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The Role of Artificial Intelligence in the Digital Transformation of Education in the Era of Society 5.0

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ABSTRACT

The rapid advancement of digital technology has accelerated the transformation of education systems, particularly through the adoption of artificial intelligence (AI) in the era of Society 5.0. This study aims to analyze the role of artificial intelligence in driving the digital transformation of education in Indonesia. A quantitative research approach was employed using survey data collected from 85 respondents involved in the education sector. Data were gathered through a structured questionnaire using a Likert scale and analyzed with SPSS version 25. The analysis included descriptive statistics, validity and reliability testing, and simple linear regression. The results indicate that artificial intelligence has a positive and statistically significant effect on the digital transformation of education. The regression analysis shows that AI explains 55.1% of the variance in digital transformation, highlighting its substantial contribution to improving learning personalization, administrative efficiency, and data-driven decision-making in educational institutions. Despite these positive outcomes, challenges related to digital infrastructure and human resource readiness remain. This study provides empirical evidence supporting the strategic importance of artificial intelligence in advancing educational transformation and offers insights for policymakers and educational institutions in aligning digital education strategies with the goals of Society 5.0 in Indonesia.

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1. INTRODUCTION

The rapid development of digital technology has fundamentally transformed various sectors of human life, including education, as the integration of advanced technologies such as artificial intelligence (AI), big data, cloud computing, and the Internet of Things (IoT) has accelerated digital transformation in educational systems worldwide [1]. This transformation goes beyond a simple shift from conventional to digital tools, representing a systemic change that influences teaching methods, learning models, institutional governance, and

educational outcomes [2]. Within the emerging Society 5.0 paradigm, technology is expected to be human-centered, serving societal needs by fostering more inclusive, adaptive, and sustainable educational ecosystems. Society 5.0 emphasizes the balance between economic progress and the resolution of social challenges through the integration of cyberspace and physical space, in which AI plays a strategic role as a key enabler of innovation and efficiency [3]. In the educational context, AI offers significant potential to personalize learning experiences, support intelligent tutoring systems, automate administrative processes, and generate data-driven insights for educational decision making, thereby positioning it as a critical component in achieving high-quality, equitable, and future-oriented education systems [4].

In Indonesia, the urgency of digital transformation in education has become increasingly evident, particularly in response to global technological shifts and post-pandemic educational challenges [5]. The Indonesian education system faces persistent issues such as disparities in access, uneven quality of learning outcomes, limited digital infrastructure in certain regions, and varying levels of digital literacy among educators and students [6]. The adoption of artificial intelligence is therefore viewed as a strategic opportunity to address these challenges while aligning national education development with global trends and the vision of Society 5.0 [7].

Despite the growing interest in artificial intelligence within the education sector, empirical studies that quantitatively examine its role in the digital transformation of education in Indonesia remain limited [8]. Much of the existing literature focuses on conceptual discussions, policy analyses, or qualitative explorations, leaving a gap in evidence-based research that measures perceptions, readiness, and impacts of AI adoption using statistical approaches. Understanding how stakeholders perceive AI and how it contributes to digital transformation is essential for ensuring effective implementation and sustainable policy formulation.

Based on these considerations, this study aims to analyze the role of artificial intelligence in the digital transformation of education in Indonesia within the context of Society 5.0. Using a quantitative approach with data collected from 85 respondents through a Likert-scale questionnaire and analyzed using SPSS version 25, this research seeks to provide empirical insights into the contribution of AI to educational transformation. The findings are expected to contribute to academic discourse while offering practical recommendations for policymakers, educational institutions, and practitioners in designing and implementing AI-driven educational strategies.

2. LITERATURE REVIEW

2.1 Digital Transformation in Education

Digital transformation in education refers to the comprehensive integration of digital technologies into all aspects of educational systems, leading to fundamental changes in teaching, learning, management, and institutional culture, and extending beyond the mere adoption of digital tools to include the redesign of pedagogical models, learning environments, and governance structures to improve effectiveness, accessibility, and sustainability [9]. This transformation enables flexible learning models such as blended and online learning, supports real-time communication, and facilitates data-driven evaluation of learning outcomes [10]. In developing countries such as Indonesia, digital transformation in education is closely connected to national development priorities, human capital enhancement, and global economic competitiveness; however, its implementation is often constrained by unequal infrastructure, limited technological readiness, and gaps in digital competencies among educators and learners [11]. These challenges underscore the need for advanced technologies that can optimize learning processes while

addressing issues of scalability and inclusivity within the educational system.

2.2 *Artificial Intelligence in Education*

Artificial intelligence (AI) is broadly defined as the capability of computer systems to perform tasks that typically require human intelligence, including learning, reasoning, problem-solving, and decision making, and its application in education has expanded rapidly through intelligent tutoring systems, adaptive learning platforms, automated assessment tools, learning analytics, and administrative support systems. These technologies enable educational institutions to deliver more personalized learning experiences, reduce administrative workloads, and enhance overall institutional efficiency [12]. Prior studies indicate that AI-driven learning systems can dynamically adapt instructional content to individual learners' needs, learning pace, and performance levels, thereby improving student engagement and learning effectiveness while assisting educators in monitoring progress and identifying learning gaps [13]. In addition, AI-based analytics can extract meaningful insights from large volumes of educational data, supporting evidence-based decision making at both instructional and policy levels.

2.3 *Society 5.0 and Human-Centered Education*

The concept of Society 5.0 emphasizes a human-centered approach to technological advancement, in which digital innovations are designed to address social challenges and enhance quality of life, including within the education sector [3]. In this paradigm, the integration of advanced technologies such as artificial intelligence (AI) is encouraged while maintaining a strong emphasis on human values, creativity, ethics, and social responsibility [14]. Education in the Society 5.0 era is expected to develop learners who are not only technologically competent but also capable of critical thinking, collaboration, and adaptability [15]. Within this framework, AI is positioned as a supportive tool rather than a substitute for human roles, assisting educators, enriching learning experiences, and expanding access to quality education, while teachers remain central as facilitators, mentors, and moral guides. Consequently, successful AI adoption in education requires a balanced approach that aligns technological innovation with sound pedagogical principles and ethical considerations [16].

2.4 *Artificial Intelligence and Digital Transformation of Education*

The integration of artificial intelligence (AI) is widely recognized as a key driver of digital transformation in education, as it enables automation, personalization, and intelligent decision making across various educational processes [17]. Research shows that educational institutions that effectively adopt AI technologies tend to achieve improvements in instructional quality, operational efficiency, and stakeholder satisfaction [18]. However, the literature also identifies several barriers to AI-driven transformation, including limited digital infrastructure, insufficient educator training, concerns over data privacy, and resistance to organizational change, all of which influence how AI technologies are perceived and implemented. Consequently, stakeholder perceptions, readiness, and acceptance play a crucial role in determining the success of AI integration and its contribution to sustainable digital transformation in education.

2.5 *Research Gap and Hypothesis Development*

Although existing studies acknowledge the transformative potential of artificial intelligence (AI) in education, empirical evidence—particularly from quantitative research in the Indonesian context—remains limited, as much of the literature relies on conceptual models or qualitative insights that constrain the generalizability of findings. This gap highlights the need for systematic quantitative studies that measure stakeholder

perceptions of AI, assess its contribution to digital transformation, and provide robust statistical evidence to inform policy and institutional decision making. Based on the theoretical perspectives and prior empirical findings, this study posits that artificial intelligence plays a significant role in driving the digital transformation of education in Indonesia; therefore, the main hypothesis of this research is that artificial intelligence has a positive and significant effect on the digital transformation of education within the context of Society 5.0.

3. RESEARCH METHODS

3.1 Research Design and Approach

This study employed a quantitative research design to examine the role of artificial intelligence in the digital transformation of education in the era of Society 5.0 in Indonesia. A quantitative approach was chosen to allow for objective measurement of respondents' perceptions and to enable statistical analysis of the relationships between artificial intelligence and digital transformation in education. The study adopted a cross-sectional survey design, in which data were collected at a single point in time from respondents involved in the education sector.

3.2 Population and Sample

The population of this study consisted of individuals engaged in the education sector, including educators, academic staff, and education practitioners who have experience or awareness of digital technologies in education. From this population, a sample of 85 respondents was selected using a non-probability sampling technique, specifically purposive sampling. This technique was considered appropriate because the study targeted respondents who were familiar with or had exposure to the use of digital technology and artificial intelligence in educational settings.

3.3 Data Collection Technique

Primary data were collected using a structured questionnaire distributed to respondents. The questionnaire was designed to capture respondents' perceptions of artificial intelligence adoption and the digital transformation of education. All questionnaire items were measured using a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The instrument consisted of two main variables: artificial intelligence and digital transformation of education. The artificial intelligence variable included indicators related to personalization of learning, efficiency of educational processes, decision-making support, and technological innovation [19]. The digital transformation variable included indicators related to digital learning implementation, institutional readiness, effectiveness of digital systems, and innovation in teaching and learning.

3.4 Research Variables and Measurement

This study involved one independent variable and one dependent variable. The independent variable was artificial intelligence, which reflects the extent to which AI technologies are perceived to be implemented and utilized in educational processes. The dependent variable was the digital transformation of education, which reflects changes in learning methods, institutional practices, and educational services resulting from digital technology adoption. Each variable was operationalized through multiple indicators, and respondents' responses were aggregated to represent the overall construct of each variable.

3.5 Data Analysis Technique

The collected data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 25, beginning with descriptive statistical analysis to summarize respondent characteristics and the distribution of research variables. Instrument testing was subsequently conducted through validity and reliability analyses to ensure the quality of the

measurement instruments, with validity assessed using correlation analysis and reliability evaluated using Cronbach's alpha coefficient. Inferential statistical analysis was then applied to test the research hypothesis using simple linear regression to examine the effect of artificial intelligence on the digital transformation of education, with a significance level set at 0.05. The results of these analyses were used to draw conclusions regarding the role of artificial intelligence in supporting educational digital transformation within the context of Society 5.0.

4. RESULTS AND DISCUSSION

4.1 Respondent Characteristics

A total of 85 questionnaires were returned and deemed valid for analysis. The respondents consisted of educators, academic staff, and education practitioners who have experience with digital learning systems. Table 1 presents a summary of respondent characteristics.

Table 1. Respondent Characteristics

Category	Description	Frequency	Percentage (%)
Gender	Male	41	48.2
	Female	44	51.8
Age	21–30 years	18	21.2
	31–40 years	34	40.0
	41–50 years	22	25.9
	> 50 years	11	12.9
Role	Lecturer/Teacher	49	57.6
	Academic Staff	21	24.7
	Education Practitioner	15	17.7

Table 1 presents the characteristics of the respondents (n = 85), showing a balanced and diverse profile in terms of gender, age, and professional roles, which strengthens the representativeness of the sample. Gender distribution is relatively even, with female respondents accounting for 51.8% and male respondents 48.2%, indicating that perceptions of artificial intelligence and digital transformation in education are captured from both genders without significant imbalance. In terms of age, the largest proportion of respondents falls within the 31–40 years group (40.0%), followed by those aged 41–50 years (25.9%) and 21–30 years (21.2%), while respondents above 50 years constitute a smaller proportion (12.9%). This distribution suggests that the majority of participants are in their productive and professionally active years, with sufficient exposure to both traditional and digital educational practices. Regarding professional roles, lecturers and teachers form the largest group (57.6%), followed by academic staff (24.7%) and education practitioners (17.7%), indicating that the data largely reflect perspectives from individuals directly involved in teaching and educational management.

4.2 Descriptive Statistics

Descriptive statistical analysis was conducted to examine respondents' perceptions of artificial intelligence (AI) and digital transformation of education. The results are presented in Table 2.

Table 2. Descriptive Statistics of Research Variables

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Artificial Intelligence (AI)	85	2.40	4.80	4.02	0.54

Digital Transformation of Education	85	2.60	4.90	4.08	0.51

Table 2 presents the descriptive statistics of the research variables, indicating generally high mean scores for both artificial intelligence (AI) and the digital transformation of education. The mean value for the AI variable is 4.02 with a standard deviation of 0.54, suggesting that respondents have a positive perception of the role and implementation of AI in educational contexts, with relatively low variability in responses. Similarly, the digital transformation of education variable shows a slightly higher mean score of 4.08 and a standard deviation of 0.51, indicating that respondents perceive a strong level of digital transformation within their institutions and that these perceptions are fairly consistent across the sample. The minimum and maximum values for both variables suggest that while most respondents rate AI and digital transformation positively, some variation still exists in terms of institutional readiness and implementation levels.

4.3 Validity and Reliability Testing

Instrument testing was conducted to ensure data quality. Item validity was assessed using Pearson correlation, with all items showing correlation coefficients greater than 0.30, indicating acceptable validity. Reliability testing was conducted using Cronbach's alpha, as shown in Table 3.

Table 3. Reliability Test Results

Variable	Number of Items	Cronbach's Alpha	Interpretation
Artificial Intelligence	8	0.871	Reliable
Digital Transformation of Education	8	0.884	Reliable

Table 3 presents the results of the reliability testing for the research variables, indicating strong internal consistency for both measurement instruments. The artificial intelligence variable, measured using eight items, yields a Cronbach's alpha value of 0.871, while the digital transformation of education variable, also measured with eight items, shows a slightly higher Cronbach's alpha of 0.884. Both values exceed the commonly accepted threshold of 0.70, confirming that the items within each scale are consistently measuring their respective constructs. These results demonstrate that the questionnaire instruments used in this study are reliable and suitable for further statistical analysis, thereby strengthening the credibility of the subsequent findings.

4.4 Regression Analysis Results

Simple linear regression analysis was conducted to examine the effect of artificial intelligence on the digital transformation of education, and the results indicate a strong model fit with a correlation coefficient (R) of 0.742, an R Square value of 0.551, and an adjusted R Square of 0.545. These findings show that artificial intelligence accounts for 55.1% of the variance in the digital transformation of education, while the remaining variance is influenced by other factors not included in the model, demonstrating the substantial explanatory power of artificial intelligence in driving educational digital transformation.

Table 4. Regression Coefficients

Variable	B	Std. Error	t-value	Sig.

Constant	1.214	0.312	3.892	0.000
Artificial Intelligence	0.713	0.071	10.043	0.000

Table 4 presents the regression coefficients for the simple linear regression model examining the effect of artificial intelligence on the digital transformation of education. The results show that artificial intelligence has a positive and statistically significant influence on educational digital transformation, as indicated by a regression coefficient (B) of 0.713, a t-value of 10.043, and a significance level of 0.000 ($p < 0.05$). This finding suggests that an increase in the application or perception of artificial intelligence is associated with a substantial improvement in the level of digital transformation in education. The constant value of 1.214, which is also statistically significant ($p = 0.000$), indicates the baseline level of digital transformation when the artificial intelligence variable is held constant.

4.5 Discussion

The results of this study provide strong empirical evidence that artificial intelligence (AI) plays a significant role in supporting the digital transformation of education [20]. The high mean scores for both the AI and digital transformation variables indicate a strong level of agreement among respondents regarding the relevance and importance of AI-driven technologies in contemporary educational practices. These findings suggest that AI contributes to the creation of more adaptive and personalized learning environments, enhances administrative efficiency, and supports data-driven decision making within educational institutions.

The regression analysis further demonstrates that artificial intelligence explains more than half of the variance in digital transformation outcomes, highlighting its strategic importance as a key driver of educational innovation in the Society 5.0 era. The positive and statistically significant regression coefficient provides clear support for the proposed hypothesis, confirming that increased adoption and utilization of AI technologies are associated with higher levels of digital transformation in education. This result reinforces the view that AI is not merely a supporting technology, but a central element in advancing digital education systems.

Nevertheless, the findings also indicate that a substantial portion of the variance in digital transformation is influenced by other factors, including digital infrastructure, organizational culture, policy frameworks, and human resource competencies. This suggests that AI implementation alone is insufficient to achieve comprehensive digital transformation without parallel investments in institutional readiness and digital skills development. Overall, the results align with the human-centered vision of Society 5.0, emphasizing that technology should function as an enabler rather than a replacement for human roles, and in the Indonesian context, they underscore the importance of balanced strategies that integrate AI adoption with pedagogical innovation and capacity building to achieve sustainable digital transformation in education.

5. Conclusion

This study concludes that artificial intelligence plays a significant and positive role in the digital transformation of education in Indonesia within the framework of Society 5.0. The quantitative findings demonstrate that increased adoption and utilization of AI technologies contribute substantially to the effectiveness and innovation of digital educational practices. Artificial intelligence supports personalized learning, enhances operational efficiency, and strengthens data-based decision-making processes in educational institutions. However, the findings also suggest that successful digital transformation requires more than technological adoption alone, as factors such as infrastructure readiness, digital

competencies, and institutional support remain critical. Therefore, educational stakeholders are encouraged to implement comprehensive strategies that integrate artificial intelligence with capacity building, policy alignment, and human-centered educational approaches to achieve sustainable and inclusive digital transformation.

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