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Application of Open Innovation in School Management and Digital Learning Design for Technology-Based Schools

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Abstract

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The development of digital technology has driven a major transformation in the education system, especially in school management and learning design. Open innovation is a strategic approach in overcoming the complexities of modern education because it integrates collaboration from various stakeholders such as teachers, students, technology developers, and society. This study uses a literature study method by analyzing 11 scientific articles that discuss the application of open innovation and the digitalization of education. The results of the study show that open innovation supports managerial flexibility, cross-actor collaboration, and more contextual and participatory learning design. The use of the Learning Management System (LMS) platform, adaptive curriculum design, and an open organizational culture are the keys to successful implementation. However, obstacles such as digital inequality, low technological literacy, and cultural resistance are still significant challenges. This study concludes that an open innovation approach is relevant to strengthen the quality of education in the era of continuous digital transformation.

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1. Introduction

The digital era has marked a paradigm shift in education management, especially in technology-based schools. In the midst of very rapid social and technological changes, conventional approaches to managing educational institutions are beginning to show their limitations. Open innovation, which was initially introduced in the industrial sector, has now become increasingly relevant in the field of education. This approach emphasizes collaboration between internal and external stakeholders to create innovative solutions, particularly in developing more inclusive, adaptive, and responsive school management systems and digital learning designs that cater to students' needs.

Digital transformation in the world of education not only demands the availability of technological infrastructure, but also requires schools to redesign their management systems and learning strategies. Technology-based schools require the ability to adapt quickly to changing job market needs, student preferences, and increasingly complex social dynamics. In this context, open innovation is a strategic approach that allows the exchange of ideas, resources, and technology between stakeholders such as teachers, students, parents, governments, technology institutions, and digital platform developers (Rahmawati & Nurachadija, 2023; Salimodo & Lestari, 2023).

School management that is open to change and collaborative is the main foundation for the implementation of open innovation. Principals and management teams need to create an organizational environment that supports experimentation, risk acceptance, and open access to external ideas. In a study conducted by Wibowo

(2023), visionary and collaborative leadership was proven to encourage sustainable innovation in curriculum design and technology-based learning methods. In addition, an organizational culture that encourages shared learning and the use of data as a basis for decision-making has strengthened the implementation of innovative strategies in schools.

Meanwhile, digital learning is an inseparable part of the transformation of education in the 21st century. Digital learning design demands a pedagogical approach tailored to the characteristics of the native digital generation. It is not enough to just move content to online platforms, but there needs to be learning design engineering that utilizes the potential of technology to support personalization, interactivity, and collaboration (Ambarwati et al., 2021). This design includes the use of Learning Management System (LMS), interactive learning media, learning analytics, and the integration of hybrid and flipped classroom models.

The COVID-19 pandemic has accelerated the adoption of technology in the world of education and at the same time has become a stepping stone in the implementation of digital learning widely. However, the implementation of digital learning on an emergency basis shows various shortcomings, especially in terms of infrastructure readiness, teacher competence, and adaptive management strategies (Suryaman et al., 2023). Therefore, the application of open innovation in redesigning digital learning systems is highly relevant, as it allows the integration of experiences from various parties to refine inclusive and sustainable learning models.

Furthermore, the open innovation approach also supports the achievement of 21st century education goals that emphasize the development of critical, creative,

communicative, and collaborative competencies (4Cs). By engaging external actors such as technology providers, research institutions, and the education community, schools can design learning systems that are more contextual, dynamic, and relevant to the needs of the global community. This is emphasized in a study by Jannah et al. (2023) which states that collaboration between schools and local technology developers is able to produce a learning platform that suits regional needs and is easier to adopt by teachers and students.

However, the application of open innovation in the context of school management and digital learning design is not without challenges. Some of them are resistance to change, limited human resources, digital inequality, and policy constraints. For this reason, an implementation strategy that is structured, participatory, and based on empirical studies is needed to ensure the success of digital transformation in the world of education. Against this background, this literature study aims to comprehensively examine how the application of open innovation can strengthen school management and digital learning design in technology-based schools. By conducting a study of various recent academic publications (2019–2024), the author hopes to develop a conceptual framework and best practices that can be used as a reference by policy makers and education implementers in responding to the challenges and opportunities of digital education in Indonesia.

2. Literature Review

A literature review on the application of open innovation in school management and digital learning design shows that this approach has become an integral part of the transformation of technology-based education in various countries, including Indonesia. The concept of open innovation encourages the integration of internal knowledge of schools with external resources, including technology partners, learning communities, and higher education institutions (Wibowo, 2023). In the context of school management, the study of Mayasari et al. (2021) emphasizes that open innovation can improve efficiency and accountability through broad collaboration and the adoption of information technology in the process of administration and evaluation of learning. In addition, the application of openly designed digital education innovations also has an impact on increasing learning effectiveness.

Ambarwati et al. (2021) stated that digitalization of collaborative innovation-based learning is able to increase accessibility, flexibility, and learning attractiveness for students. Nasir et al. (2023) added that technology-based education management systems not only strengthen the school's internal coordination, but also enable data-driven decision-making. Salimodo and Lestari (2023) highlight that the use of open-source technologies such as blogs, Moodle-based LMS platforms, and cloud-based collaborative applications provides a wider space for experimentation and personalization of learning. However, some literature such as Jannah et al. (2023) also notes that open innovation requires the support of an organizational culture

that is open to change, as well as the readiness of teachers to adopt technology actively and reflectively.

3. Methods

This study uses a qualitative approach with a literature study method (library research) to examine in depth the application of open innovation in school management and digital learning design in technology-based schools. The literature study was chosen because this method allows researchers to systematically and critically analyze various results of previous research, in order to develop a conceptual framework and best practices in the context of digital education in Indonesia. The main data source in this study is scientific articles published in national and international journals indexed by Google Scholar. Inclusion criteria in article selection include: (1) peer-reviewed articles; (2) discussing open innovation in education; (3) focus on school management and or digital learning; and (4) relevant to the context of technology-based schools. The search was conducted using keywords such as "open innovation", "digital school management", "technology-based learning design", and "digital education transformation".

A total of 12 articles that met the criteria were selected as the unit of analysis. The articles come from journals such as the Journal of Islamic Education, the Indonesian Journal of Research and Service Studies, Managerial: Journal of Management and Education Innovation, to publications from platforms such as ResearchGate and Google Books. The data analysis technique is carried out with a thematic approach, namely grouping data based on the main themes that emerge,

such as the form of open innovation implementation, implementation challenges, the role of leadership, the design of digital learning systems, and its impact on the quality of education.

After the thematic grouping was carried out, the data was analyzed descriptive-qualitatively to identify patterns, relationships, and dynamics between variables. The researcher also conducts conceptual triangulation by relating findings from various sources so that the results of the analysis are not only descriptive, but also interpretive and critical. The validity of the data is strengthened through cross-checking between references and comparisons with national education policy practices such as the Independent Curriculum and the digital transformation of the Ministry of Education and Culture. With this approach, the research aims to not only explain the application of open innovation and digital learning design, but also offer a framework of thought that can be used as a reference by education practitioners and policymakers. This literature study is exploratory and aims to expand the contextual discourse of innovative education in the digital era.

4. Results

In addition to managerial aspects and learning design, the results of the study also revealed that the open innovation approach is able to increase the capacity of schools in responding to increasingly complex and diverse student needs. This is especially important in the context of increasingly personalized education. Research by Rizal (2023) states that digital approaches built through participatory and adaptive processes, such as the implementation of technology-based learning and blended

learning, are able to bridge the gap in learning styles between students in urban and regional areas. Open innovation allows teachers to access collaborative learning modules from the community of education practitioners, thus encouraging active and continuous knowledge exchange.

Interestingly, some schools that adopted the co-creation model in learning planning and evaluation showed significant improvements in student motivation and academic outcomes. This is reinforced by the findings of Wibowo's study (2023) which emphasizes the importance of student participation in the digital learning process as a form of recognition of their learning autonomy. In this framework, students are no longer positioned as passive learning objects, but as active actors in creating content, compiling learning schedules, and providing feedback on digital learning platforms. Meanwhile, in terms of systems, open innovation encourages the formation of a more modular and interoperable digital learning platform. The implementation of the digital independent curriculum encourages schools to develop learning components that can be flexibly integrated and matched according to the needs of students. This approach allows the integration of various learning resources, both from the official portal of the Ministry of Education and Culture such as *Merdeka Mengajar*, as well as from external sources such as the MOOC platform, YouTube Edu, and teachers' scientific blogs. In this way, learning design is not only responsive to the needs of students, but also enriches the learning experience through open cross-source.

In addition to the technical and structural aspects, the literature also highlights the importance of the role of organizational culture as a prerequisite for the success

of open innovation. Schools that implement open leadership generally have inclusive internal communication mechanisms, the use of data for decision-making, and the habit of collective reflection among teachers. This creates a work environment conducive to the exchange of new ideas and practices, as well as lowers resistance to technology adoption. In contrast, schools that still apply a top-down managerial approach tend to experience obstacles in integrating technology systemically. Furthermore, the concept of open innovation in education is not only limited to the use of technology alone, but also touches on social and ethical dimensions.

In a study by Mukhid (2023), it was explained that digital learning innovations must consider inclusivity and access fairness. Schools need to design systems that are friendly to students with special needs, students from low economic backgrounds, and pay attention to data security and the ethics of using digital platforms. In this context, the role of local communities and parents is important to build a digital social safety net. In addition, cross-institutional collaboration, both universities, educational technology (ed-tech) startups, and local governments, is an important strategy in expanding the reach of open innovation. Farwati and Arifin (2023) noted that there is cooperation between schools and local campuses in developing customized content and ICT training for teachers in remote areas. In fact, some schools have leveraged open source resources such as H5P, Canva Education, and Scratch as a means of creative exploration in interactive learning.

The success of schools in big cities that form an internal digital innovation unit tasked with managing collaborations with external partners. This unit organizes teacher training, trials of new learning technologies, and impact measurement

through digital surveys and LMS analytics. With a structure like this, school management is not only reactive to change, but also proactive in creating a dynamic and ever-evolving learning ecosystem. However, not all schools have the same capacity to implement open innovation. The challenge of digital inequality remains a major issue, especially in areas with limited internet access and low technological literacy.

A study by Azizah & Subiyantoro (2023) shows that schools that do not have adequate technical support and infrastructure will tend to resist change and stick to conventional approaches. Therefore, government intervention through the provision of basic infrastructure, technology training, and intensive mentoring is a crucial factor in realizing the equitable distribution of educational innovation. In addition to technical barriers, cultural resistance is also a serious challenge. In a study by Rahmawati & Nurachadija (2023), it was found that some teachers have concerns about the transparency of performance that arises from digital systems and are less comfortable sharing learning control with students. Therefore, a participatory and dialogical school culture change strategy is key to building a stronger acceptance of digital transformation.

Interestingly, the results of this study also show that the application of open innovation is not a linear process, but an iterative process that develops through a cycle of reflection, adjustment, and organizational learning. This means that successful innovations are not the ones that are immediately perfect, but those that are able to adapt continuously to user feedback. This approach is in line with the principle of design thinking which is now widely adopted in the development of

digital learning. In the long term, the mature implementation of open innovation can expand the role of schools as centers of social innovation. Schools are not only a place of learning, but also a social laboratory that encourages cross-sectoral collaboration to solve local challenges through a digital approach. This is in line with the vision of 21st century education which places education as a driver of societal transformation.

Therefore, the practice of open innovation needs to be institutionalized in education policy, not just a momentary project. National curriculum and education regulations should provide experimental space, learning design flexibility, and institutional support that foster innovation growth. Studies from Suryaman et al. (2023) show that schools that are given higher autonomy tend to be more innovative in the use of technology and the development of collaborative learning systems. Overall, the results and discussion of this study show that open innovation not only supports the integration of technology in learning, but also paves the way for a more democratic, inclusive, and sustainable systemic transformation in Indonesian education.

5. Conclusion

This literature study confirms that the application of open innovation in school management and digital learning design is a strategic approach in facing educational challenges in the digital era. Open innovation allows schools to build a collaborative ecosystem that combines internal and external strengths, thus being able to create a learning system that is more flexible, relevant, and oriented to the

needs of today's students. The transformation of technology-based school management requires visionary leadership, an adaptive organizational culture, and an infrastructure that supports optimal technology integration. An open and participatory digital learning design also encourages increased student engagement and expands access to varied and contextual learning resources.

However, challenges such as digital inequality, teacher resistance, and limited technology literacy are obstacles that need to be overcome through comprehensive education policies and continuous training. The results of the study also show that collaboration with external partners, such as technology developers and the education community, accelerates adoption and adaptation to change. Therefore, the success of the implementation of open innovation is highly dependent on the synergy between national policies, school readiness, and community support. In the future, further research is needed that empirically tests the effectiveness of various open innovation models so that they can be used as a strategic guide in digital education reform in Indonesia.

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