Digital Leadership of Educational Administrators in the 21st Century

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Abstract

Digital transformation has significantly reshaped educational management in the twenty-first century, requiring educational administrators to develop digital leadership competencies. This study aims to (1) synthesize the concept of digital leadership, (2) identify key dimensions of digital leadership among educational administrators, and (3) propose a conceptual framework explaining the relationship between digital leadership and educational management effectiveness. The study employed a documentary research approach by analyzing and synthesizing over 50 scholarly sources from international databases, including Scopus and Web of Science. Content analysis was used to identify major themes and relationships. The findings reveal that digital leadership consists of five key dimensions: digital vision, digital communication, digital professionalism, digital learning culture, and digital literacy. Furthermore, the study proposes that digital leadership functions as an independent variable influencing educational management effectiveness through the mediating role of digital learning culture. The results provide a theoretical foundation for future empirical research and practical guidance for developing digital leadership competencies in educational institutions.

Keywords: digital leadership, educational administration, technology leadership, digital transformation, school leadership

Introduction

The rapid advancement of digital technologies has transformed nearly every aspect of modern society, including the way organizations operate and the manner in

which knowledge is created and disseminated. In the twenty-first century, digital technologies such as cloud computing, artificial intelligence, big data, and online learning platforms have reshaped educational systems worldwide. These developments have significantly influenced how educational institutions manage information, support teaching and learning, and develop innovative learning environments.

Educational institutions are increasingly expected to prepare students with competencies relevant to the digital era, including critical thinking, collaboration, digital literacy, and lifelong learning skills. To achieve these goals, schools must integrate digital technologies into both administrative processes and instructional practices. This transformation requires educational leaders who possess not only managerial competence but also the ability to guide technological change and foster innovation within their institutions.

Digital leadership has therefore emerged as a critical competency for educational administrators. According to Flanagan and Jacobsen (2003), educational leaders play a vital role in facilitating the integration of technology into teaching and learning processes. Their study highlighted that school principals who demonstrate strong technology leadership are more likely to encourage teachers to adopt digital tools in instructional practices.

Similarly, Anderson and Dexter (2005) found that leadership support is one of the most significant factors influencing successful technology implementation in schools. Administrators who provide clear technological vision, professional development opportunities, and organizational support can significantly enhance technology integration in educational environments.

In addition, Sheninger (2014) emphasized that digital leadership involves the ability of leaders to leverage digital tools to enhance communication, improve collaboration, and foster innovation within organizations. Digital leaders are expected to model technology use, create digital learning cultures, and empower teachers and students to utilize digital resources effectively.

Within the context of educational administration, digital leadership has become increasingly important as educational institutions face challenges associated with technological change, globalization, and the need for innovation in teaching and learning. Educational

administrators must therefore develop new leadership approaches that emphasize flexibility, collaboration, and digital competency.

In many countries, educational policies now emphasize the importance of digital transformation in education. Organizations such as UNESCO (2020) and OECD (2019) have highlighted the role of digital technologies in improving educational access, quality, and equity. These policy frameworks underscore the necessity for educational leaders to possess digital leadership competencies that enable them to guide schools through digital transformation.

Despite the increasing importance of digital leadership in education, many studies have primarily focused on technology integration or leadership practices in isolation. There remains a lack of comprehensive frameworks that integrate digital leadership competencies with organizational outcomes in educational contexts, particularly in developing countries such as Thailand. Furthermore, limited research has examined the mediating role of organizational factors, such as digital learning culture, in linking leadership practices to educational effectiveness. Therefore, this study addresses this gap by synthesizing existing literature and proposing an integrated conceptual framework that explains the relationships among digital leadership, digital learning culture, and educational management effectiveness.

Therefore, understanding the concept, components, and implications of digital leadership is essential for improving educational management in the digital era. This article aims to contribute to the academic discourse on digital leadership by synthesizing relevant literature and proposing a conceptual framework that explains how digital leadership influences educational effectiveness.

Objectives of the Article

This academic article aims to achieve the following objectives:

1. synthesize the concept of digital leadership.
2. identify key dimensions of digital leadership among educational administrators.
3. propose a conceptual framework explaining the relationship between digital leadership and educational management effectiveness.

Literature Review

Digital Transformation and Educational Leadership in the 21st Century

The rapid advancement of digital technologies has fundamentally transformed modern societies and organizations. Digital technologies such as cloud computing, artificial intelligence, big data analytics, and mobile learning platforms have reshaped communication, knowledge creation, and information exchange across multiple sectors. The education sector is no exception, as schools and universities increasingly adopt digital technologies to enhance teaching, learning, and administrative processes. Consequently, educational leadership has undergone significant transformation in response to the growing importance of digital technologies in educational environments.

Digital transformation refers to the process by which organizations integrate digital technologies into all aspects of their operations in order to improve efficiency, innovation, and value creation (Dwivedi et al., 2021). In educational institutions, digital transformation involves the adoption of digital learning platforms, data-driven decision-making systems, online collaboration tools, and digital assessment methods. These technological changes require educational administrators who possess the competencies necessary to guide institutions through technological and organizational change.

Educational leadership in the digital age therefore requires new forms of leadership that combine traditional managerial competencies with digital expertise. According to Sheninger (2014), digital leadership represents a leadership approach that leverages technology to enhance communication, collaboration, and learning within educational organizations. Digital leaders are responsible not only for managing technological infrastructure but also for fostering innovation and supporting teachers and students in the effective use of digital tools.

The importance of digital leadership has become particularly evident during global disruptions such as the COVID-19 pandemic, which forced educational institutions worldwide to transition rapidly to online learning environments. Research by Bond et al. (2021) indicated that schools with strong digital leadership were better prepared to maintain instructional continuity during periods of educational disruption. Leaders who possessed digital competencies were able to coordinate remote learning systems,

support teacher training in digital pedagogy, and communicate effectively with stakeholders during crisis situations.

Furthermore, international organizations such as UNESCO (2020) and OECD (2019) have emphasized the importance of digital transformation in education as a key strategy for improving educational access, equity, and quality. These organizations have highlighted the need for educational leaders who can guide digital transformation processes and ensure that digital technologies are used effectively to support learning outcomes.

As educational systems continue to evolve in response to technological innovation, the role of educational leaders has expanded beyond traditional administrative responsibilities. Educational administrators must now act as strategic leaders who guide institutions through complex digital transformation processes while maintaining educational quality and organizational stability.

Conceptual Foundations of Digital Leadership

The concept of digital leadership has its roots in earlier research on technology leadership and transformational leadership within educational organizations. Early studies on technology leadership emphasized the role of school administrators in facilitating the adoption and integration of technological tools in educational settings.

Flanagan and Jacobsen (2003) were among the first scholars to emphasize the importance of technology leadership in schools. Their research demonstrated that school principals play a crucial role in supporting the integration of technology into instructional practices. They argued that effective technology leadership requires administrators to establish clear technological visions, allocate resources for digital infrastructure, and support teacher professional development.

Anderson and Dexter (2005) conducted one of the most influential empirical studies examining technology leadership in educational institutions. Their research found that leadership support was the most significant factor influencing successful technology integration in schools. Schools with strong leadership commitment to technology adoption were more likely to develop sustainable technology integration practices.

As digital technologies became more complex and widely integrated into organizational processes, the concept of digital leadership emerged as a broader framework that extends beyond technology management. Wilson (2013) described digital leadership as a paradigm shift in leadership practices that integrates technological innovation with strategic organizational management.

Digital leadership involves multiple competencies, including technological knowledge, strategic planning, organizational communication, and innovation management. Leaders must be able to understand technological trends, evaluate digital tools, and align technological initiatives with institutional goals.

Sheninger (2014) further expanded the concept of digital leadership by emphasizing the role of leaders in creating digitally connected learning environments. According to Sheninger, digital leaders must leverage social media platforms, collaborative technologies, and digital communication channels to enhance transparency, collaboration, and engagement within educational communities.

In addition, digital leadership incorporates elements of transformational leadership, which focuses on inspiring followers to embrace change and pursue collective goals (Bass & Riggio, 2006). Digital leaders must motivate teachers and staff to adopt new technological practices and participate actively in organizational innovation processes.

Thus, digital leadership represents an interdisciplinary concept that integrates principles from educational leadership, organizational change theory, and digital technology management.

Technology Leadership and Technology Integration in Schools

Technology integration has been widely studied in educational research, particularly in relation to the role of school leadership. Technology integration refers to the effective incorporation of digital technologies into teaching and learning processes in ways that enhance educational outcomes.

Research has consistently shown that leadership plays a crucial role in shaping technology integration practices in educational institutions. Dexter (2011) emphasized that school administrators influence technology integration through policy development, resource allocation, and the establishment of supportive organizational cultures.

School leaders who actively promote technology integration are more likely to create environments in which teachers feel supported in experimenting with digital tools and innovative instructional strategies. When administrators provide professional development opportunities, technical support, and clear expectations regarding technology use, teachers are more likely to adopt digital pedagogies.

Ertmer and Ottenbreit-Leftwich (2013) identified several factors influencing teachers' technology integration practices, including leadership support, access to technological resources, and teacher beliefs about technology. Their research indicated that leadership support plays a critical role in shaping teachers' attitudes toward technology adoption.

Furthermore, distributed leadership theory provides valuable insights into how leadership responsibilities related to technology integration can be shared among multiple stakeholders. Harris (2015) argued that effective leadership involves collaboration among administrators, teachers, and technology specialists.

In digitally connected educational environments, technology integration requires collective efforts among various members of the educational community. Educational leaders must therefore create collaborative structures that enable teachers to share knowledge, exchange best practices, and engage in professional learning communities.

Technology leadership is therefore a critical component of digital leadership in educational organizations.

Digital Literacy and Professional Competencies of Educational Leaders

Digital literacy represents another fundamental component of digital leadership. Digital literacy refers to the ability to effectively use digital technologies to access, analyze, create, and communicate information in digital environments (Martin & Grudziecki, 2006).

In educational contexts, digital literacy extends beyond technical skills to include critical thinking, information evaluation, ethical awareness, and digital citizenship. Educational leaders must possess these competencies in order to guide teachers and students in responsible and effective technology use.

The Technological Pedagogical Content Knowledge (TPACK) framework developed by Mishra and Koehler (2006) provides a useful theoretical model for understanding the relationship between technology, pedagogy, and subject knowledge. Although the TPACK framework primarily focuses on teacher competencies, it also has important implications for educational leadership.

Administrators who understand the relationships between technology, pedagogy, and content knowledge are better equipped to support teachers in designing innovative learning experiences. Such leaders can guide professional development initiatives that help teachers integrate digital technologies into their instructional practices.

Digital literacy also plays an important role in supporting data-driven decision-making within educational institutions. Modern educational systems increasingly rely on digital data management systems that provide administrators with access to student performance data, attendance records, and instructional analytics.

Leaders who possess strong digital literacy skills can analyze these data sources to inform strategic planning, identify areas for improvement, and develop evidence-based educational policies.

Furthermore, digital literacy contributes to ethical and responsible technology use. Educational leaders must ensure that digital technologies are used in ways that protect student privacy, promote digital citizenship, and maintain academic integrity.

Thus, digital literacy is a foundational competency that enables educational leaders to navigate complex digital ecosystems and guide educational institutions toward responsible and effective technology use.

Digital Innovation and Organizational Culture in Education

Organizational culture plays a critical role in shaping the success of digital transformation initiatives in educational institutions. Organizational culture refers to the shared values, beliefs, and practices that influence how members of an organization interact and perform their roles.

Fullan (2014) emphasized that successful educational reform requires leaders who can cultivate cultures that support collaboration, continuous learning, and innovation.

In the context of digital transformation, educational leaders must create environments that encourage experimentation with new technologies and pedagogical approaches.

Avidov-Ungar and Eshet-Alkalai (2017) argued that digital innovation requires organizations to adopt cultures that support knowledge sharing, collaboration, and professional growth. Educational leaders must therefore promote professional learning communities in which teachers can exchange ideas and explore innovative teaching strategies.

Research has also shown that institutional culture significantly influences teachers' willingness to adopt new technologies. Schools that foster open communication, trust, and collaboration are more likely to successfully implement technology integration initiatives.

Educational leaders must therefore play an active role in shaping organizational cultures that support digital innovation and continuous professional development.

Dimensions of Digital Leadership in Educational Administration

Based on the synthesis of previous literature, several key dimensions of digital leadership can be identified. These dimensions represent the competencies required for educational administrators to effectively lead digital transformation initiatives.

The first dimension is digital vision, which refers to the ability of leaders to establish strategic directions for technology integration within educational institutions. Leaders who possess digital vision can anticipate emerging technological trends and align institutional strategies with future educational needs.

The second dimension is digital communication, which involves the use of digital technologies to facilitate communication and collaboration among stakeholders. Digital leaders utilize communication platforms, social media, and online collaboration tools to engage teachers, students, and community members.

The third dimension is digital professionalism, which refers to the ethical and responsible use of digital technologies in professional contexts. Educational leaders must demonstrate professional conduct in digital environments and promote responsible technology use within their institutions.

The fourth dimension is digital learning culture, which refers to the organizational environment that supports experimentation, innovation, and collaborative learning. Leaders who promote digital learning cultures encourage teachers to explore new pedagogical approaches and share best practices with colleagues.

Finally, digital literacy represents the foundational competency that enables leaders to effectively use digital technologies in decision-making processes, strategic planning, and instructional leadership.

Together, these five dimensions form a comprehensive framework for understanding digital leadership in educational administration.

From the review, it can be concluded that digital leadership is a multidimensional construct comprising five key components: digital vision, digital communication, digital professionalism, digital learning culture, and digital literacy. Previous studies consistently indicate that these dimensions influence technology integration, teacher professional development, and organizational innovation.

Furthermore, the literature suggests that digital learning culture plays a crucial role as an organizational mechanism that enables the effective implementation of digital leadership practices. Based on this synthesis, this study proposes that digital leadership functions as an independent variable influencing educational management effectiveness, with digital learning culture acting as a mediating variable. This relationship forms the basis of the conceptual framework presented in this study.

Table 1 Synthesis of Previous Research on Digital Leadership (20 Studies)

Table 1 : Synthesis of Previous Research on Digital Leadership (20 Studies)

Author	Year	Focus	Methodology	Key Findings
Flanagan & Jacobsen	2003	Technology leadership	Survey	Leadership influences technology adoption
Anderson & Dexter	2005	ICT leadership	Quantitative	Leadership support predicts ICT use
Martin & Grudziecki	2006	Digital literacy	Conceptual	Digital literacy is essential skill
Mishra & Koehler	2006	TPACK	Conceptual	Integration of tech, pedagogy, content
Dexter	2011	Technology leadership	Mixed	Leaders shape school tech culture
Chang	2012	Digital leadership	Survey	Vision affects technology adoption
Wilson	2013	Digital leadership	Conceptual	Leadership paradigm shift
Sheninger	2014	Digital leadership	Case study	Leaders promote digital innovation
Fullan	2014	Educational change	Conceptual	Leadership drives transformation
Harris	2015	Distributed leadership	Qualitative	Collaboration enhances innovation
Zhu	2016	Digital mastery	Case	Digital strategy improves performance
Avidov-Ungar	2017	Digital innovation	Mixed	Technology enables innovation
Chamchoy	2017	Digital leadership	Conceptual	5 dimensions proposed
Thannimalai & Raman	2018	Technology leadership	SEM	Leadership influences teacher ICT use
ISTE	2018	Education leadership	Framework	Digital leadership standards
OECD	2019	Digital education	Policy	Schools must transform digitally
Ertmer	2020	Technology integration	Mixed	Teacher beliefs influence integration
UNESCO	2020	ICT in education	Policy	Digital transformation essential
Dwivedi et al.	2021	Digital transformation	Review	Leadership critical for transformation
Bond et al.	2021	Digital learning	Review	Digital leadership supports innovation

The synthesis of 20 previous studies presented in Table 1 demonstrates that leadership plays a critical role in technology integration and educational innovation.

Across different research contexts, leadership variables consistently influence teachers' technology use, organizational culture, and institutional performance.

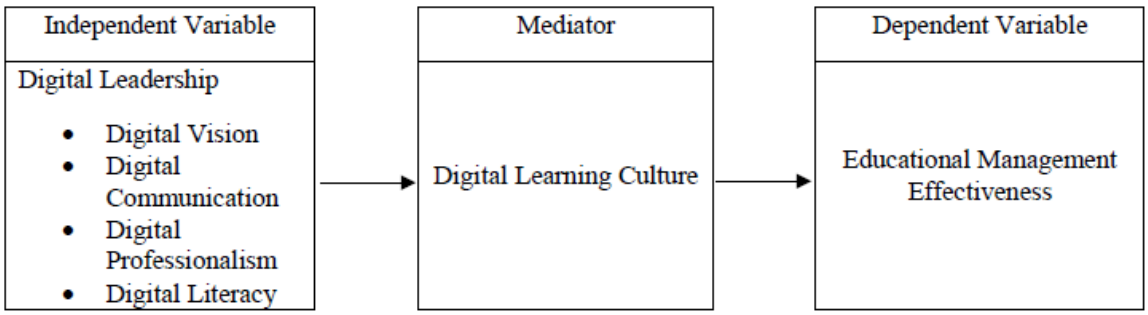
Based on this synthesis, this study identifies digital leadership as a key independent variable that encompasses five core dimensions. Additionally, the literature highlights that organizational culture-particularly digital learning culture-acts as a mechanism through which leadership influences outcomes. Therefore, this study proposes that digital leadership affects educational management effectiveness indirectly through digital learning culture, which serves as a mediating variable in the conceptual framework.

Digital Leadership Model (Five Dimensions)

Digital Leadership Dimensions: 1) Digital Vision 2) Digital Communication 3) Digital Professionalism 4) Digital Learning Culture 5) Digital Literacy.

Picture 1 Digital Leadership Model (Five Dimensions)

Conceptual Framework



Methodology

This study employed a documentary research design involving the systematic analysis of academic literature related to digital leadership in educational administration. Data were collected from international academic databases, including Scopus, Web of Science, ERIC, and ScienceDirect.

The selection criteria included:

1. Peer-reviewed publications
2. Studies related to digital leadership or technology leadership
3. Publications between 2000 and 2024

A total of approximately 70 studies were initially reviewed, and 50 relevant studies were selected for in-depth analysis.

Data were analyzed using content analysis to identify recurring themes, patterns, and relationships among variables. The analysis focused on identifying key components of digital leadership and their relationship to educational management effectiveness.

Discussion

The findings of this study highlight the increasingly critical role of digital leadership in shaping the effectiveness of educational management in the twenty-first century. As digital technologies continue to transform educational environments, school administrators must develop leadership competencies that support the integration of technological innovation into teaching, learning, and institutional management. Consistent with Anderson and Dexter (2005), leadership support is one of the most influential factors affecting successful technology integration in schools. Administrators who demonstrate strong digital leadership capabilities are more likely to establish

strategic visions for technology use, allocate resources effectively, and create supportive conditions that enable teachers to adopt digital tools in their instructional practices.

Another important finding of this study is the mediating role of digital learning culture in the relationship between digital leadership and educational management effectiveness. Organizational culture has long been recognized as a fundamental factor influencing educational innovation (Fullan, 2014). When school leaders actively cultivate a culture that values experimentation, collaboration, and continuous professional development, teachers are more likely to embrace digital technologies as part of their pedagogical practices. Dexter (2011) emphasized that technology integration is not simply a matter of providing technological infrastructure but requires leadership that encourages collaborative learning environments and supports professional growth among educators.

The synthesis of previous research also indicates that digital leadership extends beyond technological competence and involves broader transformational leadership characteristics. Transformational leadership theory suggests that effective leaders inspire followers to achieve collective goals and embrace organizational change (Bass & Riggio, 2006). In the context of digital transformation, educational leaders must act as change agents who encourage innovation and guide institutions through complex technological transitions. Research by Avidov-Ungar and Eshet-Alkalai (2017) suggests that school leaders who demonstrate strong digital leadership skills can significantly influence teachers' willingness to adopt new digital pedagogies.

Furthermore, the five dimensions of digital leadership identified in this study-digital vision, digital communication, digital professionalism, digital learning culture, and digital literacy-provide a comprehensive framework for understanding the competencies required of educational administrators in the digital age. These dimensions align with global educational technology leadership frameworks such as the ISTE Standards for Education Leaders (ISTE, 2018). According to these standards, effective educational leaders must promote visionary leadership, foster professional growth, and build digital-age learning cultures within educational institutions.

Digital vision, in particular, plays a fundamental role in guiding the long-term technological development of educational institutions. Leaders who articulate clear

digital strategies can align institutional goals with emerging technological opportunities. According to Zhu (2016), organizations that develop coherent digital strategies are more likely to achieve sustainable innovation and improved organizational performance. Within educational institutions, digital vision enables administrators to establish clear priorities for technology integration, professional development, and digital infrastructure development.

Digital communication also represents a critical dimension of leadership in digitally connected educational environments. Advances in communication technologies have transformed the ways in which leaders interact with teachers, students, parents, and stakeholders. Sheninger (2014) argues that digital leaders must leverage social media platforms, collaborative tools, and digital communication channels to enhance transparency and engagement within educational communities. Effective communication strategies help leaders build trust, share information efficiently, and foster collaborative relationships among stakeholders.

Finally, digital literacy and digital professionalism are essential competencies for educational leaders who must navigate complex technological ecosystems. Martin and Grudziecki (2006) emphasize that digital literacy involves not only technical skills but also critical thinking, ethical awareness, and responsible technology use. Educational administrators must therefore model ethical and responsible digital behavior while supporting teachers and students in developing digital citizenship skills. By demonstrating professional digital practices, school leaders can establish norms that promote responsible and effective technology use throughout the institution.

Implications for Policy and Practice

The findings of this study have important implications for educational policy and leadership practice. First, policymakers should prioritize the development of digital leadership competencies among educational administrators. As digital transformation continues to reshape educational systems, leadership development programs must include training in digital strategy, technology integration, and data-informed decision-making. National and regional education authorities should design professional

development programs that equip school leaders with the knowledge and skills necessary to guide digital transformation within their institutions.

Second, educational institutions should establish professional learning communities that support continuous digital skill development among teachers and administrators. Collaborative learning environments enable educators to share best practices, experiment with innovative teaching methods, and develop new pedagogical approaches using digital technologies. According to Ertmer and Ottenbreit-Leftwich (2013), sustained professional learning opportunities are essential for helping teachers integrate technology effectively into instructional practices.

Third, educational leaders should focus on developing organizational cultures that support innovation and experimentation. Institutions that encourage risk-taking, collaboration, and reflective practice are more likely to succeed in implementing digital transformation initiatives. Fullan (2014) emphasizes that sustainable educational reform requires leadership that fosters collective responsibility and shared vision among stakeholders.

Finally, educational policies should emphasize equitable access to digital resources and technological infrastructure. While digital leadership is essential, the successful implementation of digital transformation initiatives also depends on adequate technological infrastructure, technical support, and access to digital learning tools. Governments and educational organizations must therefore invest in technological infrastructure to ensure that schools can effectively implement digital learning initiatives.

Limitations and Future Research

Despite its contributions, this study has several limitations that should be acknowledged. First, the study employed a documentary research approach that relied on the synthesis of existing literature rather than empirical data collection. While this approach allowed for a comprehensive review of current knowledge on digital leadership, it does not provide direct empirical evidence regarding the relationships between digital leadership, digital learning culture, and educational management effectiveness.

Second, the conceptual framework proposed in this study has not yet been empirically tested. Future research should conduct quantitative or mixed-method

studies to examine the relationships among the proposed variables. Structural equation modeling (SEM) or path analysis could be used to test the mediating role of digital learning culture between digital leadership and educational management effectiveness.

Third, future studies could explore contextual factors that influence digital leadership in different educational settings. Cultural, institutional, and technological factors may shape how digital leadership is implemented across different countries and educational systems. Comparative studies examining digital leadership practices in different national contexts would provide valuable insights into how leadership strategies can be adapted to diverse educational environments.

Finally, further research should investigate the impact of digital leadership on student learning outcomes and teacher professional development. Understanding how leadership practices influence instructional innovation and student achievement would provide important evidence to support the development of digital leadership training programs for educational administrators.

Conclusion

The conclusions of this study can be summarized as follows:

1. Digital leadership is a critical competency for educational administrators in the digital era, enabling effective management of technological transformation in educational institutions.

2. Digital leadership consists of five key dimensions: digital vision, digital communication, digital professionalism, digital learning culture, and digital literacy.

3. Digital leadership significantly influences educational management effectiveness by supporting technology integration, organizational innovation, and teacher professional development.

4. Digital learning culture acts as a mediating variable that enhances the impact of digital leadership on educational outcomes by promoting collaboration, innovation, and continuous learning.

The proposed conceptual framework provides a theoretical foundation for future empirical research and practical guidance for developing digital leadership in educational contexts.

Reference

Anderson, R., & Dexter, S. (2005). School technology leadership. *Educational Administration Quarterly,* 41(1), 49-82. https://doi.org/10.1177/0013161X04269517.

Avidov-Ungar, O., & Eshet-Alkalai, Y. (2017). Teachers in a world of change. *Interdisciplinary Journal of e-Skills and Lifelong Learning,* 13, 125-140.

Bass, B. M., & Riggio, R. (2006). *Transformational leadership.* Routledge. https://doi.org/10.4324/9781410617095.

Bond, M., et al. (2021). Digital learning in higher education. *Educational Technology Research and Development,* 69, 2405-2431. https://doi.org/10.1007/s11423-020-09824-8.

Chang, I. (2012). The effect of leadership on technology adoption. *Educational Technology & Society,* 15(4), 328-340.

Dexter, S. (2011). School technology leadership. *Journal of School Leadership,* 21(2), 166-194.

Dwivedi, Y., et al. (2021). Digital transformation. *International Journal of Information Management,* 55. https://doi.org/10.1016/j.ijinfomgt.2020.102385.

Ertmer, P., & Ottenbreit-Leftwich, A. (2013). Teacher technology change. *Journal of Research on Technology in Education,* 45(3), 255-284. https://doi.org/10.1080/15391523.2013.10782618.

Flanagan, L., & Jacobsen, M. (2003). Technology leadership. *Journal of Educational Administration, 41(2), 124-142.* https://doi.org/10.1108/09578230310464648.

Fullan, M. (2014). *The principal: Three keys to maximizing impact.* Jossey-Bass.

Harris, A. (2015). Distributed leadership matters. *Educational Management Administration & Leadership,* 43(3). https://doi.org/10.1177/1741143214543205.

ISTE. (2018). ISTE Standards for Education Leaders.

Martin, A., & Grudziecki, J. (2006). Digital literacy framework. *Innovation in Teaching and Learning in Information and Computer Sciences,* 5(4).

Mishra, P., & Koehler, M. (2006). Technological pedagogical content knowledge. *Teachers College Record,* 108(6). https://doi.org/10.1111/j.1467-9620.2006.00684.x.

OECD. (2019). *OECD digital education outlook 2019: Pushing the frontiers with artificial intelligence, blockchain and robots.* OECD Publishing. https://doi.org/10.1787/50f30ad9-en.

Sheninger, E. C. (2014). *Digital leadership: Changing paradigms for changing times.* Corwin Press.

UNESCO. (2020). *ICT in education policy guide. United Nations Educational, Scientific and Cultural Organization.* https://unesdoc.unesco.org/ark:/48223/pf0000371024.

Wilson, C. (2013). Digital leadership paradigm. *International Journal of Information and Education Technology,* 3(4). https://doi.org/10.7763/IJIET.2013.V3.317.

Zhu, P. (2016). *Digital mastery: How organizations have successfully transformed themselves.* Routledge. https://doi.org/10.4324/9781315689395.