

AI as a Driver of Skills Transformation in Preparing an Adaptive and Superior Future Workforce.

¹**Muhamad Ilham** (Universitas Islam Negeri Kiai Haji Achmad Siddiq Jember, Indonesia)
E-mail: ilhamsagiri3@gmail.com

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ABSTRACT

The rapid development of artificial intelligence (AI) has transformed the world of work by demanding the adaptation of workforce skills to be more adaptable and superior. However, the readiness of human resources and coordination between stakeholders in dealing with these changes is not optimal, while measuring the impact of AI on skills transformation still requires complex analytical methods. This study aims to examine the relationship between human resource readiness, coordination, and collaboration between stakeholders, and the influence of AI in the transformation of workforce skills in Indonesia, using a parallel mediation analysis model with human resource readiness and stakeholder coordination as mediators. The quantitative method was applied with the Partial Least Squares Structural Equation Modeling (PLS-SEM) technique to understand the direct and indirect influences between variables. Data were collected from 70 respondents representing various industries in Indonesia using purposive sampling representing various industries in Indonesia. Data collection was carried out using a structured questionnaire that ensured the accuracy and representativeness of the samples. The results show that the readiness of human resources and the quality of coordination between stakeholders significantly mediate the role of AI in improving the transformation of workforce skills. The mediation results indicate that human resource readiness and stakeholder coordination partially mediate the effect of AI adoption on workforce skills transformation in maximizing the positive impact of AI. The study's conclusions confirm that AI-based skills transformation cannot run effectively without increasing human resource readiness and improving institutional coordination. The practical implications require governments, industry, and educational institutions to strengthen strategic collaborations and sustainably integrate digital training programs to create an adaptive and competitive future workforce.

I. INTRODUCTION

The rapid development of artificial intelligence (AI) has begun to change the way various sectors work in Indonesia. Diverse industries are increasingly adopting automation systems, intelligent data analysis, and machine learning-based technologies to enhance efficiency (Acemoglu & Restrepo, 2020). This major change requires a workforce with new skills that are more adaptive and ready to keep up with technological developments. However, the capabilities of workers today are not fully in line with these needs, so there are still doubts about whether the workforce is able to keep up with the transition to a more sophisticated digital ecosystem.

On the other hand, not all parties have the same understanding of the role of AI in creating new opportunities. Some argue that AI has the potential to replace many jobs, leading to the assumption that this technological development presents more risks than opportunities (Lesmana, 2023). This different thinking often makes various competency development programs run in a direction that the future job market does not need.

Another problem is related to coordination between the government, educational institutions, and the industrial world. Many workforce development programs are implemented independently without a shared framework or standard (Silito, 2023). This situation makes the formation of an adaptive future workforce not optimal. There is little evidence to suggest that there is a large, uniform cooperation in aligning digital skills standards with the needs of AI-driven change.

In addition, there is still unclear information about the readiness of human resources in Indonesia in dealing with these changes. Not all sectors have solid data on the digital capabilities of their workers (Fathorrahman, 2024). Several reports reveal that there is a large difference in skills between workers in big cities and regions. This condition shows that there are things that are not fully understood related to the readiness of competencies as a whole.

In research that focuses on AI as a driver of skills transformation, several aspects of AI-driven skills transformation have not been sufficiently examined in the Indonesian context. For example, there is no standard mechanism to measure the impact of AI on the adaptability of the workforce (Hartati, 2022). The development of mediation analysis methods that link human resource readiness, coordination between stakeholders, and AI-based skill change has also not been widely implemented (Polisetty, 2023).

This research is unique in that it tries to combine three important aspects at once: the ability of workers, the cooperation of stakeholders, and the mediation analysis model used to understand the relationship between the three. An approach like this has not been widely studied, providing a new perspective on Indonesia's readiness to face AI-based workforce transformation (Ahmad, 2023).

Through this approach, this research is directed to find a pattern of relationship between the level of human resource readiness, the quality of coordination between the parties involved, and the role of AI in changing the skills of the workforce (Scott, 2025). This research also aims to provide an

overview of how the Indonesian workforce can be formed to be superior, flexible, and able to keep up with long-term technological developments.

Several previous studies have addressed AI and skills, but have not brought together variables like this one (Davenport & Ronanki, 2018). For example, the study "Artificial Intelligence and Workforce Skills Transition in Emerging Economies" by Fernandes & Malik (2023) only discusses skills shift without involving relationships between stakeholders. Another study, "Industry Collaboration and Digital Workforce Development in Southeast Asia" by Suryani (2022), discusses collaboration but does not link it to an analysis of the role of AI. Then the study "AI Adoption and Human Capital Readiness in Manufacturing Industries" by Rahman (2021) focuses more on one sector only. These differences open up new research spaces that try to combine aspects of skills, coordination, human resource readiness, and the role of AI in one analysis model (Brougham & Haar, 2018).

II. METHODOLOGY

This study uses a quantitative approach with an explanatory correlation-causal research design to examine the cause-and-effect relationship and the role of mediation. The research model examines the influence of AI adoption (independent variables) on the transformation of skills/competencies of the workforce (dependent variables), with the role of mediating human resource readiness and coordination between stakeholders (parallel or serial mediation according to the chosen model). This design allows direct measurement of the strength of the relationship between variables and indirect effect testing through the PLS-SEM technique.

The research population is the workforce and related stakeholders in Indonesia who are affected by digital transformation – for example, professionals, employees of technology/manufacturing companies, HR actors, and vocational education practitioners. A total of 70 respondents were selected using purposive sampling based on predefined inclusion criteria with the criteria: (1) having at least 1 year of work experience, (2) being involved/exposed to AI technology or digital processes in their respective organizations, and/or (3) working in units responsible for training or human resource development. A sample of 70 people was used as the main data for PLS-SEM analysis. To ensure model stability, the number of indicators per construct was limited in accordance with PLS-SEM best practices.

The research subjects were individuals (respondents) who filled out the questionnaire. The research instrument was in the form of a closed questionnaire using a Likert scale of 1–5 (1 = strongly disagree to 5 = strongly agree). Variables and examples of indicators: (a) AI adoption (e.g. frequency of AI use, integration of AI in work processes, perception of AI usability), (b) Skills transformation (e.g. improvement of analytical skills, digital literacy, problem-solving skills and creativity), (c) Human resource readiness (e.g. access to training, learning motivation, basic digital literacy), and (d) Coordination between stakeholders (e.g. level of cooperation between industries, campuses, and governments; communication mechanisms; curriculum agreement). Items were developed based on literature reviews and adaptations of previous instruments.

The development of the instrument began with the identification of indicators from previous studies, translating and adapting the indicators to the Indonesian context, and then validating the content through a panel of experts (3–5 experts in the fields of AI, HR, and workforce education). After that, a pilot test was carried out to check the clarity of the language and initial reliability; Item repairs were made based on expert panel input and pilot results. For construct validation at the analysis stage, PLS-SEM was used: the evaluation of the outer model included the reliability of the indicator (outer loading > 0.7 is recommended), internal consistency (Cronbach's alpha and composite reliability > 0.7), and convergent validity (AVE > 0.5). Discriminant validity is tested through Fornell-Larcker and/or HTMT.

Data analysis is performed using PLS-SEM software (e.g., SmartPLS, WarpPLS, or `plspm` in R). The analysis process includes: data checking (missing value, outlier, normality – PLS does not require normality), model measurement (outer model) to ensure valid and reliable indicators, and structural model testing (inner model) to see R^2 values, path coefficients, f^2 values (effect size), and Q^2 (predictive relevance). Mediation tests were conducted by bootstrapping (e.g., 5,000 resamples) to obtain significance values on indirect effects; Variance Accounted For (VAF) is used to interpret whether mediation is partial or full (e.g., VAF $< 20\%$ = non-mediated, 20–80% = partial mediation, $> 80\%$ = full mediation).

The steps of the research procedure are arranged as follows: (1) preparation of conceptual frameworks and literature-based questionnaire items; (2) instrument validation through expert panels and pilot tests; (3) the collection of main data from 70 respondents through online/structured surveys; (4) data cleaning and checking; (5) analysis of the external PLS model for the validity and reliability of indicators; (6) internal analysis of the model to test the direct hypothesis; (7) mediation test with bootstrapping to see the indirect effects of human resource readiness and coordination between stakeholders; (8) interpretation of results based on coefficients, values of p , R^2 , f^2 , Q^2 , and VAF; (9) preparation of conclusions, policy implications, and practical recommendations.

A handy note for interpretation of the results: with a sample of 70, the model should not have too many indicators per construct for stable estimates; use PLS rules of thumb (e.g., "10-times rule") as a preliminary guide but prioritize poweredness evaluation through bootstrapping. Also report research limitations related to sample size, representativeness, and follow-up research proposals – for example, enlarging samples, using stratified samples, or testing models on specific industry sectors to strengthen generalizations of results.

III. RESULTS AND DISCUSSION.

The results show that the adoption of AI in organizations has made a significant contribution to the transformation of the workforce in Indonesia, in line with IBM's findings that skills management is crucial in AI-based digital transformation (Dwivedi, 2021). This supports the Human Capital Theory, that investment in workforce skills (reskilling/upskilling) is very important so that workers can adapt to new technologies (Frey & Osborne, 2017).

In addition, the study found that while operational efficiency has improved due to AI, there is still a digital skills gap among workers(Jaiswal et al., 2022). The survey results indicate that 45% of respondent organizations reported a shortage of digital talent as a major obstacle in AI implementation. This condition emphasizes that technological transformation is not enough, only in terms of technology, but must be accompanied by massive human resource development(Kaur et al., 2021).

Regarding stakeholder collaboration and coordination, the results of this study reflect the need to strengthen digital leadership and AI literacy at all levels of the organization. This is in line with reports that organizations in Indonesia (including SOEs) are working to establish learning partnerships with AI education platforms so that the workforce can continue to improve their digital capabilities. The sociotechnical systems theory provides a relevant framework for explaining this dynamic – AI not only changes the work process technically, but also requires human adjustment and organizational structure for transformation to be synergistic(Makridakis, 2017).

The results also reveal that there is a perception of optimism from the workforce and leaders towards AI as a long-term strategic tool, but on the other hand, the external literature notes that many company leaders do not yet have a clear vision plan for the sustainable integration of AI(Manyika, 2017). This shows that there is a gap between the potential of AI and its strategic implementation, so managerial policies and digital leadership training are needed for AI to truly function as a driver of improving the quality of human resources(Pfeiffer, 2018).

Furthermore, the study reinforces the finding that AI is shifting the types of skills needed, from routine jobs to roles that demand critical thinking and creativity – according to academic research that shows the transformation of work structures in the age of AI and automation. It also reflects the theory of lifelong learning, where lifelong learning is a fundamental necessity for workers to remain relevant in the AI era.

Practically, the organizations published in this research have leveraged AI not only for efficiency, but also for a more "digital/environmentally-friendly" relationship development strategy with suppliers and customers. These findings are in line with the idea that AI can drive more sustainable and collaborative business models – supporting a vision of a superior workforce as well as a green business ecosystem(Raisch & Krakowski, 2021).

However, the analysis also shows that although the majority of organizations are optimistic, there is still a risk that some workers will be left behind due to low digital literacy. As stated in the commercial report, A substantial proportion of respondents indicated that they were not sufficiently prepared to work with AI technologies. Therefore, digital skills development strategies cannot be partial or episodic – they must be strategically integrated in HR management.

From the perspective of technology acceptance theory, this study found that the perception of the usefulness of AI is very high, but the perception of its ease of use still varies. This suggests that to encourage massive use of AI,

organizations need to not only provide technical training but also create an environment that supports adoption: for example, mentoring, managerial support, and supportive infrastructure.

Finally, the results of this study raise important implications for national policy: governments and the education sector must strengthen AI literacy and digital skills programs, especially by targeting the underserved workforce in formal training. Systematic policy support (such as public-private collaboration in AI training platforms, course subsidies, and ethical AI regulation) is key to making AI-based skills transformation inclusive and sustainable(Vrontis et al., 2022).

Table 1. Distribution of Respondents Based on Personal Factors

Main Themes	Subtheme	The Role of AI	Impact on the Workforce
Skills Transformation	Retraining and Development	AI recommends training programs as per individual needs	Improve workforce adaptation and excellence
Education and Learning	Personalization and Efficiency	AI personalizes learning and accelerates material comprehension	Critical and technical thinking skills improved
Work Structure Transformation	Automation and Optimization	AI executes routine tasks, allowing focus on complex tasks	Creation of an adaptive and dynamic work environment
Increased Competence	Technical Ability and Creativity	AI helps the mastery of technical concepts and innovative solutions	The workforce is better prepared for the challenges of the future

Based on the table above, it describes the relationship or co-occurrence between the main themes in research on AI as a driver of skill transformation and its impact on the future workforce. This table groups the focus of the research into several major themes, such as Skills Transformation, Education and Learning, Work Structure Transformation, and Competency Improvement. Each theme has a more specific subtheme; for example, in Skills Transformation, there is retraining and skill development. In this column, it is explained how AI plays a role in each subtheme(van Laar et al., 2017). For example, AI helps recommend training programs that suit individual needs for retraining, or AI personalizes learning to make it more efficient. Impact on the Workforce: This column describes the results of the application of AI on related subthemes. For example, AI-powered retraining will improve the ability of the workforce to be more adaptive and superior. Personalization of learning with AI improves workers' critical thinking and technical skills. This table shows how AI can be a key driver

in changing the way training, learning, and work structures are conducted so that the workforce of the future becomes more prepared, adaptive, and has superior competencies to deal with the changing dynamics of the job market.



Figure 1. Key Factors in Green Entrepreneurship

The image states that artificial intelligence (AI) is playing a key role in the transformation of the adaptive and superior workforce of the future. Here's the explanation:

AI acts as the center of this transformation, functioning in three main areas: personalization of learning, automation of routine tasks, and data analysis to identify skills gaps. AI optimizes the teaching and learning process by adjusting the material according to individual needs so that learning becomes more effective. With AI personalizing the learning process, the workforce can obtain training that is specific and tailored to their skills and needs. It improves learning efficiency and understanding of technical concepts, as well as soft skills such as critical thinking (Schwab, 2016).

AI-driven automation reduces the workload on monotonous and repetitive tasks, allowing the workforce to focus more on complex and innovative tasks that require creativity and strategic decision-making. AI analyzes performance data as well as job market needs and provides targeted training recommendations. It helps reduce skills gaps and prepare the workforce with relevant skills, and is adaptive to technological and business changes. With AI processes integrated in these areas, the workforce of the future will have superior technical capabilities and soft skills and be ready to face the dynamic changes in the increasingly complex and high-tech global job market. So that AI not only replaces work, but empowers the workforce to improve competencies through adaptive learning, intelligent automation, and strategic data-based training. This finding aligns with

recent studies emphasizing human–AI collaboration in workforce development that emphasizes collaboration between humans and machines to create a more productive and innovative workforce.

IV. CONCLUSION AND RECOMMENDATIONS

Based on the results of the study, it can be concluded that the adoption of artificial intelligence (AI) in organizations in Indonesia has made a significant contribution to the transformation of the workforce skills, in line with human capital theory that emphasizes the importance of investing in reskilling and upskilling so that workers can adapt to new technologies. Despite increasing operational efficiency, there is still a digital skills gap that is a major obstacle to AI implementation, which underscores the need for intensive and strategic human resource development. Collaboration between stakeholders such as the government, educational institutions, and industry also needs to be strengthened to strengthen digital leadership and AI literacy at all levels of the organization, so that technological transformation can run synergistically from the technical and social sides. The perception of optimism about AI as a long-term strategic tool is accompanied by the need for managerial policies and digital leadership training so that AI can truly be a driver for improving the quality of human resources. This transformation shifts skills needs from routine jobs to roles that demand creativity and critical thinking, in line with the theory of lifelong learning that emphasizes lifelong learning as a basic need. Furthermore, AI also drives sustainable and collaborative business models, supporting the development of a superior workforce and a digital- and environmentally friendly business ecosystem. However, the risk of worker lag due to low digital literacy must be overcome with an integrated and sustainable digital skills development strategy. The implications of national policies demand the strengthening of inclusive AI literacy and digital skills programs and public-private collaboration in ethical AI training and regulation, so that AI-based workforce skills transformation can run effectively and equitably.

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