Digital Leadership In The Digital Economy Era

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Abstract: The concept of digital leadership has undergone significant development in recent years. Empirical and literature researches are also developing more widely and deeply. This study is in line with the increasingly widespread influence of the use of digital technology used to manage organizations and the use of digital technology in various aspects of social life. This research is a literature review and aims to find a common thread in the relationship between the concept of digital leadership implemented into various types of organizations. The method used is qualitative descriptive with a web-based literature research approach, with google scholar and sciencedirect.com search engines. To obtain the data, the keywords such as 'e-leadership, digital leader, virtual leader, leadership in the digital age, leaderhip 4.0, leadership in the era of digital transformation, digital leadership' were used. The results of the study show that digital leadership is a leadership style and focuses on the implementation of digital transformation in organizations. Digital leadership enables organizations to create a digital work environment and create a digital learning culture.

Keyword: digital leadership, digital transformation, digital culture, digital work environment

INTRODUCTION

Like being on a big ship in the world, we are currently in various circumstances colored by disruption, innovation, turbulence, change, and competition. These words try to be continuously defined in the digital era with all the challenges and impacts that come with it (Brunner et al., 2023; Sułkowski, 2023).

Individuals, communities, groups in society and organizations or companies are trying to figure out how best to respond to these major changes (Japar & Sumantri, 2022; Kotter et al., 2021). These major changes are generally expressed in the sentence that the world community is experiencing what is called digital transformation (Mudrikah et al., 2022; Sudarsono et al., 2023; Van Veldhoven & Vanthienen, 2022).

In recent years, digital transformation has taken place rapidly, which has had an impact on paradigm shifts in economic and social aspects (Aulia & Aslami, 2023; Rochmawati et al., 2023; Wahyudi et al., 2023). Various studies are focused on digital transformation with business models and their impact on society.

Digital transformation triggers changes in the life of the global economy. The world economy has now entered the digital economy as a result of the development of information technology revealed in digital transformation (Bimantoro et al., 2021; Litvinenko, 2020; Wibowo, 2022). Digital economy is an economic concept that uses digital technology as a key element in the process of production, distribution, and consumption of goods and services (Riswanto et al., 2024; Zhang, 2021). In this implementation, it includes many digital platforms such as e-commerce, digital banking, social media, and various instant or real-time messaging applications.

Digital transformation can be said to be the main theme for the business world in this century (Half, 2020; Fikariyah, 2024). This development is unprecedented when viewed in terms of speed, range, and impact (Hermawanto & Anggraini, 2020; Schneider & Kokshagina, 2021). In digital

transformation, it also reveals two basic definitions that need attention. First, digitization, which is the conversion of information from analog to digital form. Second, digitalization, which is the process of change caused by technological changes in the industry (Bunches, 2023; Rautiainen, 2024).

From digitization and digitalization, digital transformation means that it includes the use and transformative ability in terms of informing digital awareness (Nurjanah, 2022; Sağbaş & Erdogan, 2022). The transformation stage is understood as the stage of using digital processes that allow innovation and creativity in certain digital products, not only improving, but also supporting traditional methods. Digital transformation is a process that aims to increase significant change through a combination of information technology, computing, communication, and connectivity (Kirana et al., 2023; Latifah & Ngalimun, 2023; Oktaviani et al., 2023).

Organizations today are facing major changes in the way they work and lead as a result of the technological disruption manifested in digital transformation (Kupiek, 2021; Phakamach et al., 2023; Salih, 2024). The development of digital technology has also triggered the need to study leadership roles by incorporating digital technology into the development of leadership concepts and implementation (Aulia & Aslami, 2023; Tulungen et al., 2022).

The concept and implementation of leadership that is currently developing as an influence of digital transformation is digital leadership (Guzmán et al., 2020; Tulungen et al., 2022). So far, there is no single definition that has been agreed, but digital leadership is a theme that is currently of concern to experts and practitioners. It is unclear whether digital leadership refers to an outcome or market position, meaning that the organization becomes a digital leader through transformation; or whether digital leadership means digital leaders who have strategic goals supported by digital transformation (Bones & Hammersley, 2015; Eckerholm, 2023).

Information and technology transformation is a serious concern for digital leadership (Dewanto, 2023). But on the other hand, it also depends on the vision, mission and strategic priorities of the organization (Andini, 2021). The lack of clarity in the definition is due to differences regarding the vision, mission and strategic priorities in different organizations. Even in development, digital leadership is described as occurring at various levels, individuals, institutions, and even countries are sometimes described as digital leaders (Munsamy, 2022; Ratajczak, 2022).

Another opinion states that digital leadership can be understood as a leadership style that focuses on implementing digital transformation in an organization (Sepriano et al., 2023). This allows organizations or companies to digitize their work environment, work culture, and learning culture.

This research seeks to review the development of the concept of digital leadership. The phrase of the digital economy era embedded in the title of the article is used as a way to find a solution to the main theme, namely digital leadership, as a major impact of digital transformation. This study does not look for which definition of digital leadership is the most correct or, conversely, the definition is wrong or not comprehensive. This research is a literature research with the aim of finding a common thread in the development of the concept of digital leadership, which is examined from previous studies, both empirical research and literature research.

LITERATURE REVIEW

Digital leadership is a phenomenon that has emerged recently in line with the massive acceleration of digitalization in many organizations (Sağbaş & Erdogan, 2022). The presence of Industry 4.0 types of technologies such as the Internet of Things, artificial intelligence, and big data analysis has had a major impact on organizational culture, working relationships, strategies, jobs, styles and governance structures in various types of organizations. Industry 4.0 influenced by digital technologies such as cloud, mobile services has brought a new paradigm to the structure of all industries (Aksenta et al., 2023).

The COVID-19 pandemic has pushed reviews on leadership and digitalization topics to become more widespread and in-depth. Major concepts such as e-leadership, digital leader, virtual leader, leader in the digital era, leader in the Industry 4.0 era, and digital leadership, are alternately used in research, both empirical research and literature research (Banker et al., 2023; Peng et al., 2024).

Technological developments like this have shown a shift, namely social systems and technological activities need to work in harmony with the adjustment of mass products or services (Ramli et al., 2021). These studies also show that organizational work styles are and will continue to change in line with the development trend of digital transformation and digital leadership styles.

Digital technology drives customer and market change; legacy companies need to transform their systems through digitalization in order to deliver processes effectively (Iqbal, 2022). There are four key success factors in Industry 4.0 or digital technology, namely innovation, collaboration, integration, and interoperability. Digital transformation depends on how companies innovate their business models (Arifiani & Furinto, 2022).

The relationship between digital leadership and innovation in the disruptive era shows that digital leadership has an effect on innovation (Purwanto et al., 2021). A number of studies have also found that digital leadership can influence innovation, including business model development (Malik et al., 2024; Paulina, 2023).

Exploring digital leadership means looking into the beginning of the term. A number of empirical studies and literature research show agreement that the idea of the concept of digital leadership first referred to an essay written by (Avolio et al., 2000). He wrote his work using the concept of e-leadership. He interprets e-leadership as a process of social transformation with advanced information technology affecting the behavior, attitudes, emotions, thoughts, and behaviors of individuals, groups, and/or organizations.

The second figure who pioneered the idea of "digital leadership" is (Fisk, 2002). He broke away from e-leadership as the focus of thorough research. According to (Fisk, 2002), digital leaders are visionary leaders, change motivators, able to incorporate ideas in business for projects, and build connections through the creation of new opportunities for partnerships/joint ventures/outsourcing and other forms of collaboration (Fisk, 2002). The Upper Echelon Theory serves as the foundation for the concept of digital leadership. Based on the Upper Echelon theory, organizational output is influenced by managerial leadership decisions based on the interpretation and cognition of business people (Wang et al., 2022). Leadership plays an important role in managing resources to sustain the business in the future. According to this theory, the characteristics of the managerial background make organizational outcomes (strategic choices and performance levels) more predictable (Mwita & Joanthan, 2019). Organizations led by individuals who demonstrate the attributes necessary for digital leadership are also said to be digital (Abbu et al., 2020; Magesa & Jonathan, 2022).

The concept of digital leadership has since continued to be the subject of study by scientists and practitioners (Table 1). The Declaration of Industry 4.0 in Germany in 2011 also encouraged many scientists to explore the concept of digital leadership in the context of digital transformation disruption. According to (Shahim, 2021), digital transformation is characterized by five aspects, namely 1) shifting to a new business design that fundamentally utilizes information technology, 2) enabling disruption and innovation, 3) reaching and engaging customers more effectively, 4) improving operational efficiency, and 5) using modern technology in such a way that new value is generated in business models, customer experiences, and capabilities that support the organization's core operations.

If (Avolio et al., 2000) as the first originator of the concept of e-leadership and (Fisk, 2002) is the first originator of the concept of digital leader, then from the two researchers emerged the concept of digital leadership which was first triggered by (Sheninger, 2014). In an article titled 'The pillars of digital leadership', Sheninger stated that the seven pillars outlined are components embedded in school culture or are elements of professional practice that leaders have been focusing on (or should be focusing on).

According to Sheninger, the 7 pillars of digital leadership are 1) Student engagement, learning and outcomes, 2) Innovative learning space and environment, 3) Professional learning, 4) Communication, 5) Public relation, 6) Branding, 7) Opportunity.

(Wasono &Furinto, 2018) classifies digital leadership criteria into five characteristics: (1) Thought leader, has resilient abilities in dealing with market changes and competition; (2) Creative leaders, have a creative and innovative mindset to formulate ideas into reality; (3) Global Visionary Leader, able to provide direction and become an orchestra in digital business transformation transformation; (4) Inquisitive Leader, has the ability to learn to deal with complex and dynamic ecosystems due to the Volatility, Uncertainty, Complexity and Ambiguity (VUCA) factor; (5) Profound Leader, has deep knowledge and understanding to interpret, assume and synthesize information in decision-making. (Van Wart et al., 2019) deciphering digital leadership into six dimensions or aspects, namely: (1) Communication skills, (2) Social skills, (3) Team building skills, (4) Change management skills, (5) Technological skills, (6) Trustworthiness.

Since the concept of digital leadership was introduced by the three pioneers, various researches, both empirical research and literature research, have become more extensive and in-depth.

The year 2016 is a historic year for the increasingly vibrant research in the field of digital leadership. Empirical studies take a wide variety of objects or respondents, ranging from education, government, the public sector, business organizations, business leaders, to the construction sector (Fang, 2023; Gadekar, 2022; Jameson et al., 2022).

METHOD

This type of research is qualitative descriptive, namely describing the development of the concept of digital leadership. The data collection technique is carried out by using search engines on google scholar and sciencedirect. From collected from 2000 to 2024. The steps to search for research data, both empirical and bibliological, are carried out by entering keywords into the two search engines. The search for data from these studies does not pay attention to the research object.

The first step, the keywords used include 'e-leadership, digital leader, virtual leader, leadership in the digital age, leaderhip 4.0, leadership in the era of digital transformation, digital leadership'. Second, previous research data that has been successfully found is then downloaded and grouped into files according to keywords and given the year of publication on each article file. Third, article files that have been successfully downloaded are also classified into empirical research files, and literature research.

The search results using all keywords on google scholar and sciencedirect were found as many as 123 articles, both empirical research articles, literature research, books, book chapters. Then from the 123 articles, they were sorted again by the specificity of articles that used titles with the keyword 'digital leadership', and 65 articles were selected, with details of 27 literature research articles, and 38 empirical research articles.

RESULTS AND DISCUSSION

The results of this literature research as stated in table 1 are an effort to describe the development of the concept of digital leadership. Not all previous studies that were successfully collected were presented in the table. The development of the concept of digital leadership is arranged chronologically by choosing a definition that is quite significant in explaining the concept of digital leadership.

TABLE 1. Digital leadership Concept Development

Number	Year	Author	Definition
1	2000	(Avolio et al., 2000)	The originator of the initial concept of e-leadership which became the forerunner of the concept of digital leadership. Digital leadership is a process of social transformation with advanced information technology as an intermediary to influence the behavior, attitudes, emotions, thoughts, and behaviors of individuals, groups, and/or organizations
2	2002	(Fish, 2002)	The originator of the concept of digital leader. A digital leader is a visionary, motivated for transformation, the ability to combine ideas within the organization to take initiative, the ability to collaborate and all collaborations by creating new possibilities
3	2006	(Kurubacak, 2006)	The originator of the concept of digital youth leadership. Young people nurture strong partnerships of existing forces for the cause, respect citizens' democratic practices, ensure their policies are consistent and play an independent role for the purposes of their online interactions, multicultural interactions and remind themselves of the complex nature of digital youth leadership
4	2014	(Sheninger, 2014)	The first originator of the term digital leadership in an article titled 'The pillars of digital leadership'. Digital leaderhip is the ability to establish relationships for direction, influence others, and initiate sustainable change through access to information and to anticipate the changes necessary for a successful school future

5	2015	(Aksal, 2015)	Digital leadership as a capacity to keep up with technology now in an effort to reconstruct knowledge
6	2016	(El Sawy et al., 2016)	Digital leadership means doing the right thing for the strategic success of the company and its business ecosystem. Digital leadership thinks differently about business strategy, business models, IT functions, company platforms, mindsets and skills, and the workplace.
7	2017	(Zhong, 2017)	Digital leadership as the ability to inspire and lead digital transformation, create and develop a digital learning culture, support and enhance technology-based professional development, provide and maintain digital organization management
8	2018	(Cold Water, 2018)	Leadership that enables a customer-centric and service-based culture using technology is referred to as digital leadership. Digital leadership is an essential process for developing and maintaining a culture of innovation by bringing ideas to life quickly using agile IT and business architectures.
9	2021	(Eberl & Drews, 2021)	Digital leadership is a complex, customer-centric construct, digitally enabling leading-edge business models by (1) transforming roles, skills, and styles digital leaders, (2) realizing a digital organization, including governance, vision, values, structures, culture, and decision-making processes, and (3) adjustments to human resource management, virtual teams, knowledge, and communication and collaboration at the individual level
10	2021	(Schiuma et al., 2021)	Digital leadership is the ability to do the right thing for strategic success for the company and Enterprise Business Ecosystem
11	2021	(Trenerry et al., 2021)	Digital leadership is the ability that individuals possess or that organizations must have in the age of digital technology to lead others, teams, or entire organizations to contribute to digital thinking by leveraging digital insights, digital decision-making, digital implementation and digital guidance to ensure their goals are achieved
12	2022	(Sağbaş & Erdogan, 2022)	Digital leadership is a leadership style exemplified by individuals who have innovative ideas in a digital environment, motivate their employees in a digital environment, communicate with their employees sustainably even in the digital environment, and are able to to develop a digital strategy.
13	2023	(Soehaditama et al., 2023)	Digital leadership is a manager who constantly adapts to different types of rulers (transformations, transactions) and manages digital processes to gain strategic competitiveness
14	2024	(Veithzal and Rony, 2024)	Digital leadership is a process of social transformation facilitated by modern information technology to influence individuals, groups, and/or to implement, recognize, demeanor, and take actions of individuals or groups

The explanation of each definition in table 1 shows that the development of the concept of digital leadership is very varied and broad. Digital leadership is a combination of digital culture and digital competence. Digital leadership can be interpreted in the context of individuals, individual levels in the organization, and the organization itself (Büyükbeşe et al., 2022; Yusuf et al., 2023).

In the context of an organization, digital leadership can be understood as the ability to lead an organization in the digital era by utilizing technology and innovation to achieve organizational goals. This ability includes the formulation of organizational vision and strategy as well as the management of employees in the organization (Brunner et al., 2023; Kawiana, 2023; Türk, 2023). These abilities

range from creating visions and strategies that integrate digital technology into them, leading teams and managing resources to achieve goals, to building an organizational culture that is able to adapt to change (de Araujo et al., 2021).

The goal of a digital leader is to bring digital transformation to life and enable businesses to maximize their potential in the digital environment. This means that digital leadership is a leader's contribution to transforming into a community of knowledge and skills in technology (Klus & Müller, 2021; Maheshwari & Yadav, 2020).

Digital leadership must have digital knowledge and literacy, vision and capacity to design various customer-centric strategies, the ability to adapt to changing market conditions, and the willingness to take risks and the ability to collaborate (Sağbaş & Erdogan, 2022). The quality of digital leadership can be compared to other leadership styles. Digital leadership practices are closely related to emotional intelligence and other leadership styles such as transformational leadership (Aldawood et al., 2019).

Transformational leadership consists of four main aspects (Morgan & Papadonikolaki, 2021). First, Idealized influence, leaders play a role or function as role models in terms of quality and behavior. Second, inspirational motivation, leaders set a vision that inspires and shows optimism to motivate employees to realize the vision or participate actively. Third, intellectual stimulation, leaders intellectually stimulate their employees to bring out the best in themselves. And fourth, Individualized consideration (individual support), leaders respond to employees according to individual abilities and needs (Alabdali et al., 2024; Magesa & Jonathan, 2022).

Digital leadership must be guided by visionary figures, have a digital-era learning culture, professional development, systematic improvement and digital citizenship (Connolly et al., 2023). Digital leaders have a wealth of expertise and experience, a business vision to achieve digital goals, and the ability to adapt ideas and policies to a changing situation.

Digital leadership is a manager who continuously adapts different types of governance (transformation, transactions) and manages the digital transformation process to gain a strategic competitive advantage (Soehaditama et al., 2023). Digital leadership functions for digital management, becoming a combination of digital culture and digital competence. Digital leadership is a concept of reciprocity and is not tied only to top management positions in the top-down sense. A holistic approach should be applied in digital leadership and employees at lower levels of the hierarchy should adopt and be actively involved in digital leadership (Gierlich-Joas et al., 2020).

CONCLUSION

The concept of digital leadership has shown significant development in the last ten years. The results of empirical research also enrich the concept of digital leadership operationally. Digital leadership is the ability of leaders to utilize digital transformation as optimally as possible to increase organizational competitiveness.

Digital leadership refers to the ability to influence and guide an organization through digital transformation and the use of technology. These skills and competencies are needed so that digital leadership can run optimally in today's digital economy era (Malik et al., 2024; Sağbaş & Erdogan, 2022).

Digital leadership must have a vision and strategy, namely being able to create a clear vision so that digital technology can improve business processes and customer experience. Digital leadership is also closely related to innovation. For this reason, digital leadership must encourage a culture of innovation and adaptability so that teams can adapt to changes in technology and market conditions.

Digital leadership implies being tech-savvy, meaning being able to understand evolving technologies such as AI, cloud computing, and data analytics and being able to anticipate their potential impact on the organization. Furthermore, digital leadership must be skilled in collaboration, encourage cross-functional collaboration and utilize digital technology to improve communication and teamwork.

Digital leadership should also understand change management, manage people from the change side effectively, help employees adapt to new technologies and workflows. Digital leadership is encouraged to utilize the data owned by the organization as a basis for making strategic decisions and driving performance.

In a highly competitive, disruptive, turbulent competitive situation, digital leadership is encouraged to implement a business model with a customer-centric approach. Digital technology is

increasingly making it easier for organizations to increase customer engagement and improve the overall customer experience.

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REFERENCES

Abbu, H., Mugge, P., Gudergan, G., & Kwiatkowski, A. (2020). Digital leadership-character and competency differentiates digitally mature organizations. *2020 IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC)*, 1–9.

Adha, L. A. (2020). Industrial digitalization and its impact on employment and employment relations in Indonesia. *Journal of Legal Compilation*, *5*(2), 267–298.

Aksal, F. A. (2015). Are headmasters digital leaders in school culture? *Egitim ve Bilim*, *40*(182).

Aksenta, A., Irmawati, I., Ridwan, A., Hayati, N., Sepriano, S., Herlinah, H., Silalah, A. T., Pipin, S. J., Abdurrohim, I., & Boari, Y. (2023). *DIGITAL LITERACY: The Latest Knowledge & Transformation of Digital Technology in the Industrial Era 4.0 and Sociaty 5.0*. PT. Sonpedia Publishing Indonesia.

Alabdali, M. A., Yaqub, M. Z., Agarwal, R., Alofaysan, H., & Mohapatra, A. K. (2024). Unveiling green digital transformational leadership: Nexus between green digital culture, green digital mindset, and green digital transformation. *Journal of Cleaner Production*, *450*, 141670.

Aldawood, H., Alhejaili, A., Alabadi, M., Alharbi, O., & Skinner, G. (2019). Integrating digital leadership in an educational supervision context: A critical appraisal. *2019 International Conference in Engineering Applications (ICEA)*, 1–7.

Andini, R. D. (2021). Leader's Strategy in Digital Leadership in the Era of Digital Disruption. *Al-Irsyad: Journal of Education and Counseling*, *11*(1), 58–72.

Arifiani, L., & Furinto, A. (2022). *Transformation of business models concepts, strategies, and anticipations welcomes the metaverse era*. Scopindo Media Library.

Aulia, R., & Aslami, N. (2023). The role of change management in facing challenges and optimizing opportunities in the digital era. *Journal of Nusantara Economic Science*, *1*(2), 65–72.

Avolio, B. J., Kahai, S., & Dodge, G. E. (2000). E-leadership: Implications for theory, research, and practice. *The Leadership Quarterly*, *11*(4), 615–668.

Banker, D. V, Garg, S., & Maggon, M. (2023). Virtual Leadership: Bibliometrics, Framework-Based Systematic Review, and Future Agenda. *South Asian Journal of Business and Management Cases*, *12*(3), 300–332.

Bimantoro, A., Pramesti, W. A., Bakti, S. W., Samudra, M. A., & Amrozi, Y. (2021). The ethical paradox of information technology utilization in the 5.0 era. *Journal of Information Technology*, *7*(1), 58–68.

Bones, C., & Hammersley, J. (2015). *Leading digital strategy: Driving business growth through effective e-commerce*. Kogan Page Publishers.

Brunner, T. J. J., Schuster, T., & Lehmann, C. (2023). Leadership's long arm: The positive influence of digital leadership on managing technology-driven change over a strengthened service innovation capacity. *Frontiers in Psychology*, *14*, 988808.

Büyükbeşe, T., Dikbaş, T., Klein, M., & Ünlü, S. B. (2022). A study on digital leadership scale (DLS) development. *Kahramanmaraş Sütçü İmam University Journal of Social Sciences*, *19*(2), 740–760.

Connolly, C., O'Brien, E., & O'Ceallaigh, T. J. (2023). Ensuring Knowledge Sustainability in a Digital Era: Empowering Digital Transformation Through Digital Educational Leadership. *Technology, Knowledge and Learning*, 1–17.

Csombók, J. (2023). *Challenges of Transformational Leadership in the Digital Age: The Role of Moral Trust in Maintaining Transformational Approaches*. Universitätsbibliothek der HSU/UniBwH.

de Araujo, L. M., Priadana, S., Paramarta, V., & Sunarsi, D. (2021). Digital leadership in business

organizations. *International Journal of Educational Administration, Management, and Leadership*, 45–56.

Dewanto, R. (2023). *The Influence of Digital Training, Digital Leadership and Subjective Wellbeing on the Performance of Non-Civil Servants at the Kebumen Regency Communication and Informatics Office*. Putra Bangsa University.

Eberl, J. K., & Drews, P. (2021). Digital Leadership–Mountain or molehill? A literature review. *Innovation through Information Systems: Volume III: A Collection of Latest Research on Management Issues*, 223–237.

Eckerholm, R. (2023). *Navigating New Norms: The Transformation of Leadership in Hybrid Work Setting*.

El Sawy, O. A., Kræmmergaard, P., Amsinck, H., & Vinther, A. L. (2016). *How LEGO built the foundations and enterprise capabilities for digital leadership. Strategic Information Management*. Taylor & Francis Group, Oxfordshire, UK.

Fang, L. (2023). Examining the Effects of Digital Leadership Strategies on Enhancing Organizational Innovation Performance. *Journal of Logistics, Informatics and Service Science*, *10*(4), 318–335.

Fikriyah, B. U. (2024). Business in the Digital Age: Digital Transformation for Startups and SMEs. *Variety of Public Relations Practices and Virtual Research*, 53.

Fisk, P. (2002). The making of a digital leader. *Business Strategy Review*, *13*(1), 43–50.

Gadekar, R. A. (2022). *Study of industry 4.0 implementation in manufacturing companies*.

Gierlich-Joas, M., Hess, T., & Neuburger, R. (2020). More self-organization, more control—or even both? Inverse transparency as a digital leadership concept. *Business Research*, *13*(3), 921–947.

Guzmán, V. E., Muschard, B., Gerolamo, M., Kohl, H., & Rozenfeld, H. (2020). Characteristics and Skills of Leadership in the Context of Industry 4.0. *Procedia Manufacturing*, *43*, 543–550.

Hermawanto, A., & Anggraini, M. (2020). *Globalization, Digital Revolution and Locality: International and Domestic Dynamics in the Era of a Borderless World*. LPPM Press UPN "Veteran" Yogyakarta.

IQBAL, R. M. (2022). *Digital transformation analysis based on dynamic capabilities to support business sustainability*.

Jameson, J., Rumyantseva, N., Cai, M., Markowski, M., Essex, R., & McNay, I. (2022). A systematic review and framework for digital leadership research maturity in higher education. *Computers and Education Open*, *3*, 100115.

Japar, M., & Sumantri, M. S. (2022). *Pluralism and Multicultural Education*. Jakad Media Publishing.

Kawiana, I. G. P. (2023). Digital leadership: building adaptive organizations in the digital age. *Jurnal Multidisiplin Sahombu*, *3*(01), 170–179.

Kirana, A. Y., Saifudin, M., Mukhlisin, M. M., Fatmawati, N., & Ansori, M. I. (2023). Digital Transformation of Human Resources as an Effort to Improve Company Capabilities. *Digital Business: Journal of Management Science and E-Commerce Publications*, *2*(4), 19–36.

Klus, M. F., & Müller, J. (2021). The digital leader: what one needs to master today's organisational challenges. *Journal of Business Economics*, *91*(8), 1189–1223.

Kotter, J. P., Akhtar, V., & Gupta, G. (2021). *Change: How organizations achieve hard-to-imagine results in uncertain and volatile times*. John Wiley & Sons.

Kupiek, M. (2021). *Digital leadership, agile change and the emotional organization: Emotion as a success factor for digital transformation projects*. Springer.

Kurubacak, G. (2006). Reflections on the Digital Youth Leadership for Social Justice Activism: Understanding Silent Dialogues through Critical Pedagogy. *Journal on School Educational Technology*, *2*(2), 44–51.

Latifah, L., & Ngalimun, N. (2023). Post-pandemic education recovery through digital transformation with an Islamic education management approach in the Society 5.0 era. *Floating Journal: Social Sciences*, *5*(1), 41–50.

Litvinenko, V. S. (2020). Digital economy as a factor in the technological development of the mineral sector. *Natural Resources Research*, *29*(3), 1521–1541.

Magesa, M. M., & Jonathan, J. (2022). Conceptualizing digital leadership characteristics for successful digital transformation: the case of Tanzania. *Information Technology for Development*, *28*(4), 777–796.

Maheshwari, S. K., & Yadav, J. (2020). Leadership in the digital age: emerging paradigms and challenges. *International Journal of Business and Globalisation*, *26*(3), 220–238.

Malik, M., Raziq, M. M., Sarwar, N., & Gohar, M. (2024). Navigating the change: a case study of the textile industry on digital leadership, digital transformation and innovative business models. *Benchmarking: An International Journal*.

Morgan, B., & Papadonikolaki, E. (2021). Digital leadership for the built environment. In *Industry 4.0 for the Built Environment: Methodologies, Technologies and Skills* (pp. 591–608). Springer International Publishing.

Mudrikah, S., Ahyar, D. B., Lisdayanti, S., Parera, M. M. A. E., Ndorang, T. A., Wardani, K. D. K. A., Siahaan, M. N., Hanifah, D. P., Amalia, R., & Siagian, R. C. (2022). *Inovasi pembelajaran di abad 21*. Pradina Pustaka.

Munsamy, M. (2022). *A digital leadership competency framework in the era of 4IR*. University of Johannesburg.

Mwita, M. M., & Joanthan, J. (2019). Digital leadership for digital transformation. *Electronic Scientific Journal*, *10*(4), 2082–2677.

Nurjanah, I. (2022). *Analysis of Digital Culture Transformation in the Covid-19 Pandemic Era in Indonesia*.

Oktaviani, E., Asrinur, A., Prakoso, A. W. I., & Madiistriyatno, H. (2023). Digital Transformation and Management Strategy. *Oikos Nomos: Journal of Economic and Business Studies*, *16*(1), 16–26.

Paulina, O. (2023). The Effect of Digital Leadership and Transformational Leadership on Employee Performance. *Review: Journal of Multidisciplinary in Social Sciences*, *1*(01), 10–15.

Peng, Y., Alias, B. S., Mansor, A. N., & Ismail, M. J. (2024). Charting the evolving landscape of digital leadership in education: A systematic literature review. *Journal of Infrastructure, Policy and Development*, *8*(8), 5925.

Phakamach, P., Panjarattanakorn, D., & Onsampant, S. (2023). Conceptualization and development of digital leadership to drive corporate digital transformation for sustainable success. *International Journal of Educational Communications and Technology*, *3*(2), 30–42.

Purwanto, A., Purba, J. T., Bernarto, I., & Sijabat, R. (2021). The Influence of Servant, Digital and Green Leadership on Manufacturing Industry Performance Through Mediation of Organizational Commitment. *Journal of Management and Entrepreneurship Inspiration Research*, *5*(1), 1–13.

Ramli, A. M., Permata, R. R., Mayana, R. F., Ramli, T. S., & Lestari, M. A. (2021). Intellectual Property Protection in the Utilization of Information Technology during Covid-19. *De Jure Journal of Legal Research*, *21*(1), 45–58.

Ratajczak, S. (2022). Digital leadership at universities–a systematic literature review. *Forum Scientiae Oeconomia*, *10*(4), 133–150.

Rautiainen, M. (2024). *Effects of COVID-19 pandemic on Digital Transformation in the Art Museum sector*. M. Rautiainen.

Riswanto, A., Joko, J., Napisah, S., Boari, Y., Kusumaningrum, D., Nurfaidah, N., & Judijanto, L. (2024). *Digital Business Economy: Dynamics of Business Economics in the Digital Era*. PT. Sonpedia Publishing Indonesia.

Rochmawati, D. R., Hatimatunnisani, H., & Veranita, M. (2023). *Developing Business Strategies in the Era of Digital Transformation*.

Sağbaş, M., & Erdogan, F. A. (2022). Digital leadership: a systematic conceptual literature review. *Istanbul Kent University Journal of Humanities and Social Sciences*, *3*(1), 17–35.

Salih, A. M. (2024). *Digital Leadership: Evidence from Theory and Practice*. Taylor & Francis.

Schiuma, G., Schettini, E., & Santarsiero, F. (2021). How wise companies drive digital transformation. *Journal of Open Innovation: Technology, Market, and Complexity*, *7*(2), 122.

Schneider, S., & Kokshagina, O. (2021). Digital transformation: What we have learned (thus far) and what is next. *Creativity and Innovation Management*, *30*(2), 384–411.

Sepriano, S., Hikmat, A., Munizu, M., Nooraini, A., Sundari, S., Afiyah, S., Riwayati, A., & Indarti, C. F. S. (2023). *Public Administration Transformation Faces the Digital Era*. PT. Sonpedia Publishing Indonesia.

Shahim, A. (2021). Security of the digital transformation. *Computers & Security*, *108*, 102345.

Sheninger, E. (2014). Pillars of digital leadership. *International Center for Leadership in Education*, *1*(4), 1–4.

Soehaditama, J. P., Zen, A., Sjarifudin, D., Widyastuti, T., & Karsono, B. (2023). Digital leadership for agile organization and organizational sustainability. *East Asian Journal of Multidisciplinary Research*, *2*(5), 2165–2176.

Sudarsono, S. C., Putranti, A., Suprajitno, S., Taum, Y. Y., Aji, G. F. S., Utama, F. G. A., Wardani, M. M. S., Puri, A. D., Rosiandani, N. L. P., & Pukan, E. O. (2023). *Sastra dan Transformasi Digital*. Sanata Dharma University Press.

Sułkowski, Ł. (2023). *Managing the digital university: paradigms, leadership, and organization*. Taylor & Francis.

Tanniru, M. R. (2018). Digital leadership. In *Management of information systems*. IntechOpen.

Trenerry, B., Chng, S., Wang, Y., Suhaila, Z. S., Lim, S. S., Lu, H. Y., & Oh, P. H. (2021). Preparing workplaces for digital transformation: An integrative review and framework of multi-level factors. *Frontiers in Psychology*, *12*, 620766.

Tulungen, E. E. W., Saerang, D. P. E., & Maramis, J. B. (2022). Digital transformation: The role of digital leadership. *Journal of EMBA: Journal of Research in Economics, Management, Business and Accounting*, *10*(2).

Türk, A. (2023). Digital leadership role in developing business strategy suitable for digital transformation. *Frontiers in Psychology*, *13*, 1066180.

Van Veldhoven, Z., & Vanthienen, J. (2022). Digital transformation as an interaction-driven perspective between business, society, and technology. *Electronic Markets*, *32*(2), 629–644.

Van Wart, M., Roman, A., Wang, X., & Liu, C. (2019). Operationalizing the definition of e-leadership: identifying the elements of e-leadership. *International Review of Administrative Sciences*, *85*(1), 80–97.

Veithzal, A. P., & Rony, Z. T. (2024). Analysis of Implementing Digital Leadership Within Organizations. *Dinasti International Journal of Digital Business Management*, *5*(2), 303–316.

Wahyudi, A., Assyamiri, M. B. T., Al Aluf, W., Fadhillah, M. R., Yolanda, S., & Anshori, M. I. (2023). The impact of digital era transformation on human resource management. *Journal of Management Stars*, *1*(4), 99–111.

Wang, T., Lin, X., & Sheng, F. (2022). Digital leadership and exploratory innovation: From the dual perspectives of strategic orientation and organizational culture. *Frontiers in Psychology*, *13*, 902693.

Wasono, L. W., & Furinto, A. (2018). The effect of digital leadership and innovation management for incumbent telecommunication company in the digital disruptive era. *International Journal of Engineering and Technology*, *7*(2.29), 125–130.

Wibowo, A. (2022). Digital Economy Transformation. *Publisher of Yayasan Prima Agus Teknik*, 1–179.

Yusuf, M., Satia, H., Bernardianto, R., Nurhasanah, N., Irwani, I., & Setyoko, P. (2023). Exploring the role of digital leadership and digital transformation on the performance of the public sector organizations. *International Journal of Data and Network Science*, *7*(4), 1983–1990.

Zhang, M. (2021). Job characteristics and millennial employees' creative performance: a dual-process model. *Chinese Management Studies*, *15*(4), 876–900. https://doi.org/10.1108/CMS-07-2020-0317

Zhong, L. (2017). Indicators of digital leadership in the context of K-12 education. *Journal of Educational Technology Development and Exchange (JETDE)*, *10*(1), 3.