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"DETERMINING FACTORS ADOPTION OF ARTIFICIAL INTELLIGENCE (AI) IN LEARNING: SYSTEMATIC LITERATURE REVIEW (SLR). BASED ON THE THEORY OF DIFFUSION OF INNOVATION"

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Abstract

The integration of *Artificial Intelligence* (AI) into the education sector offers significant transformational potential, but its successful implementation depends heavily on the factors driving the adoption of the technology by educators and institutions. This study aims to identify and analyze the determinants of AI adoption in learning contexts using Everett Rogers' Diffusion of Innovation (DOI) Theory framework. The study employed a *Systematic Literature Review* (SLR) method. A literature search was conducted in reputable *databases* (such as Google Scholar, Scopus, and Eric) spanning the past five years. Data were analyzed through the stages of identification, screening, eligibility, and inclusion of relevant articles. The findings indicate that the five characteristics of innovation in DOI Theory—relative advantage, compatibility, complexity, triability, and observability—play a crucial role in AI adoption decisions. Relative advantage in the form of administrative efficiency and personalized learning are key drivers, while technical complexity and lack of supporting infrastructure are significant barriers. Furthermore, external factors such as institutional policies and teacher self-efficacy contribute to accelerating the diffusion process. The study concludes that to increase AI adoption, technology developers and policymakers should focus on reducing system complexity and aligning technology with existing curricula.

Keywords: Artificial Intelligence , Diffusion of Innovation, Learning, Systematic Literature Review , Educational Technology.

Introduction

Artificial Intelligence (AI) technology has brought about a paradigm shift in various sectors, including higher and secondary education. AI in learning is no longer merely a tool , but has become a transformative element capable of providing personalized learning, automating administrative tasks, and even predictive academic data analysis (Zawacki-Richter et al., 2019). However, despite its enormous potential benefits, the adoption of AI in educational settings still faces various systemic and individual challenges. The main problem that arises is the gap between the availability of AI technology and the readiness of educators and institutions to integrate it effectively. Many AI innovations fail to be implemented not because of technical deficiencies, but rather because of a lack of understanding of the sociological and psychological factors of users (Chassignol et al., 2018). In the Indonesian context, challenges such as digital infrastructure and AI literacy are additional obstacles that slow the diffusion of this technology in formal classrooms. To understand this phenomenon, the Diffusion of Innovation Theory developed by Everett Rogers provides a comprehensive framework. This theory emphasizes that the adoption of an innovation is influenced by five key attributes: relative advantage, compatibility, complexity, triability, and observability (Rogers, 2003). Using the DOI framework allows researchers to map why an AI technology may be quickly accepted by one group of educators but rejected by another. Much research has been conducted on AI adoption, but most of it focuses on the technical aspects of algorithms. There is still little literature systematically reviewing adoption factors from a diffusion theory perspective over the past five years. Therefore, this study aims to conduct *a Systematic Literature Review* (SLR) to identify the determinants of AI

adoption in learning. The results are expected to provide theoretical contributions to the development of more targeted educational technology implementation strategies.

METHOD

The literature reviewed in this study was selected from databases such as Google Scholar, Scopus, and other academic databases. The period covered in this review was from 2010 to 2023, using keywords such as "AI adoption in education," "barriers to educational technology adoption," and "innovation diffusion theory." The article selection process followed strict inclusion and exclusion criteria to ensure the quality and relevance of the research. The results of this literature review were analyzed using thematic analysis. This approach enabled researchers to identify key themes emerging from the relevant literature related to barriers to AI adoption in educational institutions.

RESULTS AND DISCUSSION

The following are selected journals analyzed by researchers in this literature review study:

Table 1. Details of the results from the key journals selected for the literature review.

No	Author / Year	Research Title	Journal Name / Publisher	Research Objectives	Research Methods	Research Findings
1	**Nature (2021)**	Possibilities and apprehensions in the landscape of AI in education	*ICCICA*	Exploring the potential and challenges of AI in education.	Descriptive	AI has the potential to personalize learning but poses privacy risks.
2	**Anistasya et al. (2025)**	Implementation of Innovation Diffusion Elements in Educational Technology in the Form of Virtual Labs	*JIIP*	Analyzing innovation adoption elements in virtual laboratories.	Literature review	Relative advantage and compatibility determine the success of educational technology adoption.
3	**Bond et al. (2020)**	Mapping higher education technology research themes and methods	*IJETHE*	Mapping technology research themes in higher education.	*Mapping Review*	Technology research is still dominated by general software rather than specific pedagogical tools.
4	**Cahyanto & Sonjaya (2024)**	Leveraging AI to Improve Learning Evaluation Processes	*Edum Journal*	Reviewing the potential of AI in the efficiency of learning	*Literature Review*	AI is able to speed up evaluation feedback but requires teacher supervision.

				outcome evaluation.		
5	**Chassignol et al. (2018)**	Artificial Intelligence trends in education: A narrative overview	*Procedia Computer Science*	Provides an overview of AI technology trends in schools.	*Narrative Review*	Content personalization and virtual assistants are key trends in the future.
6	**Chen et al. (2020)**	Artificial intelligence in education: A review	*IEEE Access*	Reviewing AI applications from a technical and administrative perspective.	Bibliometric Analysis	AI significantly improves the efficiency of educational administration.
7	**Chiu et al. (2021)**	Digital support for student engagement in remote learning	*BJET*	Examining digital support on student engagement during distance learning.	Quantitative	Autonomy-based digital support increases students' emotional engagement.
8	**Hinojo-Lucena et al. (2019)**	AI in higher education: A bibliometric study	*Education Sciences*	Mapping the impact of AI through global scientific literature.	Bibliometrics	There has been a surge in AI publications, but few focus on ethical values.
9	**Luckin & Holmes (2016)**	Intelligence Unleashed: An argument for AI in education	*Pearson (Book)*	Provides a strong argument for the application of AI in the classroom.	Theoretical	AI should be used to complement teachers, not replace them.
10	**Maulana et al. (2025)**	Ethics of AI Use in Education for Early Childhood Education Teachers	*Indonesian Community Service*	Educating PAUD teachers about the ethical boundaries of AI use.	Community service	Understanding AI ethics is crucial for teachers starting in early childhood education.
11	**Mariko et al. (2026)**	Synergy of Hybrid Learning and AI Policy	*National Research and Technology Seminar*	Analyzing hybrid policies for digital literacy.	Policy Analysis	Government policies must support AI infrastructure to ensure equitable digital literacy.

12	**Mubarok & Aimah (2025)**	Hybrid Model Mentoring for Teacher Development	*Development : JCE*	Addressing AI challenges through hybrid model support.	Descriptive	The hybrid model effectively helps teachers adapt to digital disruption.
13	**Ocaña-Fernández et al. (2019)**	AI and soft skills in higher education	*Propósitos y Rep.*	Examining the relationship between AI and *soft skills development* .	Review	AI can help train cognitive skills but it is difficult to replace empathy.
14	**Oktaviani et al. (2024)**	Implementation of Educational Innovation in the Independent Curriculum	*The Wisdom of Monotheism*	Reviewing the implementation of innovation in the elementary school context.	Qualitative	Curriculum innovation requires mental readiness of teachers and technological support.
15	**Popenici & Kerr (2017)**	Impact of AI on teaching and learning in higher education	*RP TEL*	Exploring the changing role of teachers due to AI.	Analytical	The role of lecturers has changed to become facilitators in the era of artificial intelligence.
16	**Reskiya et al. (2025)**	The effectiveness of AI-based Seek by iNaturalist media	*Pendas*	Testing the effectiveness of AI applications on science learning outcomes.	Experiment	The use of AI-based media significantly improves the learning outcomes of elementary school students.
17	**Rogers (2003)**	Diffusion of Innovations (5th ed.)	*Free Press (Book)*	Explain the theory of the spread of new technology in society.	Theoretical / Empirical	The speed of adoption is influenced by innovation attributes and communication channels.
18	**Soegiarto et al. (2023)**	AI-Based Learning Innovation in Civil Service Schools	*Innovative: JSSR*	Reviewing AI in the Industry 4.0 era at civil service schools.	Descriptive	Civil service schools are starting to integrate AI for intelligent simulations and evaluations.

19	**Turnando et al. (2025)**	Challenges and opportunities for AI implementation in Indonesia	*PM & RP Journal*	Case study of AI implementation in local schools.	Case study	The main challenges are infrastructure costs and limited human resources.
20	**Vial (2019)**	Understanding digital transformation : A review	*JSIS*	Provides a digital transformation framework.	*Thematic Review*	Digital transformation is not just about technology, but a change in strategy and culture.
21	**Zaki & Ulya (2025)**	Analysis of Teachers' Pedagogical and Technological Readiness	*Indonesian Journal of Education.*	Analyzing teacher readiness to adopt adaptive AI.	Qualitative	Teachers need AI-specific pedagogical training, not just technical training.
22	**Zawacki-Richter et al. (2019)**	Systematic review of research on AI applications	*IJETHE*	Assessing the presence of educator perspectives in AI research.	*Systematic Review*	Current AI research is still too focused on technology (*tech-centric*) rather than education.

DISCUSSION

A systematic analysis of the selected literature reveals that the adoption of *Artificial Intelligence* (AI) in the education ecosystem is not simply a technical process, but rather a complex socio-technical phenomenon. Using Rogers' (2003) Diffusion of Innovation Theory framework, the findings suggest that the success of AI integration depends heavily on how the innovation's attributes are perceived by stakeholders. Based on the findings of Zawacki-Richter et al. (2019) and Soegiarto et al. (2023), relative advantage *is* the most dominant driver in this diffusion process. AI offers personalized learning capabilities that are impossible to achieve through conventional methods, where the system can automatically adapt to each individual's learning pace. This is reinforced by Chiu et al. (2021) who stated that AI-based digital support significantly increases student autonomy and engagement. When educators and institutions see these tangible benefits as a solution to human resource constraints, the tendency to adopt the technology increases linearly. However, this enormous potential is often hampered by complexity . Chen et al. (2020) highlighted that complex algorithms and unintuitive user interfaces are the first lines of resistance for new users. In Indonesia, this phenomenon is exacerbated by teachers' low self-efficacy in operating cutting-edge technology. Zaki et al. (2025) found that teachers who feel they lack adequate digital competency tend to view AI as an additional workload rather than a professional aid. Therefore, digital literacy is a crucial moderating variable; as emphasized by Mariko et al. (2026), strong digital literacy has been shown to accelerate the diffusion process by lowering the threshold for perceived complexity and making it easier for users to navigate the technology trial phase. The aspect of compatibility *has* also emerged as a serious ethical challenge in both global and national literature. Research by Alam (2021) and Maulana et al. (2025) revealed a "value clash" between AI automation and traditional humanist pedagogical norms. Concerns about the loss of human control, student data privacy issues, and the threat of machines replacing teachers create inconsistencies with the existing culture of educational organizations. Popenici and Kerr (2017) emphasize that AI adoption will not reach sustainability without an ethical framework aligned with institutional values. If AI is perceived as a threat to academic integrity, the diffusion of innovation will stall at the persuasion stage without ever reaching a permanent adoption decision.

In addition to internal innovation attributes, external factors such as infrastructure and policies play a vital role, especially in the context of developing countries. Cahyanto and Sonjaya (2024) and Turnando et al. (2025) provide empirical evidence that disparities in internet access and limited hardware in various regions in Indonesia directly hinder the emergence of observability . When positive outcomes from AI use cannot be widely witnessed or proven due to technical constraints, the academic community's trust in the innovation will weaken. In this regard, the role of institutional leadership is key to creating effective communication channels. Mubarok and Aimah (2025) suggest that ongoing training strategies and the provision of experimental facilities can enhance trialability , where teachers are given the space to try AI tools on a small scale without the risk of major systemic failure. Integratively, this discussion emphasized that to achieve massive and effective AI diffusion, educational institutions must not focus solely on hardware procurement. A holistic approach is needed that combines technological excellence with curriculum readiness (Oktavianti et al., 2024) and supports effective communication channels between educators and communities of practitioners. Reducing complexity through user - *centered system design* and strengthening regulations that guarantee data security will increase AI's compatibility in the public eye. Thus, the diffusion process of AI innovation can move from a group of innovators to the broad majority (*early majority*), creating an inclusive, safe, and sustainable educational transformation in the future.

CONCLUSION

This study concludes that the adoption of *Artificial Intelligence* (AI) in the learning ecosystem is a socio-technical phenomenon strongly influenced by user perceptions of innovation attributes, where the relative advantage in personalized learning is the main driver, while technical complexity and low teacher self-efficacy are significant barriers. Based on the Diffusion of Innovation Theory framework, it was found that compatibility issues related to data privacy ethics and infrastructure constraints in Indonesia hamper the process of triability and observability of AI benefits in the field. Therefore, accelerating AI diffusion requires a holistic strategy that integrates improving educators' digital literacy, equitable access to technology, and the development of adaptive policy regulations to ensure this technology aligns with pedagogical values and future curriculum needs.

IMPLICATIONS

Theoretically, this research strengthens the relevance of the Diffusion of Innovation Theory in explaining the phenomenon of cutting-edge educational technology, where compatibility and complexity variables prove to be more critical determinants than the mere availability of the technology itself. The practical implication for policymakers is the need to shift the focus from merely procuring hard infrastructure to strengthening human resource capacity through structured AI literacy training to reduce the perception of complexity among educators. For educational institutions, these findings emphasize the importance of creating an ecosystem that supports independent testing and collaboration among teachers to increase the observability of AI's benefits in the classroom. Thus, AI integration will no longer be viewed as a disruption, but rather as a pedagogical tool compatible with instructional values, which will ultimately accelerate the technology adoption curve nationally.

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