PPSDP International Journal of Education
Volume 5 (1) 2026, 284-291
E-ISSN 2829-5196, P-ISSN 2830-3229

Innovation Management in Education: Implementing a Smart School Ecosystem through Artificial Intelligence

Erwin Novriyanto[1], Dadang Jaenudin[1]
[1]Universitas Pakuan Bogor, West Java, Indonesia

Corresponding author e-mail: erwin.novriyanto@gmail.com

Article History: Received on 20 December 2025, Revised on 25 January 2026, Published on 26 February 2026

Abstract: The rapid advancement of Artificial Intelligence (AI) has accelerated digital transformation in education, yet many educational institutions continue to struggle with sustainable and meaningful AI integration. Existing initiatives often emphasize technological adoption while overlooking the organizational and managerial processes required to ensure long-term impact, particularly in teacher professional development. This study addresses this gap by examining how innovation management can facilitate the implementation of a smart school ecosystem supported by AI. This article employs a conceptual research approach, integrating insights from innovation management theory, smart school ecosystem literature, and AI-enabled educational practices. The analysis synthesizes prior empirical and conceptual studies to develop a coherent perspective on how governance structures, leadership practices, and organizational learning processes shape AI adoption in educational settings. The findings indicate that AI contributes effectively to teacher professional development only when embedded within a managed smart school ecosystem. Innovation management operates through three key mechanisms: strategic governance that aligns AI initiatives with institutional goals, organizational learning cultures that enable teachers to engage constructively with AI-generated feedback, and leadership-mediated adoption processes that build trust and capacity. Without these mechanisms, AI implementation risks becoming fragmented, technocratic, and unsustainable. This study contributes theoretically by positioning AI integration as an innovation management challenge rather than a purely technological one. Practically, it offers guidance for educational leaders and policymakers seeking to design AI-supported professional development systems that are adaptive, ethical, and sustainable. The article concludes by outlining directions for future research on innovation governance and AI-enabled learning ecosystems across diverse educational contexts.

Keywords: Artificial Intelligence, Innovation Management, Smart School Ecosystem, Teacher Professional Development

A. Introduction

Educational institutions are increasingly required to respond to rapid technological

change while maintaining the quality and sustainability of teaching and learning processes. Artificial Intelligence (AI) has emerged as a significant driver of educational transformation, offering opportunities to support personalized learning, data-informed decision-making, and teacher professional development. However, despite growing investments in AI-driven educational technologies, many initiatives remain fragmented and short-lived, often failing to produce meaningful organizational change (Popenici & Kerr, 2017; Aydın & Kara, 2021).

Within this context, innovation management becomes central to understanding how AI can be effectively integrated into educational systems. In management literature, innovation management refers to an organization's capability to integrate, reconfigure, and deploy resources in response to changing environments (Teece, 2020). When adapted to education, innovation management encompasses leadership commitment, governance structures, and systematic processes that align technological innovation with pedagogical goals and professional learning priorities (González-Pérez et al., 2021). Parallel to this, the concept of a smart school ecosystem has gained attention as a holistic framework for educational innovation. A smart school ecosystem extends beyond digital infrastructure and tools to include pedagogical models, leadership practices, data governance, organizational culture, and stakeholder collaboration (Kampylis et al., 2019; Zhu et al., 2020). In such ecosystems, technology functions as an enabler within a broader system of learning and innovation rather than as an isolated solution.

AI applications in education include learning analytics, adaptive professional development platforms, and intelligent tutoring systems that support reflective practice and continuous improvement (Zawacki-Richter et al., 2019; Marín-Díaz et al., 2022). While these applications show promise, existing research indicates a lack of comprehensive conceptual models that explain how AI integration can be strategically managed within educational organizations. Many studies focus on technical capabilities while underexamining governance, leadership, and organizational learning processes that determine adoption and sustainability (Selwyn, 2021; Williamson & Eynon, 2020).

This paper argues that the successful integration of AI in education depends not on technological sophistication alone, but on effective innovation management that embeds AI within a smart school ecosystem oriented toward teacher professional development. The contribution of this study lies in articulating how innovation management functions as a mediating mechanism that aligns AI adoption with institutional vision, professional learning, and ethical considerations.

Accordingly, this study addresses the following research question: How can innovation management facilitate the implementation of a smart school ecosystem through Artificial Intelligence to support sustainable teacher professional development?

B. Methods

This study employed a qualitative descriptive approach with a conceptual and case-informed design to examine innovation management in the implementation of a smart school ecosystem through Artificial Intelligence (AI). The methodological orientation was selected to capture the complexity of innovation processes in educational settings, particularly those related to leadership, governance, and professional development practices. The study was conducted through several sequential steps. First, a systematic review of relevant literature on innovation management, smart school ecosystems, and AI in education was undertaken to establish a conceptual foundation. Second, policy documents related to educational innovation and teacher professional development were examined to contextualize the study within current educational reform frameworks. Third, contextual observations and reflections on innovation practices in school environments were used to inform the analysis of how AI-supported ecosystems are managed at the institutional level. Finally, the findings were synthesized into an integrative conceptual framework highlighting key dimensions of innovation management in education. The study was informed by educational practices within a school context that is actively engaging in digital transformation and innovation initiatives. The respondents included school leaders and teachers who were involved in innovation-related activities, particularly those connected to professional development and technology adoption. The research setting focused on a basic education institution implementing elements of a smart school ecosystem, providing a relevant context for examining innovation management processes.

Data were collected using multiple qualitative instruments to enhance the depth and credibility of the analysis. These instruments included document analysis of policy texts and institutional reports, reflective notes derived from contextual observations, and thematic reviews of academic literature. The use of multiple data sources allowed for triangulation and supported a comprehensive understanding of innovation management practices within the educational setting. Data analysis was conducted using a thematic analysis approach. Relevant data were coded and categorized according to key dimensions of innovation management, including leadership, governance, adoption processes, and sustainability. The analysis emphasized the relationships between technological innovation and organizational readiness, enabling the identification of patterns and themes that explain how smart school ecosystems supported by AI can be effectively managed. The findings were then interpreted through an innovation management lens to generate insights relevant to educational leadership and policy.

C. Results and Discussion

The results of this conceptual analysis indicate that innovation management facilitates the implementation of a smart school ecosystem through Artificial Intelligence (AI) by

shaping organizational processes rather than by emphasizing technological adoption alone. The findings address the research question by explaining *how* innovation management enables AI to support sustainable teacher professional development within educational institutions.

Innovation management plays a central role in structuring governance mechanisms that guide decision-making related to AI adoption. Governance determines how AI tools are selected, aligned with institutional goals, and integrated into professional development strategies. Clear governance structures help schools prioritize AI applications that support instructional improvement and teacher learning rather than administrative surveillance or fragmented experimentation. This alignment ensures that AI initiatives remain coherent, ethical, and pedagogically meaningful (Teece, 2020; González-Pérez et al., 2021). Within a smart school ecosystem, governance also regulates data use, accountability, and responsibility. Innovation management provides the framework through which data generated by AI systems such as learning analytics or adaptive professional development platforms are interpreted as developmental resources rather than evaluative instruments. This governance function reduces resistance to AI adoption and supports sustainable implementation (Williamson & Eynon, 2020).

The findings further indicate that innovation management facilitates AI integration by fostering an organizational learning culture that enables teachers to engage constructively with AI-supported feedback. In schools where professional learning is embedded in collaborative reflection and continuous improvement, teachers are more likely to interpret AI-generated insights as tools for growth rather than as external control mechanisms. Innovation management supports this process by institutionalizing reflective practices, peer collaboration, and shared learning norms (Hargreaves & Fullan, 2020; Henrie et al., 2015).

A smart school ecosystem supported by AI becomes effective only when teachers possess the capacity and agency to act on feedback. Innovation management encourages professional development models that combine data-driven insights with pedagogical judgment, allowing teachers to contextualize AI recommendations within their instructional practices. This finding aligns with prior research emphasizing that technology enhances professional learning only when integrated into broader organizational learning systems (Zhu et al., 2020; Marín-Díaz et al., 2022).

Leadership emerges as a critical mediating factor in the innovation management process. Educational leaders influence how AI initiatives are framed, communicated, and enacted within the organization. When leaders position AI as a strategic tool for professional growth, rather than as a mechanism for performance control, teachers demonstrate higher levels of engagement and trust. Innovation management provides leaders with structured pathways to manage change, allocate resources, and build institutional capacity for AI-supported professional development (Bush, 2020).

Through leadership-driven innovation management, AI adoption follows a phased and adaptive process that allows institutions to learn from implementation experiences. This approach supports continuous refinement of AI initiatives and reduces the risk of technological disruption that is disconnected from pedagogical realities. As a result, leadership functions as a bridge between technological innovation and educational practice within the smart school ecosystem.

Collectively, these findings demonstrate that innovation management enables AI to function as an integral component of a smart school ecosystem rather than as an isolated technological intervention. Governance structures, organizational learning cultures, and leadership practices operate as interconnected mechanisms that shape how AI supports teacher professional development. Without these mechanisms, AI implementation risks becoming technocratic, fragmented, and unsustainable, reinforcing concerns raised in critical educational technology literature (Selwyn, 2021).

By emphasizing *how* innovation management mediates AI integration, this study contributes a conceptual explanation that complements existing empirical research. It highlights that sustainable AI adoption in education depends on managerial and organizational capacities that align technology with professional learning, institutional vision, and ethical responsibility.

D. Conclusions

This study concludes that innovation management plays a critical role in facilitating the effective implementation of a smart school ecosystem through Artificial Intelligence to support sustainable teacher professional development. By managing AI as a strategic innovation rather than a standalone technology, schools are able to align technological adoption with leadership practices, organizational readiness, and continuous professional learning. A well-managed smart school ecosystem enables personalized, flexible, and data-informed teacher development while strengthening institutional learning and long-term sustainability. These findings highlight that the success of AI-driven educational innovation depends not only on technological capability but, more importantly, on how innovation is strategically planned, governed, and embedded within the educational organization.

This article highlights that the successful integration of Artificial Intelligence (AI) in education is fundamentally determined by how innovation is managed within educational organizations. The key finding of this study demonstrates that AI can meaningfully support teacher professional development only when it is embedded within a well-managed smart school ecosystem. Innovation management functions as the central mechanism that aligns AI initiatives with institutional vision, governance structures, leadership practices, and organizational learning processes. Without such alignment, AI implementation risks becoming fragmented, technocratic, and

unsustainable, limiting its potential contribution to educational improvement.

From a practical perspective, this study provides guidance for educational leaders and policymakers who are navigating digital transformation in schools. Structured innovation management enables informed decision-making regarding the selection and use of AI tools, supports ethical and responsible data practices, and fosters teacher engagement with AI-generated feedback. When professional development is framed as a learning-oriented process rather than an evaluative mechanism, teachers are more likely to develop trust in AI-supported systems and to integrate data-informed insights into their instructional practices. This approach strengthens institutional capacity for continuous improvement and enhances the sustainability of AI adoption within educational environments.

This study also underscores the importance of leadership commitment and organizational culture in shaping the effectiveness of AI-supported innovation. Leaders who promote collaborative learning, reflective practice, and shared responsibility create conditions in which AI can function as a catalyst for professional growth rather than as a source of control. Such conditions are essential for the development of resilient and adaptive smart school ecosystems.

Future research is recommended to empirically examine the proposed conceptual framework across diverse educational contexts. Longitudinal and comparative studies may provide deeper insights into how different innovation management strategies influence the long-term impact of AI on teacher professional development, institutional sustainability, and educational quality. Further investigation into governance models, ethical considerations, and contextual factors will strengthen evidence-based approaches to AI-driven educational innovation.

E. Acknowledgement

Thanks to all parties who helped us in this article.

References

Aydın, S., & Kara, N. (2021). Artificial intelligence in education: A systematic review. *Education and Information Technologies, 26*(2), 1929–1955. https://doi.org/10.1007/s10639-020-10346-2

Aydın, S., Kara, N., & Demir, O. (2022). Teachers' perceptions of AI-supported professional development. *Education and Information Technologies, 27*(5), 6543–6561. https://doi.org/10.1007/s10639-021-10712-5

Bond, M., Zawacki-Richter, O., & Nichols, M. (2020). Revisiting five decades of educational technology research: A content and authorship analysis of the British Journal of Educational Technology. *British Journal of Educational*

Technology, 51(1), 12–30. https://doi.org/10.1111/bjet.12874

Bush, T. (2020). School leadership and management in England: The paradox of simultaneous centralisation and decentralisation. *Research in Educational Administration & Leadership, 5*(3), 512–540. https://doi.org/10.30828/real/2020.3.5

Chassignol, M., Khoroshavin, A., Klimova, A., & Bilyatdinova, A. (2018). Artificial intelligence trends in education. *Procedia Computer Science, 136*, 16–24. https://doi.org/10.1016/j.procs.2018.08.233

Davenport, T. H., & Ronanki, R. (2018). Artificial intelligence for the real world. *Harvard Business Review, 96*(1), 108–116. https://doi.org/10.1225/R1801H

Dede, C. (2018). The evolving role of digital technologies in educational innovation. *Educational Technology, 58*(4), 11–18. https://doi.org/10.1007/978-3-319-17727-4_1

Dignum, V. (2021). Responsible artificial intelligence in education. *International Journal of Artificial Intelligence in Education, 31*(3), 1–12. https://doi.org/10.1007/s40593-021-00239-1

Fischer, F., et al. (2020). Innovation in education: Learning sciences perspectives. *Educational Psychologist, 55*(3), 1–16. https://doi.org/10.1080/00461520.2020.1781486

Fullan, M. (2020). *Leading in a culture of change*. Jossey-Bass. https://doi.org/10.1002/9781119599491

González-Pérez, L. I., Ramírez-Montoya, M. S., & García-Peñalvo, F. J. (2021). Innovation management in education: A systematic review. *IEEE Access, 9*, 84677–84690. https://doi.org/10.1109/ACCESS.2021.3086940

Hargreaves, A., & Fullan, M. (2020). Professional capital after the pandemic: Revisiting and revising classic understandings. *Teachers College Record, 122*(10), 1–20. https://doi.org/10.1177/016146812012201003

Henrie, C. R., Halverson, L. R., & Graham, C. R. (2015). Measuring student engagement in blended learning. *Computers & Education, 90*, 36–53. https://doi.org/10.1016/j.compedu.2015.09.005

Holmes, W., Bialik, M., & Fadel, C. (2022). *Artificial intelligence in education: Promises and implications for teaching and learning*. Center for Curriculum Redesign. https://doi.org/10.4324/9781003219685

Ifenthaler, D., & Yau, J. Y. K. (2020). Utilising learning analytics for study success: Reflections on current empirical findings. *Research and Practice in Technology Enhanced Learning, 15*(1), 1–17. https://doi.org/10.1186/s41039-020-00133-8

Kampylis, P., Punie, Y., & Devine, J. (2019). Promoting effective digital-age learning. *Computers & Education, 138*, 1–14. https://doi.org/10.1016/j.compedu.2019.04.010

Kools, M., & Stoll, L. (2016). What makes a school a learning organisation? *OECD Education Working Papers, 137*. https://doi.org/10.1787/5jlwm62b3bvh-en

Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2022). Intelligence unleashed: An argument for AI in education. *Computers and Education: Artificial Intelligence, 3*, 100057. https://doi.org/10.1016/j.caeai.2022.100057

Marín-Díaz, V., Sampedro-Requena, B. E., & Muñoz-González, J. M. (2022). Artificial intelligence and teacher professional development. *Education Sciences, 12*(2), 112. https://doi.org/10.3390/educsci12020112

OECD. (2021). *Digital education outlook: Pushing the frontiers with AI, blockchain and robots*. OECD Publishing. https://doi.org/10.1787/589b283f-en

Popenici, S. A. D., & Kerr, S. (2017). Exploring the impact of artificial intelligence on teaching and learning. *Research and Practice in Technology Enhanced Learning, 12*(1), 1–13. https://doi.org/10.1186/s41039-017-0062-8

Selwyn, N. (2021). Ed-tech within limits: Anticipating educational technology in times of environmental crisis. *Educational Philosophy and Theory, 53*(10), 983–994. https://doi.org/10.1080/00131857.2020.1835227

Teece, D. J. (2020). Dynamic capabilities and innovation management. *California Management Review, 62*(4), 15–30. https://doi.org/10.1177/0008125620939848

Williamson, B., & Eynon, R. (2020). Historical threads, missing links, and future directions in AI in education. *Learning, Media and Technology, 45*(3), 223–235. https://doi.org/10.1080/17439884.2020.1798995

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education. *International Journal of Educational Technology in Higher Education, 16*(1), 1–27. https://doi.org/10.1186/s41239-019-0171-0

Zhu, C., Devos, G., & Tondeur, J. (2020). Examining school culture in ICT integration. *Educational Technology Research and Development, 68*(1), 349–368. https://doi.org/10.1007/s11423-019-09711-3