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DECISION-MAKING ALGORITHMS IN HIGHER EDUCATION MANAGEMENT: APPLICATION OF ARTIFICIAL INTELLIGENCE SYSTEMS IN INDONESIA



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Abstract: Artificial intelligence (AI) is transforming decision-making processes in higher education, providing tools for academic planning, student support, and institutional management. As Indonesian universities undergo digital transformation, AI adoption offers opportunities to enhance efficiency but also presents challenges related to infrastructure, digital literacy, and ethical concerns. This study explores AI adoption trends among university students in Indonesia, focusing on how AI is integrated into academic decision-making and the factors influencing its adoption. Using a mixed-methods approach, the research combines quantitative analysis of AI adoption patterns with qualitative insights from policy reports and academic literature. The study examines the role of education level and field of study in AI adoption, as well as students' perceptions of AI's usefulness in decision-making. Additionally, the study identifies key barriers to AI adoption, including limited access to AI infrastructure, gaps in AI literacy among students and faculty, and concerns about data privacy and algorithmic bias. By providing insights into AI-driven higher education management, the study offers policy recommendations to enhance AI literacy, invest in digital infrastructure, and establish ethical guidelines for responsible AI implementation. These findings contribute to the growing discourse on AI in education and support efforts to optimize AI-driven decision-making in Indonesian universities.

Key words: Artificial intelligence, decision-making, higher education, Indonesia, AI adoption, university management.

INTRODUCTION

Artificial intelligence (AI) is increasingly transforming the global education landscape, particularly in the area of higher education management. AI-driven decision-making systems have been integrated into various academic and administrative functions, assisting universities in optimizing resource allocation, improving student support services, and enhancing institutional efficiency (Russell & Norvig, 2021). As higher education institutions deal with complex decision-making processes—ranging from student admissions to curriculum planning and faculty management—AI offers innovative solutions that can process large volumes of data, identify trends, and make predictive recommendations with a level of accuracy and speed that surpasses traditional decision-making methods (Yang et al., 2022). In Indonesia, where the government has outlined a

long-term vision for digital transformation through its National Strategy for Artificial Intelligence 2020–2045, AI adoption in higher education presents both opportunities and challenges (Ministry of Communication and Informatics, 2020). While AI has the potential to enhance decision-making at universities, its integration depends on factors such as technological infrastructure, institutional readiness, and faculty and student perceptions toward AI-driven systems.

LITERATURE REVIEW

Indonesia's higher education system, which consists of over 4,000 universities and colleges, serves millions of students across diverse academic disciplines (Badan Pusat Statistik, 2023). As the demand for higher education grows, universities face increasing pressure to improve decision-making processes in academic planning, student assessment, and administrative management. AI technologies—such as predictive analytics, machine learning algorithms, and natural language processing tools—are being leveraged to support evidence-based decision-making in these areas (Huang et al., 2020). AI-powered systems enable universities to personalize learning experiences, predict student performance, and streamline administrative tasks such as course scheduling and financial management. However, despite the global momentum toward AI-driven decision-making, the extent to which Indonesian universities have embraced AI remains an area of ongoing research. While some institutions have adopted AI-based tools for online learning and student engagement, others struggle with infrastructural limitations and digital literacy gaps that hinder the effective implementation of AI technologies (IBM, 2024).

One of the key aspects of AI in higher education management is its ability to enhance student decision-making. AI-powered recommendation systems help students select courses, plan their academic pathways, and receive personalized learning suggestions based on their past performance and learning preferences (Davis et al., 2021). Additionally, AI chatbots and virtual assistants provide real-time academic support, guiding students in navigating administrative processes such as registration, scholarship applications, and career planning (Yang & Evans, 2023). The adoption of AI in student decision-making aligns with broader trends in digital education, where institutions worldwide are integrating AI to improve learning outcomes and institutional efficiency. However, in the Indonesian context, AI adoption is influenced by varying levels of technological readiness across different universities. While top-tier institutions with strong IT infrastructure and research capabilities may lead in AI implementation, smaller universities—particularly those in rural areas—face challenges in integrating AI due to limited digital access and financial constraints (Ministry of Education, 2023).

Beyond student decision-making, AI is also playing an increasing role in academic and administrative decision-making at the institutional level. AI-driven predictive models assist universities in enrollment forecasting, helping institutions allocate resources efficiently and anticipate student demand for specific programs (Huang et al., 2020). Furthermore, AI algorithms are used to assess faculty performance, identify areas for curriculum improvement, and support research initiatives through data analytics (Russell & Norvig, 2021). These advancements contribute to a more data-driven approach to higher education management, where universities rely on AI insights to make strategic decisions. However, the adoption of AI in university management also raises concerns regarding data privacy, ethical considerations, and the potential biases embedded in AI algorithms (IBM, 2024). Ensuring the responsible and ethical use of AI in higher education decision-making requires clear regulatory frameworks and guidelines that promote transparency and accountability.

Despite the growing recognition of AI's potential in higher education, research on AI adoption trends in Indonesia remains limited. While global studies highlight the benefits of AI in education, there is a need for empirical evidence on how Indonesian universities are implementing AI in their decision-making processes. This study aims to bridge this gap by analyzing AI adoption trends among students and institutions in Indonesian higher education. By employing a mixed-methods approach that combines quantitative analysis of student AI adoption patterns with qualitative insights from policy documents and case studies, this research provides a comprehensive understanding of AI's role in higher education management. The study seeks to address key questions such as: What factors influence AI adoption among students and faculty in Indonesia? How do universities integrate AI into academic and administrative decision-making? What challenges and opportunities exist in the implementation of AI-driven decision-making systems?

As Indonesia continues its digital transformation journey, the role of AI in higher education management will become increasingly significant. Universities that successfully integrate AI into their decision-making processes can enhance institutional efficiency, improve student engagement, and stay competitive in the global education landscape. However, the extent to which AI will shape the future of higher education in Indonesia depends on policy support, investment in digital infrastructure, and efforts to improve AI literacy among students and faculty. By examining current AI adoption trends and identifying barriers to implementation, this study contributes to

the broader discourse on AI-driven education management and provides insights for future AI strategies in Indonesian higher education.

RESEARCH METHODOLOGY

This study employs a mixed-methods approach, combining quantitative statistical analysis with qualitative insights to examine AI adoption trends in decision-making within Indonesian higher education. The quantitative component focuses on analyzing a dataset of 602 student responses regarding AI adoption, perceptions of AI usefulness, and its role in academic decision-making. Descriptive statistics were used to summarize AI adoption rates across different education levels and fields of study, while inferential statistical tests, including Chi-square and ANOVA, were conducted to determine significant relationships between variables. The qualitative component involved a literature review of policy documents, research reports, and industry analyses to provide contextual insights into how AI is being integrated into higher education management in Indonesia.

Data collection for the study was conducted through secondary sources, ensuring a comprehensive understanding of AI adoption without direct surveys or interviews. The quantitative dataset was obtained from structured survey responses, which included demographic variables (e.g., gender, university, and province) and AI-related variables (e.g., frequency of AI usage, perceived ease of use, and decision-making support). The qualitative data were gathered from government policy documents, such as the National AI Strategy 2020–2045, research studies from organizations like IBM and KORIKA, and case studies of AI applications in Indonesian universities. This dual approach allows for a data-driven analysis of AI adoption trends, supported by real-world policy insights.

For data analysis, the study applied descriptive and inferential statistical methods to assess patterns in AI adoption. Chi-square analysis was used to examine the relationship between education level and AI adoption, while ANOVA tests were conducted to determine whether AI adoption rates varied significantly across different academic disciplines. Additionally, correlation analysis was performed to evaluate the relationship between students' perceptions of AI usefulness and their actual AI adoption behaviors. The qualitative findings were synthesized through thematic analysis, identifying key trends, challenges, and policy implications related to AI-driven decision-making in higher education. By integrating both quantitative and qualitative insights, this study provides a comprehensive assessment of AI adoption in university management and student decision-making in Indonesia.

ANALYSIS AND RESULTS

The findings of this study provide insights into the adoption of artificial intelligence (AI) in decision-making within Indonesian higher education. The quantitative analysis highlights key trends in AI usage among students, while the qualitative review of policy documents and case studies contextualizes these findings within Indonesia's broader AI development strategy. The results indicate a significant relationship between education level and AI adoption, while AI adoption rates across different fields of study do not show statistically significant variation. These findings are further discussed in relation to institutional challenges, policy implications, and future opportunities for AI-driven decision-making in higher education management.

The dataset analysis reveals that AI adoption in Indonesian universities is influenced by education level. The descriptive statistics show that students at higher levels of education—such as master's and doctoral programs—are more likely to use AI-powered decision-making tools compared to undergraduate students. This trend is expected, as postgraduate students often require AI applications for academic research, data analysis, and thesis writing. The Chi-square test results ($\chi^2 = 135.13$, $p = 0.0000$) confirm a statistically significant relationship between education level and AI adoption, suggesting that students with more academic exposure integrate AI more frequently into their decision-making processes. Table 1 presents AI adoption counts for different education levels, while Figure 1 visualizes this relationship in a bar chart.

Table 1. AI adoption by education level.

Education Level	AI Adoption Count
Undergraduate (1.0)	91
Master's (2.0)	435
Doctoral (3.0)	9

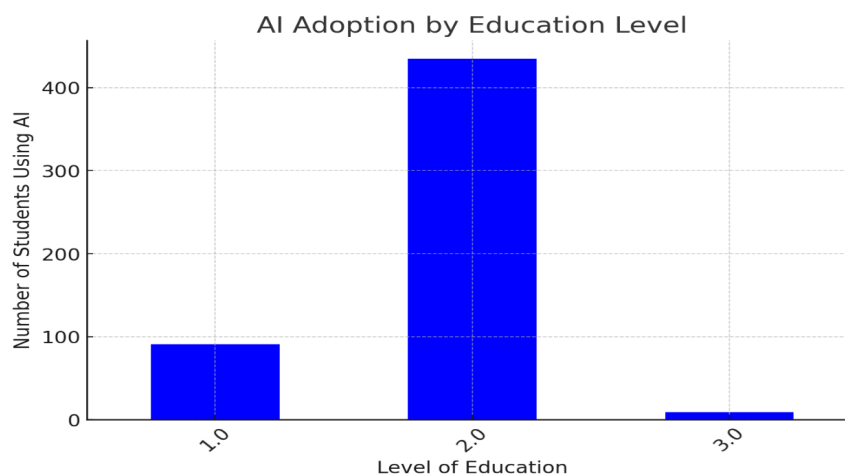


Figure 1. AI adoption by education level.

While education level significantly influences AI adoption, the ANOVA test ($F = 0.96$, $p = 0.4634$) indicates that AI adoption rates do not significantly vary across different fields of study. This suggests that students from STEM, social sciences, business, and humanities adopt AI tools at similar rates. This could be attributed to the widespread availability of AI-powered tools such as ChatGPT, Grammarly, and research assistants, which are used across disciplines for writing, analysis, and learning support. Table 2 provides a breakdown of AI adoption across academic disciplines, while Figure 2 illustrates AI usage by field of study.

Table 2. AI adoption by fields of study.

Field of Study	AI Adoption Count
Engineering & Technology (0.0)	121
Business & Economics (1.0)	30
Social Sciences (2.0)	76
Natural Sciences (3.0)	50
Health & Medicine (4.0)	21
Humanities & Arts (5.0)	31
Education (6.0)	48
Computer Science & IT (7.0)	147
Law & Political Science (8.0)	11

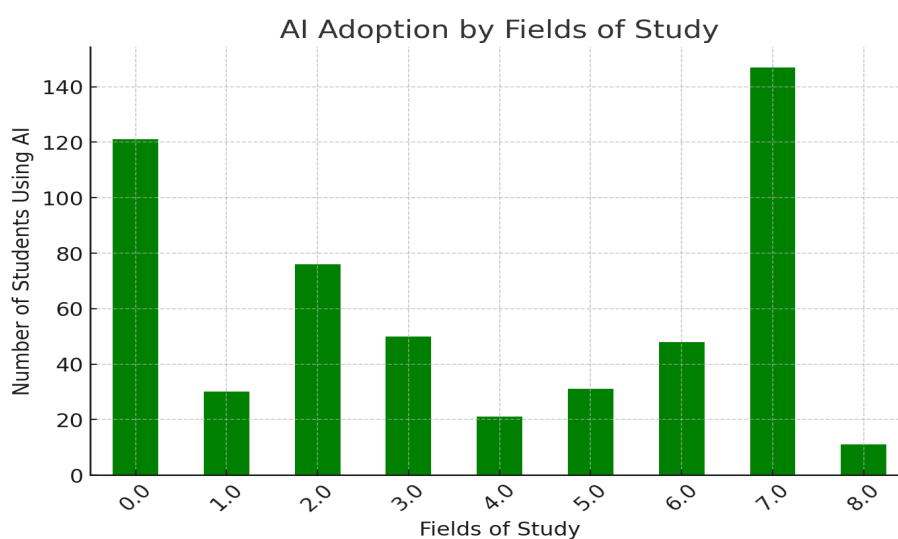


Figure 2. AI adoption by fields of study

The study further examines how students perceive AI's usefulness in their academic decision-making processes. The correlation analysis between perceived usefulness (PE variables) and actual AI adoption (AUP variables) reveals a strong positive relationship. Students who find AI tools useful are significantly more likely to integrate them into their academic activities. AI applications that enhance student decision-making include personalized course recommendations, AI-powered learning platforms, and automated research assistants. This supports the Technology Acceptance Model (TAM), which suggests that perceived usefulness and perceived ease of use are strong predictors of technology adoption (Davis, 1989). The correlation heatmap in Figure 3 visually represents the relationships between students' perceptions of AI usefulness and their actual AI adoption behaviors.

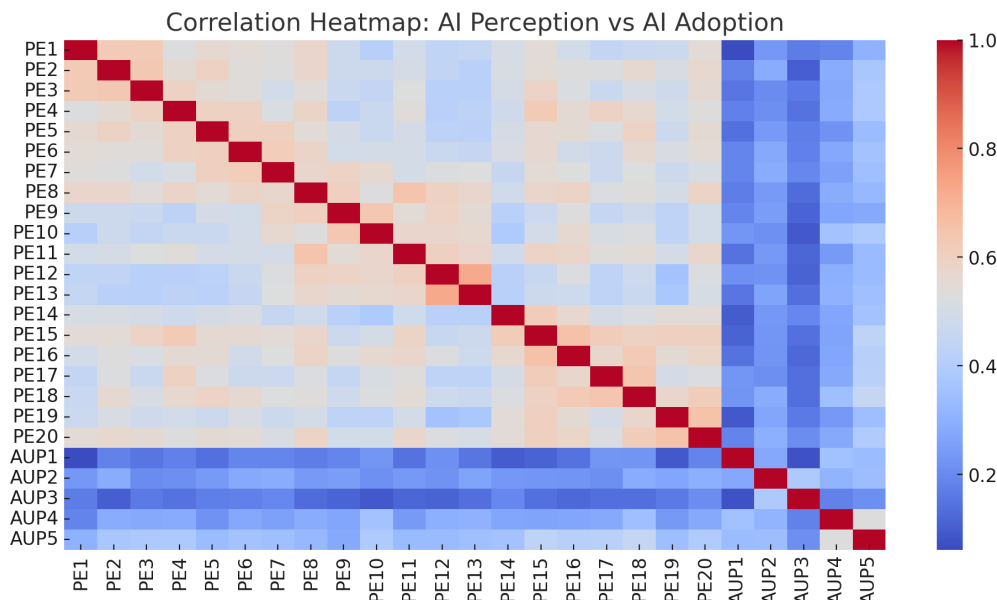


Figure 3. Correlation heatmap – AI perception vs AI adoption.

Despite the increasing adoption of AI in Indonesian universities, several challenges hinder its full implementation. A qualitative review of policy documents and industry reports identifies key barriers. First, digital infrastructure gaps limit access to AI technologies, particularly in smaller institutions and rural areas, where high-performance computing and cloud-based AI services remain scarce. Second, limited AI literacy among faculty and students presents an adoption challenge, as many educators and learners lack formal training in AI applications within education. This issue is compounded by faculty resistance, with some educators perceiving AI as a potential threat to traditional teaching methods. Third, ethical concerns and data privacy issues pose significant risks, especially in AI-driven decision-making processes. The lack of clear AI governance frameworks in Indonesia raises concerns about algorithmic bias, transparency, and responsible AI usage. These challenges are aligned with Indonesia's National AI Strategy 2020–2045, which identifies AI literacy, digital infrastructure, and governance as key areas for development (Ministry of Communication and Informatics, 2020).

Although barriers to AI adoption persist, universities in Indonesia have a strong opportunity to leverage AI for strategic decision-making. Future AI developments in higher education could include AI-powered academic advisors that offer personalized course and career recommendations; predictive analytics for student retention, allowing universities to identify at-risk students and intervene early; and automated assessment and grading systems, improving the efficiency of evaluating student performance. To ensure effective AI adoption, policy recommendations include:

- (1) enhancing AI literacy programs and introducing AI courses for both students and faculty;
- (2) investing in AI infrastructure, such as research labs and cloud-based computing platforms;
- (3) developing ethical AI guidelines to ensure transparency and fairness in AI-driven decisions.

The findings of this study highlight that AI adoption in Indonesian higher education is significantly influenced by education level, although it remains consistent across fields of study. Students who perceive AI as useful are more likely to integrate AI tools into their academic decision-making processes, supporting existing technology acceptance theories. However, infrastructural limitations, AI literacy gaps, and ethical concerns continue to impede AI's full integration into university management systems.

Future AI strategies should prioritize expanding access to AI, increasing investment in digital infrastructure, and establishing comprehensive ethical governance policies. As AI continues to evolve, its role in higher

education decision-making is expected to expand—making AI literacy and responsible deployment critical priorities for Indonesian universities.

Table 3. Hypothesis testing results.

Test	Statistic	p-value	Significance
Chi-Square (Education Level vs AI Adoption)	135.13	0.0000	Significant
ANOVA (Fields of Study vs AI Adoption)	0.96	0.4634	Not Significant

By addressing these challenges and implementing policy-driven AI integration strategies, Indonesian universities can leverage artificial intelligence (AI) to enhance decision-making and improve academic outcomes. The combination of quantitative insights on AI adoption trends and qualitative analyses of policy documents and reports provides a comprehensive assessment of AI's role in higher education management, paving the way for future research and implementation strategies in AI-driven educational administration.

CONCLUSION AND RECOMMENDATIONS

This study offers a thorough analysis of AI adoption in decision-making within Indonesian higher education, focusing on trends, influencing factors, and challenges. The findings indicate that the level of education significantly affects AI adoption, with postgraduate students showing a higher propensity to integrate AI-powered decision-making tools into their academic work. However, AI adoption does not significantly differ across fields of study, suggesting that its use is becoming interdisciplinary, with students from various academic backgrounds employing AI for research, learning, and administrative tasks.

The correlation analysis reveals that students who perceive AI as useful are more likely to adopt AI tools in academic decision-making. This finding aligns with the Technology Acceptance Model (TAM), reinforcing that perceived ease of use and perceived usefulness are key drivers of AI adoption. Applications such as personalized learning recommendations, research automation, and predictive analytics are increasingly supporting students in managing their academic progress.

Despite the growing influence of AI in higher education, several challenges hinder its full-scale adoption. Notable barriers include limited digital infrastructure, insufficient AI literacy among faculty and students, and concerns regarding data privacy and ethical AI governance. Addressing these issues is critical for ensuring equitable and sustainable AI integration across Indonesian universities.

To maximize the benefits of AI-driven decision-making in higher education, the following policy recommendations are proposed:

Enhance AI literacy programs for both students and faculty to raise awareness and competency in AI usage.

Invest in AI infrastructure by expanding access to cloud services, high-performance computing resources, and dedicated AI research facilities.

Develop and implement ethical AI governance frameworks to ensure responsible use of AI in academic decision-making.

As Indonesia continues its digital transformation, AI is expected to play an increasingly important role in university management, student engagement, and academic planning. Future research should include longitudinal studies to evaluate AI's long-term impact on learning outcomes, as well as comparative analyses of AI adoption between public and private universities. By fostering an AI-ready educational ecosystem, Indonesian universities can enhance institutional efficiency, student success, and data-driven decision-making in the years ahead.

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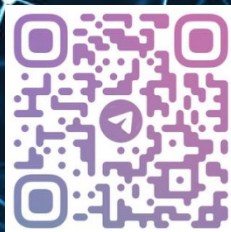
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