Indonesian Journal of Management and Economic Research
Volume: 03 No. 01 (2025) ISSN 3047-9363

Building an Innovative Culture through Technological Leadership: An Empirical Approach

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Abstract Digital transformation in education has put schools at a critical point to adapt and innovate systemically. This study aims to describe the practice of technological leadership and its contribution to the formation of an innovative culture in an integrated Islamic school environment. Using a qualitative approach and case study design, the research was conducted at SMP IT Aqidah Bekasi through participatory observation, in-depth interviews, and documentation studies. The results show that the principal plays a central role in formulating the digital vision, building teachers' capacity, providing technological infrastructure, and creating a collaborative ecosystem that supports innovation. An innovative culture grows through teacher learning communities, student expression spaces, and the integration of Islamic values into the digitization process. However, challenges such as senior teacher resistance, limited advanced training and less than optimal documentation of innovations are still obstacles that need to be overcome. This study concludes that strategic, participatory and value-based technology leadership is an important catalyst for sustainable school culture transformation. The implications of these findings include the development of contextualized educational leadership models, as well as the formulation of structured and inclusive innovation policies.

Keywords: Technological leadership, innovative culture, digital transformation, integrated Islamic school, 21st century education

INTRODUCTION

The development of digital technology has brought great disruption in various sectors of life, including in the world of education. In the context of digital transformation, schools are not only required to adopt technology as a learning tool, but also as a strategic element in shaping a more adaptive and innovative work culture, managerial processes and learning. Therefore, educational leadership plays a crucial role in directing technology-based change that is sustainable and meaningful for all school members.

Technological leadership is a leadership approach that integrates the use of digital technology into the strategy of educational organizations, not only in administrative terms but also in the transformation of pedagogy and organizational culture. According to Anderson and Dexter (2005), principals who have high technological literacy are able to facilitate, inspire and become agents of change through the use of technology in the school system. This approach requires not only mastery of digital tools, but also strategic vision, managerial competence and the courage to take innovative risks.

An innovative culture is an absolute requirement for schools to survive and thrive in an era of rapid change. Hargreaves and Fullan (2012) emphasize the importance of a school work environment that encourages the exploration of new ideas, continuous learning and collaboration among stakeholders. In an innovative culture, all components of the school-teachers, students, leaders and staff-are encouraged to become agents of change who are able to identify challenges and respond to them in creative and adaptive ways. However, such a culture will not grow naturally without a leadership figure who is able to create a supportive and empowering organizational climate.

Digital transformation in schools must also take into account the local social and cultural context. In this case, integrated Islamic schools (SIT) present a unique complexity, as they combine academic, spiritual and Islamic values. Leadership in such schools is required to be not only technologically competent, but also able to synergize digital transformation with Islamic values that are the foundation of the curriculum and school culture. This requires an adaptive, spiritual and visionary leadership model.

One level of education that has a strategic role in shaping the character and way of thinking of students is Junior High School (SMP). During this period, students are experiencing a transition period from childhood to adolescence, where innovative and meaningful education is very important to form the foundation of critical thinking and positive character. Integrated Islamic Junior High School as an educational institution that combines religious and academic values has a great opportunity to develop a technology-based education model integrated with Islamic spiritual values.

However, the reality on the ground shows that many schools are still experiencing challenges in building an innovative technology-based culture. Some of the main obstacles include limited technological infrastructure, low digital literacy of teachers and staff, lack of continuous training, and no collective vision that supports innovation. These obstacles become more complex if there is no strong and purposeful leadership support.

Previous studies have emphasized the importance of the principal's role in shaping an innovative organizational culture that is open to change. Leithwood et al. (2020) emphasized that effective principals are those who are able to build structures and cultures that encourage professional learning, collaboration, and continuous innovation. In this context, technological leadership can be a form of transformational leadership that is relevant to answer the demands of the times.

SMP IT Aqidah Bekasi is one example of an integrated Islamic school that has begun to adopt a digital approach in the learning process and school management. However, there are not many empirical studies that illustrate how technological leadership practices in this school contribute to the formation of an innovative culture. This research aims to fill this gap by comprehensively describing the dynamics and practices of technological leadership in the school.

By exploring the forms of technological leadership practiced, the challenges faced, and its impact on innovative culture, this research is expected to make conceptual and practical contributions to the development of technology-based educational leadership models, especially in Islamic education. In addition, this research also seeks to show how the integration between Islamic values and technology can strengthen each other in creating a dynamic, collaborative and future-oriented school culture.

Based on this background, this research is designed to answer two main questions: (1) What is the form of technological leadership applied in Aqidah Bekasi Integrated Islamic Junior High School? and (2) How does technological leadership influence in building an innovative culture in the school environment? These questions become the explorative foundation for empirical studies that are expected to enrich the educational leadership literature in the digital era.

Literature Review

Technological leadership in the context of education is a concept that continues to evolve along with the rapid digitalization of schools. It refers to the principal's ability to direct, manage and encourage the use of technology to achieve educational goals more effectively and efficiently. According to Anderson and Dexter (2005), technological leadership is not only about mastering digital tools, but also involves developing a strategic vision, strengthening the capacity of human resources, and the ability to lead changes in organizational culture through technology.

Dexter (2011) reinforces this perspective by asserting that technology leadership is part of a system of practices involving artifacts, policies, social interactions and cultural norms in schools. Principals cannot go it alone, but need to create a collaborative ecosystem that allows technology integration to take place in a systemic and sustainable manner. Therefore, the success of technology leadership depends largely on the ability of school leaders to create support structures and build collective trust in innovation.

One important aspect of technology leadership is clarity of digital vision. Leithwood et al. (2020) stated that effective leaders always start the transformation by developing a vision that can be understood and shared by all school members. This vision becomes a framework for policy making, resource management, and the formation of organizational culture. In the context of Islamic education, the vision must be aligned with Islamic values so that digital transformation does not conflict with the spiritual and moral mission of educational institutions.

In addition to vision, capacity building of teachers and education personnel is a crucial indicator of technological leadership. Flanagan and Jacobsen (2003) emphasize the importance of training, mentoring, and creating a space for digital pedagogy experimentation for teachers. The principal acts as a facilitator who encourages teachers to keep learning and trying new approaches without fear of failure. Thus, the principal's role is not only as a manager, but also as an instructional leader and builder of an innovative culture.

An innovative culture itself is an important foundation for successful technology integration in schools. According to Hargreaves and Fullan (2012), an innovative culture involves the courage to experiment, adaptability to change and strong collaboration among school members. Schools with such a culture will be better prepared for uncertainty, more responsive to technological opportunities and more oriented towards continuous improvement. This culture cannot be formed instantly, but requires a long-term process supported by visionary and participatory leadership.

Komariyah et al. (2022) in their study showed that an innovative culture in schools can start from the leadership example. When principals show commitment and consistency in implementing technology and supporting innovative ideas, teachers and students will feel empowered to contribute. One of the concrete forms of this culture is the establishment of teacher learning communities (PLCs), student innovation spaces, and rewarding creative ideas that have an impact on learning or school management.

In the context of integrated Islamic schools, digital transformation has distinctive characteristics. Tilman (2024) reminds us that this kind of transformation should not neglect the spiritual dimension that is the main strength of Islamic schools. Digitalization should be used to strengthen Islamic values, not just to improve technical efficiency. This encourages the birth of a model of technological leadership that is moral and transformative - where technology is interpreted as a means of worship and empowerment of the people.

Putrawan et al. (2023) emphasized that an innovative culture in Islamic schools will be stronger if it is built on an inclusive and adaptive Islamic vision. This means that schools do not reject modernization, but integrate it with local wisdom and religious values. In this model, the principal must have a dual capacity: being able to manage technology and at the same time maintain the integrity of values. The collaboration between technology and spirituality becomes the main force in shaping a sustainable innovative culture.

Ghavifekr and Yulin's (2022) research in Malaysia also found that digital collaboration between teachers and active participation of school leaders are two factors that determine the success of an innovative culture. When leaders encourage the use of technology to build knowledge networks and support collaborative learning projects, cultural change can occur organically. Therefore, technology leadership must be distributive, participatory and data-driven to foster an innovative ecosystem.

This literature study shows that the link between technology leadership and innovative culture is mutually reinforcing. Technological leadership provides the direction, resources and inspiration for change, while innovative culture provides the climate that allows the change to survive and thrive. In the context of integrated Islamic schools, the synergy between the two is key to realizing 21st century education based on faith, science and technology.

RESEARCH METHODS

This research uses a qualitative approach with an intrinsic case study design, as it aims to describe in depth the practice of technological leadership and the dynamics of innovative culture formation in the context of integrated Islamic schools. This approach was chosen to capture the complexity of the phenomenon holistically and contextually, especially in understanding the interaction between Islamic values, educational policies, and the utilization of digital technology at the junior high school level. The qualitative approach allows researchers to explore the experiences, perceptions and practices of school actors in a narrative and reflective manner, resulting in a rich and meaningful understanding.

The locus of this research is Aqidah Bekasi Integrated Islamic Junior High School located in Graha Cikarang Complex, Simpangan Village, North Cikarang District, Bekasi Regency. This school was chosen because it has started the adoption of technology-based learning but is still in the consolidation stage of innovative culture. The characteristics of SMP IT Aqidah Bekasi that integrates the national curriculum, Islamic values, and managerial digitalization make it a relevant case study to explore technological leadership in the context of contemporary Islamic education. In addition, the school's openness to research collaboration is a major supporting factor in the in-depth and layered data collection process.

Data collection techniques were conducted through triangulation of methods, namely participatory observation, in-depth interviews, and documentation studies. Observations were made directly to the activities of principals, teachers and students in using technology and initiating innovations in the school environment. Semi-structured interviews were conducted with principals, vice principals for curriculum and student affairs, senior teachers, administrative staff and selected students to explore perceptions and practices related to technology leadership and innovative culture. Meanwhile, the documentation study included a review of the School Work Plan and Budget (RKAS) document, digitization policy, ICT training program, and documentation of innovative technology-based activities that have been implemented by the school.

Data analysis was conducted using the interactive approach of the Miles and Huberman model, which includes three main stages: data reduction, data presentation, and conclusion drawing/verification. Data obtained from interviews, observations, and documents were analyzed thematically to identify the main patterns that illustrate the relationship between technological leadership and innovative culture. Data validity was maintained through source and method triangulation techniques, as well as member checking with interviewees to confirm the accuracy of the researcher's interpretations. This research is also committed to the principles of research ethics, such as informed consent, anonymity, and limited use of data for academic purposes.

RESULTS AND DISCUSSION

The results of this study show that technology leadership at SMP IT Aqidah Bekasi has been executed with a transformational orientation, where the principal plays a central role in driving technology adoption in various aspects of management and learning. The principal actively develops the school's digital vision through integrating Learning Management System (LMS) such as Google Classroom and Moodle into daily learning practices. This not only demonstrates the high technological literacy of the leadership but also shows a consistent strategic direction towards the utilization of technology as an instrument to improve the quality of education.

The principal's leadership is also reflected in the initiative to digitize school administration through the implementation of the School Information System (SIS), which has replaced most manual processes such as grade management, student attendance and academic information distribution. This has accelerated administrative workflows and enabled efficient communication among school personnel. This implementation cannot be separated from the support of the school principal who provides regular training for staff and ensures that adequate technology infrastructure is available in each work unit.

One important finding is the principal's ability to facilitate regular teacher training in educational technology. This training covers the use of learning platforms, digital content creation and strengthening ICT-based pedagogical competencies. Teachers reported that this training increased their confidence in implementing innovative learning strategies, including flipped classroom and digital-based projects. Thus, the principal's role as instructional leader is realized through empowering teachers' professional capacity.

In terms of innovative culture, the formation of teacher learning communities (PLCs) is a strong indicator of the success of cultural transformation in schools. This community encourages the practice of sharing ideas and collaborative reflection among teachers, especially in exploring technology-based learning models. The principal facilitates a weekly meeting space for the PLCs and provides a digital platform to document the results of their explorations. This initiative not only improves the quality of learning but also strengthens professional solidarity among educators as the foundation of an innovative culture.

Students are also positively impacted by the technology leadership implemented. School-facilitated technology clubs and digital innovation competitions provide space for students to express creative ideas and apply 21st century skills. The principal explicitly encourages students to engage in ICT-based projects, such as the creation of simple apps, educational vlogs and digital campaigns based on Islamic values. Thus, innovation becomes a hands-on experience that shapes students' character and digital prowess.

However, this study also found some structural and cultural obstacles that hinder the development of an innovative culture. Some senior teachers still show resistance to digital approaches due to limited experience and concerns about changing methods too quickly. In addition, limited advanced training and less than optimal collaboration across subjects mean that some innovations are sporadic and not yet

integrated into the overall school system. These findings suggest the need for affirmative strategies to bridge the generation and competency gaps among teachers.

The availability of technological infrastructure is also an important issue in strengthening innovation. While schools have provided basic digital devices such as projectors, Wi-Fi connections and computer labs, some classrooms still suffer from limited facilities. In addition, the absence of a systematic innovation evaluation system means that many innovative efforts have not been well documented or utilized as a basis for policy making. In fact, as emphasized by Ghavifekr and Yulin (2022), the success of an innovative culture is highly dependent on the synergy between structural support (infrastructure and training) and cultural support (trust and collaboration between individuals). Without a system that is able to record, evaluate and reward innovative initiatives on an ongoing basis, the potential of schools in forming an innovative ecosystem will be difficult to develop to its full potential. Therefore, schools need to design a measurable and inclusive innovation evaluation framework as part of their strategic agenda.

In this context, the role of the school principal is crucial to facilitate these structural and cultural changes. The principal's strategy of establishing a School Innovation Team or Innovation Task Force is an exemplary progressive step. The team is tasked with coordinating cross-field innovation activities, identifying professional development needs, and liaising between the school and external partners such as edtech startups and universities. Through this mechanism, innovation is not only an individual responsibility, but also an institutional agenda that is managed systematically.

A participatory approach to decision-making is also an important feature of technological leadership at Aqidah Bekasi IT Junior High School. The principal routinely holds open discussion forums with teachers and students to solicit input on digitization programs. This forum not only reinforces democratic practices in school governance, but also fosters a sense of ownership of the ongoing changes. This approach shows how visionary and inclusive leadership can simultaneously shape a collaborative and innovative work culture.

By considering the spiritual dimension that characterizes integrated Islamic schools, technological leadership in this school shows that innovation does not have to come at the expense of religious values. On the contrary, digitalization is positioned as a means to strengthen Islamic values in the daily lives of school members. For example, through digital moral development platforms and memorization reminder applications, the value of spirituality is integrated into learning and managerial activities. This strengthens the leadership position of technology as a bridge between modernity and tradition.

Furthermore, the results of this study show that collaboration among school stakeholders is a major strength in maintaining the sustainability of the innovative culture. The principal as the main leader is able to orchestrate the relationship between teachers, students, administrative staff and parents in building a shared narrative about the importance of innovation. When all parties feel involved and valued for their contributions, the innovative culture will grow more authentically and be deeply rooted in the school ecosystem.

Overall, the results of this study confirm that strategic, participatory and value-based technology leadership has a great capacity to encourage the birth of an innovative culture in an integrated Islamic school environment. Digital transformation is not only evident in the devices used, but also in the way all school members think, act and interact. The innovative culture formed is the result of a collective process built on the foundation of visionary and inclusive leadership.

CONCLUSION

This study concludes that the technological leadership exercised by the principal of SMP IT Aqidah Bekasi plays a strategic role in shaping and strengthening the innovative culture in the school environment. This leadership is demonstrated through the formulation of a clear digital vision, teacher capacity building, provision of technological infrastructure, and the creation of spaces for collaboration and active participation of all school members. In the context of integrated Islamic schools, leaders are able to integrate the spiritual and digital dimensions harmoniously, making technological transformation part of Islamic character development.

Theoretically, this finding enriches the educational leadership literature by presenting a new perspective on the synergy between technological leadership and Islamic values in shaping innovative organizational culture. It shows that the leadership model cannot be separated from the cultural and spiritual context in which it is carried out, as well as the importance of developing a more contextual and transformative educational leadership theory.

Practically, the results of this study provide guidelines for school principals and other educational stakeholders in designing technology-based leadership strategies that not only focus on technical aspects, but also foster collaborative and ethical ecosystems. Strategies such as the formation of innovation teams, continuous training, teacher reflection forums, and reward systems for innovation proved effective in strengthening creative and adaptive cultures in schools.

The managerial implications of this research include the need to develop institutional policies that support digital transformation systemically. Schools need to formulate an innovation roadmap that involves all components of the organization, develop measurable indicators of innovation success, and establish partnerships with external parties such as universities and the education technology industry. With a holistic and participatory managerial approach, technological leadership will be a strong foundation for inclusive, sustainable and meaningful 21st century educational transformation.

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