology, including ongoing training programs for employees so that they can adapt to technological changes.
- c. Improved Business Performance: By leveraging AI and improving the quality of human resources, companies can achieve better performance, contributing to overall productivity and economic growth.
- d. Further Research: Further research is needed to explore the factors that influence the contribution of technology to future firm performance, as well as to understand better the interactions between technology, HR, and education.

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