

Chapter 5

The Validity and Reliability of the Measure for Digital Leadership: Turkish Form



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Abstract Digital transformation is forcing the business world to rethink leadership. Organizations now need a new form of leadership, and these leaders need to be better equipped to navigate this extraordinary kind of change. The role of the leaders is now crucial to capture the real value of digitalization for they are the ones who manage and retain talent by better reaching for, connecting, and engaging with employees. Leaders are therefore faced with the challenge of putting these different ideas into practice and reinventing themselves as *digital leaders*. Unfortunately, most of the studies addressing digital leadership are conceptual, and empirical evidence addressing this subject is scarce. In the future, a significant share of conceptual material and experience reports will emerge because digital leadership is still a very new subdiscipline of leadership research, in part because of the field's extremely high speed. Digital leadership continues to have numerous outcomes at the conceptual level; it also needs to be operationalized and investigated empirically. In order to move research on digital leadership forward, it is now time to explore new ideas and theories, which are empirically based, to reaffirm digital leadership. To fill these gaps, this chapter introduces a theoretical framework for digital leadership and tests the validity and reliability of the Turkish form of the Measure for Digital Leadership which is developed by Claassen et al. (J Occup Med Toxic 16, 2021).

Within the scope of the scale validation process, a total of 363 employees were reached from two different samples to evaluate the psychometric properties of the scale. Descriptive and confirmatory factor analyses and test-retest analyses were performed on the collected data. The findings showed that the scale has a one-factor structure, like the original. The researchers of this chapter believe that the validity

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and reliability of the Measure for Digital Leadership: Turkish Form will make contributions to the literature on leadership research.

Keywords Digital leadership · Digital technology · Digitalization · Chief digital officer

5.1 Introduction

There is a rapid development of digital technologies, such as artificial intelligence, big data, cloud computing, blockchain, and the industrial Internet. Organizations are going through a digital transformation to achieve breakthrough innovation and sustainable development (Zhu et al., 2022). The digital revolution is here, and there is no sector that is exempt from its effects (Swaminathan & Meffert, 2017). Consequently, digitalization is on the agenda of most organizations (Vardarlier, 2020).

Digitization does not only change the structures, processes, and information technology (IT) of organizations; it changes the people who live and work in this new reality as well (Swaminathan & Meffert, 2017). As leadership is an essential factor that may shape digital transformation processes and outcomes in work teams and organizations (Trenerry et al., 2021), digitalization will require a cultural change for leaders. This change will be even more challenging than the technological challenges organizations will be facing (Zimmermann, 2018).

Digital transformation is forcing the business world to rethink leadership. Digital leaders need to evolve faster than this pace of change; they need to improve their skills and capabilities for the continuous success of their organizations (Brett, 2019). Brandes-Visbeck (as cited in Teichmann & Hüning, 2018) argues digital leadership stands for everything that a lot of organizations currently lack: an innovative spirit, value orientation, the potential for disruption and contradiction, flexibility in the matter at hand, but also steadfastness, in essence, a high level of social competence, and a great deal of courage. Since they are experimenting with combined human and robotic workforces, digital leaders have the potential to shape the future of many organizations (Joy, 2020).

This chapter tests the validity and reliability of the Turkish form of the measure for digital leadership which is developed by Claassen et al. (2021). Within the scope of the scale validation process, a total of 363 employees were reached from two different samples to evaluate the psychometric properties of the scale. Descriptive and confirmatory factor analyses and test-retest analyses were performed on the collected data. The findings showed that the scale has a one-factor structure, like the original. The researchers of the present study believe that the validity and reliability of the Measure for Digital Leadership: Turkish Form will make contributions to the literature on leadership research.

5.2 Literature Review

5.2.1 *Digital Technology and Digitalization of the Working Environment*

Digitalization has moved to the center stage and is changing the whole game, and digital technologies, trends, opportunities, and threats are creating a brand-new competitive frontier (Gartner, 2015). The changes brought about by increasing digitalization are immense – both from an economic and a social perspective: information technologies, digital business models, machines with artificial intelligence, and new media are transforming markets and industries, organizational structures and cultures, value creation processes, and customer relationships, as well as forms of collaboration (Zeichhardt, 2018).

The ongoing repercussions and consequences of digitalization control the digital transformation (Pelters, 2021) which involves using digital technologies to remake a process to become more efficient or effective (Samuels, 2021) and is defined as “an ongoing and far-reaching process of change for society, the economy, and politics based on digital technologies that have a fundamental impact on information, communication, and transactions between the players involved in each case and leads to a new understanding and behavior in the social, economic and political spheres of life” (Kollmann, 2020).

The role of the leaders is now crucial to capture the real value of digitalization for they are the ones who manage and retain talent by better reaching for, connecting, and engaging with employees (Cortellazzo et al., 2019). *Leadership 4.0* is therefore faced with the challenge of putting these different ideas into practice and reinventing themselves as *digital leadership* (Eggers & Hollmann, 2018) – also referred to as *e-leadership* (Avolio et al., 2000; Gurr, 2006). For the purposes of this chapter, the researchers use the term *digital leadership* as broadly as possible to capture the many perspectives found in the literature.

5.2.2 *Digital Leadership*

Digitalization has profoundly altered leadership styles and competencies in the digital economy (de Araujo et al., 2021) and presents new challenges to leaders. They must adjust to the uncertain climate and increase their digital literacy in order to lead organizations effectively. The principles of digital leadership have emerged as the most pertinent leadership philosophies to address demands that are changing and becoming more complex (Zhu et al., 2022).

Although previous research reveals that the digital business environment is fundamentally different from the traditional one (Kane et al., 2018) and it takes a renaissance of leadership (Zimmermann, 6), in parallel, there is an ongoing debate about whether digital leadership distinguishes from traditional leadership (Kane

et al., 2019; Wirtz, 2021). While some researchers suggest that current leadership theories are outdated and not keeping pace with continual change and vast technological advancements (Martin, 2017) and they do not sufficiently address the opportunities and challenges arising from digitalization (Klein, 2020), some argue that digital leadership is not different from traditional leadership (Morgan & Papadonikolaki, 2022), and it has been existing for more than 150 years (Bach & Sulíková, 2021). In parallel, Stott (2016) asserts that in essence, wherever a leader is on the spectrum of digital transformation, or if he/she is facing tectonic demographic shifts, economic volatility or else leadership is still leadership, and the fundamentals do not change.

Living in an increasingly complex world and having to cope with technology that is evolving so rapidly create a challenge for all organizations to confidently and safely navigate the digital world (Benbya et al., 2020; Lewis, 2020). Overall, the demands on leaders in a digital world are immense (Teichmann & Hüning, 2018). The leadership literature tackles the issue of the growing prevalent diffusion of information and communication technologies that have profoundly changed relationships among employees. Therefore, leadership needs to adapt to develop through the support of these technologies (Torre & Sarti, 2020). This emerging phenomenon has been labeled *digital leadership* (also referred to as *e-leadership* in academic research). It is defined by various researchers as “the new or adapted roles/activities required of leaders to effectively lead digital transformation and digital business” (Busulwa & Evans, 2021), “doing the right things for the strategic success of digitalization for the enterprise and its business ecosystem” (El Sawy et al., 2016), “the leadership abilities to manage the staff’s online activities (e.g., posting product descriptions and handling customer queries), leading marketing activities, problem-solving, and decision-making concerning online activities of the business” (Borah et al., 2022), “leaders who have initiated a massive process of digitalization in their organizations” (Cortellazzo et al., 2019), “the systematic use of an organization’s digital data to accomplish corporate objectives” (Antonopoulou et al., 2021), or “leadership in the core sectors of the knowledge society – the three ‘C’s of computing, communications and content (broadcasting and print), and now multi-media” (Wilson, 2004).

Digital leadership is not defined consistently in literature (Benitez et al., 2022; Claassen et al., 2021; Eberl & Drews, 2021; Teichmann & Hüning, 2018), and there is no patent recipe for the successful establishment of a digital leader (von Boeselager, 2018). Besides, some researchers made a list of the competencies and characteristics that digital leaders should possess.

While Kane et al. (2018) name the five most important traits needed to be a digital leader as direction (providing vision and purpose), innovation (creating the conditions for people to experiment), execution (empowering people to think differently), collaboration (getting people to collaborate across boundaries), and inspirational leadership (getting people to follow you), Antonopoulou et al. (2021) argue that digital leadership skills include all of the expertise and abilities necessary for a person to initiate and direct IT-related creativity at all levels of the organization, from the smallest to the largest, both private and public. Prince (2018) asserts

that digital leadership is multidimensional; it comprises elements of authentic leadership, transactional leadership, and transformational leadership. Chandrasekar and Mallis (2021) compile nine digital leadership roles which provide a holistic picture of what is really required to make digital transformation happen. Those are identified as future seekers (setting direction: scanning the environment to frame digital opportunities and make strategic decisions); business shapers, customer champions, ecosystem builders, organization transformers, and innovation accelerators (creating alignment: developing the learning environment and innovation infrastructure for rapid execution); and talent maker, culture catalyst, and engagement energizer (scaling commitment: engaging talent across the organization to enable change, new ways of leading and working).

Møller et al. (2022) claim that digital leaders who have achieved outsized value creation by investing heavily in foundational capabilities and building their teams, technology, and data platforms have taken four key actions to accelerate their digital strategies which are having focused digital investments on innovation and new products and services; having maintained a fail fast and agile culture; having centralized operating models with a strong, outcome-driven incentive system; and having empowered team leads or change agents to socialize and champion digital projects requiring more scrutiny. Hüsing et al. (2015) argue that these leaders drive successful innovation and capitalize on advances in information and communication technologies.

Research reveals that high-performing leaders today need different skills and expertise than in generations past, yet most organizations have not moved rapidly enough to develop digital leaders, promote young leaders, and build new leadership models (Abbatiello et al., 2017).

5.3 Chief Digital Officer (CDO)

As quickly developing digital technologies continue to change the business landscape, a new position has evolved at the top table of many businesses: the Chief Digital Officer (CDO) (Kunisch et al., 2022). In fact, the head of data (Chief Digital Officer), the trustee, the data management executive, and the leader of information governance are among the new jobs that are currently emerging in many businesses to address digital management concerns. All of these positions are vying to fill the present leadership gap in organizations that exists to guarantee the accuracy and utility of information (Dolan, 2021). However, the organization's overall digital agenda falls under the purview of the Chief Digital Officer (Swaminathan & Meffert, 2017). Thus, more and more organizations are hiring CDOs to manage their digital transformation (Hermes & Riedl, 2022).

Although the job of CDO is increasing in popularity, it is still not widespread enough. Nevertheless, researchers believe that this change is soon to come. More boards and executive teams today recognize that the Chief Marketing Officer, Chief Information Officer, Chief Strategy Officer, and Chief Executive Officer all have a

role in driving digital transformation. However, the Chief Digital Officer has the exceptional capacity to bring together an executive team as an enabler who supports the missions of their peers (Deloitte, 2015).

Today, digital leadership means mastering the triad of digital transformation of digital mindset, digital skills, and digital execution (Kollmann, 2020). As the establishment of the CDO role denotes the strategic nature of the organization's digital transformation (Firk et al., 2021; Rakovi'c et al., 2022), the CDO has been dubbed by McKinsey and Co. (2015) as the *transformer in chief*. Creusen et al. (2017) emphasize that the competence factor will become increasingly important in the context of digital transformation and state "A Chief Digital Officer (CDO) is important, not because of the title on the business card, but because of the competence to implement the digital transformation in a company."

von Boeselager (2018) states that true to the word the CDO as Chief Digital Officer assumes the highest leadership position in the company for the digital theme world, but the CDO bears the responsibility, particularly for the digital transformation for the sustainable anchoring of digital in the organization. He adds that CDO replaces the CEO. However, as Swaminathan and Meffert (2017) claim that digital transformation starts with the CEO of an organization because he/she is the one who triggers the change in the corporate culture and the one who takes responsibility for the digital change, research also reveals that 41% of digitally mature companies and 31% of digitally developing companies put the responsibility of digital transformation with the CEO (Kane, 2018).

5.4 Research on Digital Leadership

Even though digital leadership was broadly defined nearly two decades ago as an overlapping concept of *e-leadership* (Avolio et al., 2000), there has been surprisingly little progress (Avolio et al., 2014).

The findings of the study of Abbatiello et al. (2017) revealed that the most critical need for organizations is for leaders to develop digital capabilities and that only 5% of organizations feel they have strong digital leaders in place. Nonetheless, the findings of the same study also revealed that 72% of respondents are developing or starting to develop new leadership programs focused on digital management, and this may be regarded as a sign of positive change.

Previous research revealed that digital leadership has a relatively favorable association with the leadership outcome, which is translated as a high level of performance and satisfaction coexisting with a high level of digital leadership execution (Antonopoulou et al., 2021), promotes learning organization on individual performance (Artüz & Bayraktar, 2021) and employee creativity (Zhu et al., 2022), improves an organization's innovation performance by digitalizing the organization's platform (Benitez et al., 2022), has a positive impact on exploratory innovation (Wang et al., 2022), fosters timely and open communications (Abbu et al., 2020), and supports communication and collaboration (Zhong, 2016).

The findings of the study by Zeike et al. (2019) showed that well-being is significantly correlated with digital leadership. The results of the study of Dewi and Sjabadhyni (2021) reveal that as a unidimensional variable, digital leadership is a strong predictor of psychological well-being. However, as a multidimensional variable, the digital leadership–skill dimension has significant and positive effects on psychological well-being, whereas the digital leadership–attitude, competencies, and behavior dimension do not have a significant effect on psychological well-being.

Previous research also reveals that leadership attributes, strategic priorities, organizational focus areas for exploration, and digital governance practices for exploitation are significant antecedents of effective digital leadership (Karippur & Balaramachandran, 2022).

The study of Claassen et al. (2021) presents an instrument for measuring the construct of digital leadership competence at the computer workstation.

5.5 Research Method

In the context of the process proposed by Brislin (1970), the English form of the scale was translated into Turkish by a commission consisting of five academicians with good command of English, and then the consistency between the Turkish and English forms was examined. Later, the Turkish form was examined in terms of meaning and grammar by three academicians in Turkish language and necessary corrections were made, and the Turkish form was obtained for trial. In the next step, the Turkish trial form was applied to ten doctoral students who took a leadership course, and some minor changes were made in line with the opinions of these students.

To protect all participants, all subjects read informed consent before participating in this study and voluntarily made their decision to complete surveys. The protocol was approved by an institutional review board at Nişantaşı University.

5.5.1 Sample

The data of the scale validation study consist of samples collected at two different times. The first sample of the study consists of 225 employees between June 5 and 28 2022, and the second sample consists of 138 employees who answered the questionnaire twice in June and September 2022. The entire sample of the research consists of 363 people.

5.5.2 *Digital Leadership Scale*

Digital Leadership Scale, developed by Claassen et al. (2021), consists of seven items. First question “I am involved in decisions that affect my work and my digital work environment” in the original scale into two questions as “I am involved in decisions that affect my work environment” and “I am involved in decisions that affect my digital work environment” where “work” and “digital work” in one question have a potential to confuse the respondents (Appendix A). The participants were asked to evaluate the items with a 6-point Likert-type scale (1 = Strongly Disagree, 6 = Strongly Agree). As a result of the analysis carried out by the authors, none of the questions was removed from the scale.

5.5.3 *Scale Validation Process*

According to Hinkin (1995), the “scale evaluation” phase, which is recommended to focus on scale development studies, includes the validity and reliability analysis of an improved scale. In this context, factor analyses, internal consistency, and test-retest analyses were generally used.

The first sample was used for factor and internal consistency analysis, and the second sample was used to test test-retest reliability. The scales used in the social sciences are expected to have medium or high correlations within a certain time frame. Because the concepts shaped by socialization processes are expected to lead people for a long time, and it is assumed that this is a concept that will not change situationally. For this reason, scale’s time consistency was examined.

5.5.4 *Findings*

Confirmatory factor analysis was applied in the first stage of the study, and items of the scale were collected under one factor like in the original study. In the second stage, data were subjected to exploratory factor analysis.

Exploratory factor analysis (EFA) was used to determine the factor structure and the distribution of items by factors. Before conducting the exploratory factor analysis, the Kaiser-Meyer-Olkin (KMO) coefficient was analyzed, whether the number of samples was sufficient, and whether the correlation between the items was appropriate was examined by the Bartlett test. Data set shows that Kaiser-Meyer-Olkin value of .910 ($> .60$) is very good for performing CFA analysis and that the Bartlett test [$\chi^2 = 1.208,412$; $df = 28$; $p < .000$] shows that it is significant (Tabachnick & Fidell, 2012).

Accordingly, the principal component analysis was applied to determine the factor structure, and the direct Oblimin method was used to take into account the correlation between items (de Winter et al., 2009; Worthington & Whittaker, 2006). The item loads and the cross-loading between the factors were used when deciding which item to stay in the analysis. In other words, while keeping the items in the analysis, it is paid attention that each item load is higher than (0.60), and if there are items loaded with more than one factor at the same time, the difference between factor loads is more than .30 (Worthington & Whittaker, 2006). If an item is removed from the analysis, the analysis was repeated until the exploratory factor analysis was carried out from the beginning and the above criteria were met. None of the items need to be removed. The results showed that the scale has a one-factor structure which explains 65.56% of the total variance. According to the EFA structure matrix, one factor consists of all eight items and has an acceptable internal consistency coefficient (Table 5.1).

At this stage, during the confirmatory factor analysis (CFA), the results obtained from EFA were used in line with the recommendations of Worthington and Whittaker (2006). In other words, the one-factor model was used as the proposed model in confirmatory factor analysis.

All index values were found in acceptable range (GFI = .901, TLI = .917, CFI = .927, and RMR = .046).

Data collected from 127 participants at 3-month intervals were analyzed for test-retest validity. The purpose of this validity is to determine the continuity of the concept over time by showing that the same concept mentioned is related between two different time periods. Item correlations varied between .482 and .675 at times T1 and T2 (3-month interval measurement), which confirms the temporal validity of the concept (Table 5.2).

Table 5.1 Digital Leadership Scale (Turkish form): item means, standard deviations, factor loadings, eigenvalue, variance explained, and Cronbach alpha value

Items	Mean	Std. Dev.	Factor loadings
Digital-Leadership-8	3.24	1.791	.856
Digital-Leadership-3	3.15	1.681	.855
Digital-Leadership-4	3.09	1.726	.827
Digital-Leadership-6	3.35	1.728	.795
Digital-Leadership-1	3.02	1.793	.792
Digital-Leadership-7	3.26	1.635	.792
Digital-Leadership-5	3.34	1.685	.785
Digital-Leadership-2	3.15	1.640	.771
<i>Eigenvalue</i>			5.245
<i>Total variance explained</i>			65.564
<i>Cronbach's alpha</i>			.925

Table 5.2 Digital Leadership Scale (Turkish form) Test: retest validity

Items	Mean (T1)	Mean (T2)	Correlation
Digital-Leadership-1	3.12	3.20	.510**
Digital-Leadership-2	3.19	3.23	.482**
Digital-Leadership-3	3.20	3.10	.638**
Digital-Leadership-4	3.30	3.33	.558**
Digital-Leadership-5	3.39	3.12	.515**
Digital-Leadership-6	3.40	3.36	.573**
Digital-Leadership-7	3.41	3.29	.672**
Digital-Leadership-8	3.30	3.14	.675**

5.6 Conclusion

Digital transformation cannot be stopped. Every business will eventually be affected by the *digitization tsunami* (Meier et al., 2017; Swaminathan & Meffert, 2017: ix) and will need to undergo its own digital transformation. For this, they all need a digital strategy. It is, however, lacking without the digital leaders, who serve as the chief digitizers, and without them, its successful alignment is extremely unlikely (von Boeselager, 2018) because only the organizations who adapt their capabilities to the digital world will continue to be in the lead. Besides, looking at numerous success stories of digital leaders in organizations throughout the world, the researchers may suggest that it is only the digital leaders who may put the organizations on the path to a successful digital future. They can help organizations achieve their goals by giving them direction and a clear vision for the future. Additionally, empirical data support the relevance of digital leadership to the concrete functioning of organizations (Torre & Sarti, 2020).

In their article which was published in the year 2001, Avolio et al. (2000) stated that they believed that it was perhaps too early to identify any empirically based, systematic, patterned variations or to draw any broad conclusions about digital leadership. Furthermore, in their article which was published in the year 2014, they stated that although the term *digital leadership* was introduced into the literature more than a decade ago, the research on this topic is still developing and there is still much to be done in this area. As Brett (2019) asserts “Leaders that lead the digital world, lead the World”. In the age of the digital (r)evolution (Aguiar, 2020; Petry, 2019), effective leadership and management require a deep understanding of the procedures used to run organizations, the objectives that determine their business models, and the social milieu in which they operate. Therefore, organizations that aim to gain a lasting competitive edge in the digital era are challenged to create transformative digital leadership characterized by a specific set of skills. As Kollmann (2020) also states, digital leadership requires an existing or new leadership personality as a digital leader who establishes a digital leadership style and culture in the organization and digitally transforms both the previous business models and the previous organization as well as builds new digital business models and a digital corporate strategy. In parallel to this statement, it is also important to note

that regarding the need for digital leadership in business which is driven by digital transformation, there are extra-occupational courses of study to become a digital leader with certificates from several universities like Galatasaray University in Turkey, the University of Duisburg – Essen in Germany, ESSEC Business School in France, HKU Space HKU School of Professional and Continuing Education in Hong Kong, the Warwick Business School – the University of Warwick in the United Kingdom and Cornell University, the Wharton School of the University of Pennsylvania, and Daniels College of Business – the University of Denver in the USA in which participants can acquire the skills and mindset needed to manage an organization in the digital age, and they will also come away better prepared to lead digital transformation initiatives to success in their organization.

Unfortunately, most of the studies addressing digital leadership are conceptual and empirical evidence addressing this subject is scarce (Oh & Chua, 2018). In the future, a significant share of conceptual material and experience reports will emerge because digital leadership is still a very new subdiscipline of leadership research, in part because of the field's extremely high speed (Eggers & Hollmann, 2018). As digital leadership continues to have numerous outcomes at the conceptual level, it also needs to be operationalized and investigated empirically. In order to move research on digital leadership forward, it is now time to explore new ideas and theories, which are empirically based, to reaffirm digital leadership. The researchers hope that the Turkish form of the measure for digital leadership may be subjected to numerous analyses to confirm its reliability and validity and will therefore be suitable for use in future studies on the impact of digital leadership on several individual and organizational outcomes, especially in the Turkish context. As a useful tool for analyzing the impacts of digital leadership, this measure can help researchers who wish to have a better overview of digital leadership but also as a useful tool for analyzing the relationship between digital leadership and several outcomes. This study has several limitations. Firstly, the data collected mainly come from the employees of organizations in Istanbul, Turkey. Additional studies in other geographical locations might help broaden the understanding of whether there are differences in the perception of digital leadership in the organization that exists among cultures. Wider coverage of different sectors including engineering, technology, medical services, and financial services makes the study more representative. The researchers encourage future research to build on the results presented in the present study and to validate the effects of digital leadership, for example, on the basis of other industries.

Appendix A: Digital Leadership Scale

English form (items)	Turkish form (maddeler)
1. I am involved in decisions that affect my work environment.	1. İşimi etkileyen kararlara dahil olurum.
2. I am involved in decisions that affect my digital work environment.	2. Dijital çalışma ortamımı etkileyen kararlara dahil olurum.
3. My digital literacy is encouraged by my manager.	3. Yöneticim dijital okuryazarlık konusunda beni teşvik eder.
4. When there is a need for questions about digitalization, I receive support from my manager.	4. Dijitalleşme ile ilgili sorularımda yöneticimden destek alırım.
5. I get regular feedback on the quality of my digital work.	5. Dijital çalışmamın niteliği hakkında düzenli olarak geri bildirim alırım.
6. I get all the information I need to do my digital job.	6. Dijital nitelikli işlerimi yapmak için ihtiyacım olan tüm bilgileri alırım.
7. I am supported by my manager to better understand and use digital applications.	7. Dijital uygulamaları daha iyi anlamak ve kullanmak için yöneticim tarafından desteklenirim.
8. In my department, digital working methods are encouraged.	8. Çalıştığım bölümde dijital çalışma yöntemleri teşvik edilir.

References

- Abbatiello, A., Knight, M., Philpot, S., & Roy, I. (2017). *Rewriting the rules for the digital age: 2017 Deloitte global human capital trends*. Deloitte University Press.
- Abbu, H., Mugge, P., Gudergan, G., & Kwiatkowski, A. (2020). Digital leadership - character and competency differentiates digitally mature organizations. In *2020 IEEE international conference on engineering, technology and innovation (ICE/ITMC)*, 2020 (pp. 1–9) <https://doi.org/10.1109/ICE/ITMC49519.2020.9198576>
- Aguiar, Y. B. (2020). *Digital (R)evolution: Strategies to accelerate business transformation*. Wiley.
- Antonopoulou, H., Halkiopoulos, C., Barlou, O., & Beligiannis, G. N. (2021). Associations between traditional and digital leadership in academic environment: During the COVID-19 pandemic. *Emerging Science Journal*, 5(4), 405–428. <https://doi.org/10.28991/esj-2021-01286>
- Artüz, S. D., & Bayraktar, O. (2021). The effect of relation between digital leadership practice and learning organization on the perception of individual performance. *İstanbul Ticaret Üniversitesi Sosyal Bilimler Dergisi*, 20(40), 97–120. <https://doi.org/10.46928/iticusbe.761479>
- Avolio, B. J., Kahai, S., & Dodge, G. E. (2000). E-leadership: Implications for theory, research, and practice. *Leadership Quarterly*, 11(4), 615–668.
- Avolio, B. J., Sosik, J. J., Kahai, S. S., & Baker, B. (2014). E-leadership: Re-examining transformations in leadership source and transmission. *The Leadership Quarterly*, 25(1), 105–131. <https://doi.org/10.1016/j.leaqua.2013.11.003>
- Bach, C., & Sulíková, R. (2021). Leadership in the context of a new world: Digital leadership and industry 4.0. *Managing Global Transitions*, 1(3), 209–226. <https://doi.org/10.26493/1854-6935.19.209-226>

- Benbya, H., Nan, N., Tanriverdi, H., & Yoo, Y. (2020). Complexity and information systems research in the emerging digital world. *MIS Quarterly*, 44(1), 1–17.
- Benitez, J., Arenas, A., Castillo, A., & Esteves, J. (2022). Impact of digital leadership capability on innovation performance: The role of platform digitization capability. *Information & Management*, 59(2), 103590. <https://doi.org/10.1016/j.im.2022.103590>
- Borah, P. S., Iqbal, S., & Akhtar, S. (2022). Linking social media usage and SME's sustainable performance: The role of digital leadership and innovation capabilities. *Technology in Society*, 68, 101900.
- Brett, J. (2019). *Evolving digital leadership: How to be a digital leader in tomorrow's disruptive world*. Apress.
- Brislin, R. W. (1970). Back-translation for cross-cultural research. *Journal of Cross-Cultural Psychology*, 1(3), 185–216.
- Busulwa, R., & Evans, N. (2021). *Digital transformation in accounting*. Routledge.
- Chandrasekar, A. & Mallis, E. (2021). *Digital leadership readiness: Lessons from Singapore [White paper]*. Center for Creative Leadership. Retrieved at http://cclinnovation.org/wp-content/uploads/2021/02/ccl_digital-leadership-readiness_lessons-from-singapore.pdf.
- Claassen, K., dos Anjos, D. R., Ketschau, J., & Broding, H. C. (2021). How to evaluate digital leadership: A cross-sectional study. *Journal of Occupational Medicine and Toxicology*, 16(44). <https://doi.org/10.1186/s12995-021-00335-x>
- Cortellazzo, L., Bruni, E., & Zampieri, R. (2019). The role of leadership in a digitalized world: A review. *Frontiers in Psychology*, 10, 1938. <https://doi.org/10.3389/fpsyg.2019.01938>
- Creusen, U., Gall, A. B., & Hackl, O. (2017). *Digital Leadership: Führung in Zeiten des digitalen Wandels*. Springer Gabler.
- de Araujo, L. M., Priadana, S., Paramarta, V., & Sunarsi, D. (2021). Digital leadership in business organizations: An overview. *International Journal of Educational Administration, Management, and Leadership*, 2(1), 45–56. <https://doi.org/10.51629/ijeamal.v2i1.18>
- Deloitte. (2015). *The rise of the chief digital officer: Key considerations for driving digital growth from the C-Suite*. Retrieved at <https://chief.digital/wp-content/uploads/Deloitte-Rise-of-the-Chief-Digital-Officer.pdf>
- Dewi, R. K., & Sjabadhyini, B. (2021). Digital leadership as a resource to enhance managers' psychological well-being in the COVID-19 pandemic situation in Indonesia. *The South East Asian Journal of Management*, 15(2), 154–168.
- Dolan, S. L. (2021). Leadership and values: A new framework for the future of work. In M. Santana & R. Valle-Cabrera (Eds.), *New directions in the future of work* (pp. 19–34). Emerald Publishing Limited. <https://doi.org/10.1108/978-1-80071-298-020211004>
- Eberl, J. K. & Drews, P. (2021). *Digital leadership - mountain or molehill? A literature review*. 16th International Conference on Wirtschaftsinformatik, 2021, Duisburg & Essen, Germany.
- Eggers, B., & Hollmann, S. (2018). Digital leadership – Anforderungen, Aufgaben und Skills von Führungskräften in der “Arbeitswelt 4.0”. In F. Keuper, M. Schomann, L. Sikora, & R. Wassef (Eds.), *Disruption und transformation management: Digital leadership – Digitales Mindset – Digitale Strategie* (pp. 43–68). Springer Gabler. https://doi.org/10.1007/978-3-658-19131-3_3
- El Sawy, O., Kraemmergaard, P., Amsinck, H., & Vinther, A. (2016). How LEGO built the foundations and enterprise capabilities for digital leadership. *MIS Quarterly Executive*, 15(2), 141–166.
- Firk, S., Hanelt, A., Oehmichen, J., & Wolff, M. (2021). Chief digital officers: An analysis of the presence of a centralized digital transformation role. *Journal of Management Studies*, 58(7), 1800–1831. <https://doi.org/10.1111/joms.12718>
- Gartner. (2015). *Flipping to digital leadership: Insights from the 2015 Gartner CIO Agenda Report Gartner Executive Programs*. Retrieved at https://www.gartner.com/imagesrv/cio/pdf/cio_agenda_insights2015.pdf
- Gurr, D. M. (2006). E-leadership. *The International Journal of Knowledge, Culture, and Change Management: Annual Review*, 5(1), 103–116. <https://doi.org/10.18848/1447-9524/CGP/v05i01/49435>

- Hermes, A., & Riedl, R. (2022). Chief Digital Officer (CDO): Literaturanalyse und Handlungsempfehlungen für die Praxis. *HMD Praxis der Wirtschaftsinformatik*, 59, 795–817. <https://doi.org/10.1365/s40702-022-00864-x>
- Hinkin, T. R. (1995). A review of scale development practices in the study of organizations. *Journal of Management*, 21(5), 967–988.
- Hüsing, T., Dashja, E., Gareis, K., Korte, W. B., Stabenow, T., & Markus, P. (2015). *E-leadership skills for small and medium sized enterprises: Final report*. Publications Office of the European Union.
- Joy, M. M. (2020, Jan). *Leadership 4.0: Equip managers, leaders and administrators for industry 4.0* (pp. 52–54). Pallikkutam.
- Kane, G. C., Phillips, A. N., Copulsky, J., & Andrus, G. (2019). How digital leadership is(n't) different. *MIT Sloan Management Review*, 60(3), 34–39.
- Kane, G. C. (2018, Aug 03). *Is the right group leading your digital initiatives? Companies shouldn't bottle up digital transformation in any one function*. Retrieved at <https://sloanreview.mit.edu/article/is-the-right-group-leading-your-digital-initiatives/>
- Kane, G. C., Palmer, D., Phillips, A. N., Kiron, D., & Buckley, N. (2018, June). *Coming of age digitally: Learning, leadership and legacy*. MIT Sloan Management Review and Deloitte University Press.
- Karippur, N. K., & Balaramachandran, P. R. (2022). Antecedents of effective digital leadership of enterprises in Asia Pacific. *Australasian Journal of Information Systems*, 26. <https://doi.org/10.3127/ajis.v26i0.2525>
- Klein, M. (2020). Leadership characteristics in the era of digital transformation. *Business & Management Studies: An International Journal*, 8(1), 883–902. <https://doi.org/10.15295/bmij.v8i1.1441>
- Kollmann, T. (2020). *Digital Leadership: Grundlagen der Unternehmensführung in der Digitalen Wirtschaft*. Springer Gabler.
- Kunisch, S., Menz, M., & Langan, R. (2022). Chief digital officers: An exploratory analysis of their emergence, nature, and determinants. *Long Range Planning*, 55(2), 101999. <https://doi.org/10.1016/j.lrp.2020.101999>
- Lewis, K. (2020, Feb 19). *Promoting digital inclusion in a complex digital world*. Retrieved at <https://digileaders.com/promoting-digital-inclusion-in-a-complex-digital-world/>
- Martin, W. (2017). *Leadership: Outdated theories and emerging non-traditional leadership*. Doctoral dissertation, Northcentral University School of Business and Technology, San Diego, California.
- McKinsey & Co. (2015). 'Transformer in chief': The new chief digital officer. Retrieved at <https://www.mckinsey.com/capabilities/people-and-organizational-performance/our-insights/transformer-in-chief-the-new-chief-digital-officer>
- Meier, C., Sachs, S., Stutz, C. & McSorley, V. (2017). *Establishing a digital leadership barometer for small and medium enterprises (Sme)*. MakeLearn & TIIM Joint International Conference, 2017, Lublin, Poland.
- Møller, T. H., Prabhakaran, S. & Wang, J. (2022, June 16). *Four ways digital leaders are accelerating their innovation strategy*. Retrieved at <https://hbr.org/sponsored/2022/06/four-ways-digital-leaders-are-accelerating-their-innovation-strategy>.
- Morgan, B., & Papadonikolaki, E. (2022). Digital leadership for the built environment. In M. Bolpagni, R. Gavina, & D. Ribeiro (Eds.), *Industry 4.0 for the built environment: Methodologies, technologies and skills* (pp. 591–608). Springer.
- Oh, S. P., & Chua, Y. P. (2018). An explorative review of e-leadership studies. *International Online Journal of Educational Leadership*, 2(1), 4–20.
- Pelters, E. (2021). Corporate digital responsibility: Understanding and applying. In T. A. Herberger & J. J. Dötsch (Eds.), *Digitalization, digital transformation and sustainability in the global economy: Risks and opportunities* (pp. 71–84). Springer.
- Petry, T. (2019). *Digital Leadership: Erfolgreiches Führen in Zeiten der Digital Economy*. Haufe-Lexware.
- Prince, K. A. (2018). *Digital leadership: Transitioning into the digital age*. Doctoral dissertation, James Cook University.

- Rakovi'c, L., Mari'c, S., Đordevi'c Milutinovi'c, L., Sakal, M., & Anti'c, S. (2022). What about the chief digital officer? A literature review. *Sustainability*, 14, 4696. <https://doi.org/10.3390/su14084696>
- Samuels, M. (2021, Oct). *What is digital transformation? Everything you need to know about how technology is reshaping business*. Retrieved at <https://www.zdnet.com/article/what-is-digital-transformation-everything-you-need-to-know-about-how-technology-is-reshaping/>
- Swaminathan, D., & Meffert, J. (2017). *Digital @ scale: How you can lead your business to the future with Digital@Scale*. Wiley.
- Stott, J. (2016). *Decoding digital leadership: What you need for surviving digital transformation is not digitally savvy leaders*. Retrieved at <https://www2.deloitte.com/content/dam/Deloitte/nz/Documents/human-capital/decoding-digital-leadership-nz.pdf>
- Tabachnick, B. G., & Fidell, L. S. (2012). *Using multivariate statistics* (6th ed.). Person Education.
- Teichmann, S., & Hüning, C. (2018). Digital Leadership– Führung neu gedacht: Was bleibt, was geht? In F. Keuper, M. Schomann, L. I. Sikora, & R. Wassef (Eds.), *Disruption und transformation management: Digital leadership – Digitales Mindset – Digitale Strategie* (pp. 23–42). Springer Fachmedien Wiesbaden. https://doi.org/10.1007/978-3-658-19131-3_2
- Torre, T., & Sarti, D. (2020). The “way” toward e-leadership: Some evidence from the field. *Frontiers in Psychology*, 11, 554253. <https://doi.org/10.3389/fpsyg.2020.554253>
- 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. <https://doi.org/10.3389/fpsyg.2021.620766>
- Vardarlier, P. (2020). Digital transformation of human resource management: Digital applications and strategic tools in HRM. In U. Hacıoglu (Ed.), *Digital business strategies in Blockchain ecosystems. Contributions to management science* (pp. 239–264). Springer. https://doi.org/10.1007/978-3-030-29739-8_11
- von Boeselager, F. (2018). *Der Chief Digital Officer: Die Schlüsselposition für eine erfolgreiche Digitalisierungsstrategie*. Springer Vieweg.
- 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. <https://doi.org/10.3389/fpsyg.2022.902693>
- Wilson, E. J. (2004). Leadership in the digital age. In G. R. Goethals, G. J. Sorenson, & J. MacGregor Burns (Eds.), *The Encyclopedia of leadership* (pp. 858–861). Sage Publications.
- de Winter, J. C. F., Dodou, D., & Wieringa, P. A. (2009). Exploratory factor analysis with small sample sizes. *Multivariate Behavioral Research*, 44(2), 147–181. <https://doi.org/10.1080/00273170902794206>
- Wirtz, B. W. (2021). *Digital business and electronic commerce: Strategy, business models and technology*. Springer.
- Worthington, R. L., & Whittaker, T. A. (2006). Scale development research: A content analysis and recommendations for best practices. *The Counseling Psychologist*, 34(6), 806–838. <https://doi.org/10.1177/0011000006288127>
- Zeichhardt, R. (2018). E-Leader, CDOs & Digital Fools: Eine Führungstypologie für den digitalen Wandel. In F. Keuper, M. Schomann, L. I. Sikora, & R. Wassef (Eds.), *Disruption und transformation management: Digital leadership – Digitales Mindset – Digitale Strategie* (pp. 3–21). Springer Gabler.
- Zeike, S., Bradbury, K., Lindert, L., & Pfaff, H. (2019). Digital leadership skills and associations with psychological well-being. *International Journal of Environmental Research and Public Health*, 16(14), 2628. MDPI AG. <https://doi.org/10.3390/ijerph16142628>
- Zhong, L. (2016). *The effectiveness of digital leadership at K-12 schools in Mississippi regarding communication and collaboration during CCRS implementation*. Doctoral dissertation: The University of Southern Mississippi.
- Zhu, J., Zhang, B., Xie, M., & Cao, Q. (2022). Digital leadership and employee creativity: The role of employee job crafting and person-organization fit. *Frontiers in Psychology*, 13, 827057. <https://doi.org/10.3389/fpsyg.2022.827057>
- Zimmermann, M. (2018, Feb). Leadership, quo vadis? Renaissance of leadership in the digital age? *Flow Bukapha Group Leadership Magazine*, 4–7.