

Digital Leadership for a Collaborative Culture: The Key to Improving the Quality of Contemporary Education

Khomsinnudin¹, Afifah Aulia²

¹ STIT Darul Ishlah Tulang Bawang, Indonesia

² UIN Raden Intan Lampung, Indonesia

Corresponding Author:

Khomsinnudin, STIT Darul Ishlah Tulang Bawang, Indonesia; khomsinu@gmail.com

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Abstract

Education in the digital era faces major challenges that demand transformation in school leadership practices. The industrial revolution 4.0 and the acceleration of digitalization after the COVID-19 pandemic have forced educational institutions to adapt quickly to changes in technology and learning methods. The main problem faced is how school principals manage and lead this change in order to improve the quality of education through effective collaboration. This study aims to explore the role of digital leadership in building a collaborative culture in schools as an effort to improve the quality of education. The method used is a qualitative approach with a literature study design to explore theories and findings related to digital leadership and collaborative culture. The research results show that effective principals have the ability to integrate technology into school management, as well as facilitate collaboration between teachers through digital platforms and Professional Learning Communities (PLC). In addition, leadership that supports the development of trust and psychological safety among teachers and the appropriate use of technology for collaboration are key factors. Recommendations included improving principals' digital competencies, using effective digital collaboration platforms, and establishing time structures that support collaboration.

Keywords: *Digital leadership, collaborative culture, quality of education, Professional Learning Communities*



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INTRODUCTION

Education in the digital era faces complex challenges that demand fundamental transformations in school leadership practices. The industrial revolution 4.0 and the acceleration of digitalization following the COVID-19 pandemic have dramatically changed the educational landscape, forcing educational institutions to adapt rapidly to changes in technology, learning methods, and stakeholder expectations (Antonopoulou et al., 2021). Principals, as educational leaders, can no longer rely on traditional hierarchical, top-down leadership models. Instead, they must develop a digital leadership approach that facilitates collaboration, innovation, and continuous learning. This transformation is not simply the adoption of technology, but a fundamental shift in the school's organizational culture that

places collaboration as the foundation for improving educational quality (Kielblock, 2025).

The concept of digital leadership has become an important focus in contemporary educational leadership discourse. According to (Aqsa et al., 2022), digital leadership is defined as the ability of educational leaders to utilize digital technologies to create vision, facilitate communication, encourage innovation, and build professional learning communities. In contrast to traditional leadership, digital leadership emphasizes transparency, openness, and the active participation of all organizational members in the decision-making process. Research conducted by (Karaköse et al., 2024) shows that effective digital leadership has a positive correlation with increased teacher engagement, learning innovation, and student achievement. Furthermore, it is emphasized that school principals with strong digital leadership competencies are able to create a learning ecosystem that is adaptive and responsive to changing times.

Collaborative culture is a crucial element in improving the quality of education in the digital era. (García-Martínez et al., 2021) defines collaborative culture as a work environment in which teachers and educational staff systematically work together to improve instructional practices, share knowledge, and solve problems collectively. A meta-analysis conducted by (Hermawan & Aswan, 2025) of 82 studies showed that teacher collaboration has a significant impact on improving the quality of learning, pedagogical innovation, and job satisfaction. In a digital context, collaborative culture is strengthened through the use of digital platforms that enable real-time communication, resource sharing, and collective learning that transcends the boundaries of space and time. However, building a collaborative culture is not a spontaneous process; it requires strong leadership, a supportive organizational structure, and a shared commitment from all members of the school community.

The role of the principal in building a collaborative culture in the digital era is becoming increasingly complex and strategic. Research conducted by (Nurjani et al., 2025) shows that principal leadership has an indirect but significant influence on student achievement through the creation of a conducive school culture. In a digital context, principals must have dual competencies: technical skills in utilizing technology and social skills in facilitating collaboration. According to (Rasdiana, Nurhadi, et al., 2024), effective principals in the digital age are those who are able to: (1) communicate a clear digital vision; (2) provide adequate technological infrastructure and professional development; (3) create time and space structures for collaboration; (4) build trust and psychological safety; and (5) model collaborative practices in their own leadership. The study found that transformational and technology-savvy principal leadership contributes significantly to the development of a culture of innovation and collaboration in schools.

Although the importance of digital leadership and collaborative culture has been widely recognized, its implementation in the field still faces various obstacles. Research conducted by (Aqsa et al., 2022). identified several key challenges, including: resistance to change, limited digital competency of teachers and principals, inadequate technological infrastructure, and an organizational culture that is still oriented towards individualism and

competition. In Indonesia, it shows that the majority of principals still face difficulties in integrating digital technology into their leadership practices, especially in areas with limited access to technology. In addition, the still strong hierarchical culture in many Indonesian schools is a significant obstacle to the development of a collaborative culture. These findings indicate the need for more in-depth research into effective strategies that principals can use to overcome these barriers.

In Indonesia, digital leadership and collaborative culture do not fail because schools lack awareness, but because principals must navigate structural and cultural constraints that are very specific to the national context. Many schools still operate within a strong bureaucratic hierarchy that limits teacher voice in decision making and makes collaboration feel like an extra task rather than a shared professional routine. Infrastructure gaps also create unequal starting points between urban and rural schools, where unstable internet, limited devices, and restricted access to digital platforms push principals to lead hybrid systems with minimal technical support. At the same time, teachers often carry heavy administrative workloads and multiple roles, which reduces protected time for Professional Learning Communities and weakens continuity of collaboration. These conditions force principals to act not only as instructional leaders, but also as change managers who must build trust, reduce resistance, and redesign workflows so collaboration becomes practical, measurable, and sustainable despite limited resources and uneven digital readiness.

Based on the identified research gaps, this study aims to explore and analyze the role of principals' digital leadership in building a collaborative culture as a key to improving the quality of contemporary education. Specifically, this study will examine: (1) the characteristics and practices of effective digital leadership in the context of Indonesian education; (2) principals' strategies in building and maintaining a collaborative culture in the digital era; (3) the relationship between digital leadership, collaborative culture, and educational quality; and (4) challenges and solutions in implementing digital leadership for a collaborative culture. This study is expected to provide theoretical contributions in enriching the literature on educational leadership in the digital era, as well as practical contributions in the form of policy recommendations and best practices for principals, educational policy makers, and educational institutions in developing digital leadership competencies that are responsive to the demands of 21st-century education.

METHODS

This study employs a qualitative approach with a literature study design to examine how principals' digital leadership supports a collaborative culture in schools. The study selects literature through explicit criteria to ensure conceptual strength and direct relevance to Indonesian conditions. First, the review includes peer reviewed journal articles, scholarly books, and reputable research reports that define digital leadership, collaborative culture, and school improvement mechanisms and that provide clear methods or evidence, so the study can rely on accountable findings rather than opinion-based claims. Second, the review prioritizes studies that discuss school leadership in K-12 settings, teacher collaboration,

Professional Learning Communities (PLC), and technology-enabled organizational change, because these constructs match the study's focus on principals' leadership practices and collaboration routines inside schools. Third, the study gives priority to research conducted in Indonesia or in contexts comparable to Indonesia, such as developing countries, decentralized education systems, and settings with uneven digital infrastructure, because these studies better capture challenges that Indonesian principals face, including limited connectivity, varying teacher digital readiness, administrative workload, and hierarchical organizational culture. Fourth, the study includes sources that explicitly connect leadership practices to measurable or observable outcomes, such as teacher engagement, collaboration frequency, instructional innovation, or student learning indicators, to support a systematic synthesis rather than a purely conceptual discussion. Fifth, the review retains foundational international theories that frequently guide empirical studies, but it uses them as analytical lenses and evaluates their applicability against Indonesian constraints and school realities.

Data collection follows a structured search and screening process by using targeted keywords such as "digital leadership", "principal leadership", "collaborative culture", "teacher collaboration", "PLC", and "digital transformation in schools", then screening titles and abstracts, and finally reading full texts to confirm alignment with the inclusion criteria. Data analysis uses thematic analysis by coding statements and findings related to leadership practices, collaboration enablers, technology use, and barriers, then grouping codes into themes that explain how digital leadership shapes collaborative culture and which factors strengthen or weaken implementation in Indonesian schools. The synthesis compares patterns across sources, highlights context-specific constraints and enabling conditions, and produces practical recommendations that Indonesian principals can apply to build collaboration through digital tools and routines.

FINDINGS AND DISCUSSION

Characteristics and Practices of Effective Digital Leadership in Contemporary Educational Contexts

Effective digital leadership in the contemporary educational context is characterized by the principal's ability to integrate digital technology into all aspects of school management, from communication and decision-making to teacher professional development. Research by (Baharuddin et al., 2024) in the study of the conceptual structure and evolution of digital leadership shows that digital leadership has evolved from mere technical competence in using technology to a strategic capability in transforming the learning ecosystem through the purposeful and pedagogical use of technology. The main characteristics identified include: a clear digital vision, adequate technological competence, effective digital communication skills, and the capacity to facilitate technology-based innovation. Principals with strong digital leadership not only adopt technology, but are also able to integrate it strategically to improve the quality of learning and the effectiveness of the school organization.

Effective digital leadership practices include the use of digital platforms to increase

transparency and accountability in school management (Baharuddin et al., 2024). A study on transforming higher education through digital leadership found that successful educational leaders leverage technology to create transparent management systems, facilitate multi-directional communication, and build professional learning communities that transcend physical boundaries. These practices include using a learning management system (LMS) for learning monitoring, digital collaboration platforms like Google Workspace or Microsoft Teams for team coordination, and professional social media for networking and sharing best practices. Effective principals also use data analytics for evidence-based decision-making, improving learning personalization, and identifying areas for intervention.

The digital competence of school principals is an important predictor of the effectiveness of school management in the digital era. Research conducted by (Tømte, 2024). The concept of principal technological competence identifies that principal technological competence encompasses three main dimensions: technical competence (the ability to operate and solve technological problems), digital-pedagogical competence (the ability to integrate technology into learning), and digital-leadership competence (the ability to lead the school's digital transformation). Principals with comprehensive digital competence are able to create a clear technological vision, allocate resources effectively for digital infrastructure, design technology-based teacher professional development programs, and build a culture of innovation that encourages experimentation and continuous learning. These competencies are not static, but require continuous learning and adaptation along with technological developments.

Effective digital leadership is also characterized by the ability to model positive and ethical digital practices for the entire school community. (Hamzah et al., 2021) in a study on the association between traditional and digital leadership during the COVID-19 pandemic found that principals who successfully managed the transition to digital learning were those who not only provided direction but also served as role models in the effective, ethical, and inclusive use of technology. These modeling practices included: actively using digital platforms to communicate with stakeholders, sharing educational content through digital media, participating in online learning communities, and demonstrating a positive attitude towards technological innovation. This digital leadership modeling creates organizational norms that encourage all members of the school community to adopt technology productively and responsibly.

The collaborative dimension of digital leadership is the key differentiator between effective digital leadership and mere technical competence. (Susanto et al., 2024) in a study on leadership in extensive education emphasized that collaborative development fosters organizational quality, where effective leadership is not top-down but involves the active participation of all stakeholders in the decision-making and innovation process. Principals with digital-collaborative leadership utilize technology to create virtual dialogue spaces, facilitate co-creation in curriculum and school program development, and build feedback mechanisms that allow the voices of teachers, students, and parents to be heard and responded to. This collaborative approach not only increases the sense of ownership but also

produces more contextual and sustainable solutions.

Effective digital leadership also requires the ability to manage change and overcome resistance to digital transformation. (Surjawan et al., 2025) in a systematic literature review on higher education transformation identified that one of the biggest challenges in implementing digital leadership is resistance from organizational members who feel uncomfortable with change or feel threatened by technology. Effective principals overcome this resistance through a comprehensive change management strategy, including: clear communication about the benefits and goals of digital transformation, providing adequate support and training, creating quick wins to build trust, and providing space for experimentation and learning from failure. An empathetic and inclusive approach to managing change ensures that digital transformation is not only technocratic but also humanistic, paying attention to the needs and concerns of all members of the school community.

Effective digital leadership in the contemporary educational context combines the principal's technical and strategic capabilities to transform the school ecosystem by optimally utilizing technology. Principals who have strong digital leadership can integrate technology into school management, communication, and transparent decision-making. They are also able to create a clear digital vision, provide supporting infrastructure, and facilitate continuous innovation and learning through the use of digital platforms. Principals' digital competencies include technical, digital-pedagogical, and digital-leadership skills, which enable them to lead transformation by creating a collaborative and inclusive culture. Furthermore, effective principals are able to manage change by overcoming resistance to technology through empathetic change management strategies and serving as role models demonstrating ethical and productive technology use. Successful digital leadership depends on the active collaboration of all school members in the decision-making process, which in turn improves the overall quality of education.

Strategies for Building a Collaborative Culture Through Digital Leadership to Improve the Quality of Education

Building a collaborative culture in the digital era requires a systematic strategy that integrates technology as a collaboration enabler, not just a communication tool (Hermawan & Aswan, 2025). In research on the role of collaborative work culture in improving teacher effectiveness, a strong collaborative culture significantly impacts teacher pedagogical competence, instructional innovation, and ultimately student achievement. Key strategies identified include: creating dedicated time structures for collaboration (such as professional learning communities), providing digital platforms that support resource sharing and asynchronous communication, and developing clear norms and expectations about collaboration as an integral part of teacher professionalism. Principals act as cultural architects, deliberately designing systems, structures, and processes that facilitate and reward collaboration.

Utilizing digital-based professional learning communities (PLC) is an effective

strategy in building a sustainable collaborative culture. (Hidayat et al., 2024) in a study on the effects of digital leadership in developing teachers' innovation skills found that PLCs mediated by digital technology enable more flexible, inclusive, and productive collaboration compared to traditional face-to-face meetings. Effective principals facilitate digital PLCs by providing adequate technological infrastructure, establishing protocols and norms for online collaboration, allocating dedicated time for PLC participation, and providing necessary pedagogical and technical support. These digital PLCs serve not only as a forum for sharing practices but also as a space for collaborative inquiry, virtual lesson study, and the development of evidence-based learning innovations. Strong digital leadership ensures that PLCs do not become an administrative formality but truly become a driver of continuous professional development.

Strategies for building trust and psychological safety are important foundations for an authentic collaborative culture. (Qu et al., 2024) in a study on mapping teacher collaboration for school success emphasized that effective collaboration can only occur in an environment where teachers feel safe to share vulnerabilities, admit ignorance, and experiment with new approaches without fear of judgment or punishment. Principals build psychological safety through consistent leadership practices, such as: responding to mistakes as learning opportunities rather than as failures that must be punished, actively soliciting and valuing different perspectives, acknowledging one's own limitations, and creating a norm that vulnerability is a strength rather than a weakness. In the digital context, psychological safety also includes creating an online space that is safe from cyberbullying, negative judgment, and unhealthy competition, where every member feels valued and their contributions are recognized.

The use of appropriate collaborative technology is an important enabler in facilitating collaboration that transcends the boundaries of space and time. (Cherniavska et al., 2024) in a study of leadership in extended education showed that digital technology enables more inclusive collaboration by involving geographically separated stakeholders, facilitating asynchronous participation that accommodates different schedules, and providing automatic documentation of collaborative processes that can be reflected on and learned from. Effective principals not only provide technology but also facilitate capacity building in the use of collaborative tools such as shared documents, video conferencing, project management platforms, and social learning networks. The choice of technology must consider the local context, including accessibility, ease of use, and suitability to pedagogical needs, rather than simply following trends or adopting the most advanced technology.

Recognition and celebration strategies are important mechanisms for strengthening a collaborative culture and motivating continued participation. (Hermawan & Aswan, 2025) found that recognizing collaborative contributions, both formal and informal, increases teachers' intrinsic motivation to continue participating in collaborative activities. Principals can implement recognition systems in various ways: digital showcases showcasing best collaborative practices, awards for teams demonstrating effective collaboration, publicizing collaborative achievements on the school website or social media, and integrating

collaboration as a criterion in performance evaluations and promotions. Effective recognition focuses not only on the end result but also values the collaborative process itself, such as willingness to share, openness to feedback, and contributions to helping colleagues. In a digital context, recognition can be strengthened through gamification, digital badges, or peer recognition systems that enable community members to recognize each other.

Developing distributive leadership through digital technology is a transformative strategy in building a sustainable collaborative culture. (Rasdiana, Wiyono, et al., 2024) emphasizes that effective digital leadership is not centralized on the principal, but distributed to various teacher leaders who facilitate collaboration in specific domains. Digital technology makes this distribution of leadership more feasible through the formation of virtual teams with different leaders for different initiatives, the rotation of facilitators in digital PLCs, and the granting of autonomy to teachers to lead innovation projects. The principal acts as an orchestrator who identifies and develops leadership capacity in teachers, provides the necessary support and resources, and creates a coordination structure that ensures various collaborative initiatives complement each other rather than compete. This distributive leadership not only increases organizational capacity but also builds a sense of ownership and agency among teachers, which is the foundation for an authentic and sustainable collaborative culture.

The strategy of building a collaborative culture through digital leadership to improve the quality of education requires a systematic, technology-based approach. Principals play a key role in designing structures that support collaboration, such as creating dedicated time for collaboration, providing digital platforms that support communication and resource sharing, and establishing clear collaboration norms. The use of digital-based Professional Learning Communities (PLCs) is an effective strategy, enabling flexible and inclusive collaboration that focuses on continuous professional development. Furthermore, building trust and fostering psychological safety among teachers is crucial to creating an environment where collaboration can thrive without fear of negative judgment. Collaborative technologies, such as project management platforms and video conferencing, enable collaboration that transcends the boundaries of space and time, strengthening connectivity among educators. Recognition of collaborative contributions also plays an important role in motivating continued participation, with rewards implemented both formally and informally. Finally, developing distributive leadership through technology enables more holistic collaboration, by giving teachers autonomy to lead innovation projects, thereby creating a sustainable and motivating collaborative culture.

CONCLUSION

Effective digital leadership is a decisive lever for building a collaborative school culture that strengthens learning quality in the digital era, yet principals will struggle to sustain it without policy and system support. Government and education stakeholders should operationalize support through concrete actions: set clear national and local competency standards for principals' digital leadership and embed them into recruitment,

promotion, and performance appraisal, then provide mandatory, practice-based training that focuses on daily leadership tasks such as using data dashboards, running online PLC cycles, and managing digital communication protocols. Education offices should fund and standardize minimum infrastructure packages, including reliable connectivity, shared devices for teachers, secure learning platforms, and basic cybersecurity procedures, while prioritizing schools in low-access areas through targeted subsidies and technical assistance teams. Policymakers should also protect collaboration time by issuing regulations that allocate scheduled PLC hours within the school timetable, reducing non-essential administrative reporting, and simplifying digital reporting systems so teachers and principals gain time to collaborate rather than filling forms. To strengthen implementation quality, stakeholders should create mentoring and coaching systems, pairing high-performing principals with developing principals, and establishing district-level PLC networks that share lesson resources, conduct peer observation, and solve instructional problems using a structured cycle. Governments and school owners should support incentives that reward collaborative outcomes, not individual competition, for example through recognition, micro-credentials, and school improvement grants tied to evidence of collaboration routines and learning innovation. Finally, education stakeholders should run continuous monitoring that tracks platform usage, collaboration frequency, teacher participation, and learning indicators, then use the data to adjust training, infrastructure, and policy enforcement so digital leadership becomes a sustained capability that consistently enables collaboration and better learning outcomes.

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