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Research Article

Development and Validation of a Digital Leadership Scale for School Principals in the AI-Driven Era

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ABSTRACT

The emergence of the artificial intelligence (AI) era has accelerated the digital transformation of educational systems, reshaping leadership practices in schools. As digital technologies increasingly influence teaching, learning, and administrative processes, there is a growing need for robust instruments to assess digital leadership. However, existing measures largely focus on technology leadership or digital competencies, overlooking the multidimensional nature of digital leadership as a process of organizational transformation. This study addresses this gap by developing and validating a Digital Leadership Scale for school principals. Using a quantitative instrument development design, an initial item pool was generated through literature review and refined via focus group interviews. Exploratory Factor Analysis (EFA) with data from 302 school principals revealed a three-factor structure, which was validated through Confirmatory Factor Analysis (CFA) using an independent sample of 227 principals ($\chi^2/df = 3.58$, GFI = .91, CFI = .92, RMSEA = .05). The final scale consists of 28 items across three dimensions: Digital Transformation, Distance and Hybrid Education, and Digitalization. The scale demonstrated high internal consistency ($\alpha = .945$). The findings indicate that digital leadership extends beyond technology use to encompass strategic vision, instructional innovation, and organizational change, providing a valid and reliable tool for future research.

Keywords: Digital leadership, Scale development, Educational leadership, Digital transformation, Artificial intelligence in education

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Introduction

Artificial intelligence (AI) is increasingly reshaping educational systems, organizational governance, and leadership practices worldwide. AI-supported systems, learning analytics, digital platforms, and data-driven administrative tools now influence teaching practices, communication processes, learning environments, and decision-making mechanisms within schools. As educational institutions become more digitally interconnected and data-driven, the responsibilities of school leaders are also undergoing a significant transformation. School leadership can no longer be understood merely as managing technological infrastructure or supervising routine administrative processes. Instead, school principals are increasingly expected to guide institutional transformation, support innovation, foster digital culture, and sustain human-centered learning environments in technology-rich educational settings. In this context, digital leadership has emerged as a critical leadership capacity for contemporary schools.

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Digital leadership refers to leadership practices that support the strategic use of digital technologies for innovation, collaboration, and organizational development. Beyond the operational use of technological tools, digital leadership emphasizes leaders' ability to establish a vision for digital transformation, manage organizational change, and create sustainable digital learning cultures (Cortellazzo, Bruni, & Zampieri, 2019; El Sawy, Kræmmergaard, Amsinck, & Vinther, 2016). Recent studies indicate that research on digital leadership has expanded rapidly across fields such as management, information systems, and educational leadership, particularly around themes including innovation, digital transformation, organizational adaptation, and leadership competencies (Tigre, Curado, & Henriques, 2023). This growing interest reflects the increasing recognition that leadership plays a central role in determining how effectively educational organizations respond to technological and organizational transformation.

Educational systems worldwide have invested substantially in digital infrastructure and learning technologies. In Türkiye, initiatives such as the FATIH Project, the Educational Informatics Network (EBA), MEBBIS, E-School, and the Document Management System (DYS) represent important large-scale digitalization efforts. Similar developments are also evident internationally, where schools continue to expand technology integration and digital learning environments (Murphy, 2015). However, technology itself does not automatically produce meaningful educational improvement. The effectiveness of digital transformation largely depends on the leadership capacities of school administrators who guide these processes. In digitally transformed schools, leadership increasingly requires principals to balance technological innovation with pedagogical responsibility, ethical decision-making, and organizational trust.

Despite the growing importance of digital leadership, its conceptualization and measurement in educational settings remain limited. Existing studies and measurement tools have largely focused on technology leadership, digital competence, or infrastructure management perspectives rather than the broader leadership processes associated with organizational transformation and digitally mediated governance (Anderson & Dexter, 2005; Banoğlu, Vanderlinde, & Çetin, 2016). Although these approaches provide important insights into technology integration in schools, they often remain operational and competency-oriented. As a result, they are insufficient for explaining how school leaders manage AI-supported decision-making, ethical data governance, institutional trust, and the strategic transformation of digitally mediated educational environments. In AI-responsive schools, leadership increasingly involves interpreting data-driven systems, supporting pedagogical adaptation, coordinating organizational change, and maintaining human-centered governance in technology-rich contexts. These developments suggest that digital leadership should be understood not simply as the use of technology, but as a multidimensional leadership capacity shaped by digital transformation and artificial intelligence.

Accordingly, an important gap remains in understanding how digital leadership should be conceptualized and measured within contemporary educational organizations. There is a need for a comprehensive, context-sensitive, and multidimensional measurement tool capable of capturing the strategic, pedagogical, organizational, and governance-related dimensions of digital leadership in schools. In response to this gap, the present study aims to develop and validate a Digital Leadership Scale specifically designed for school principals in AI-responsive educational environments. Unlike many existing instruments that primarily focus on digital competence or technology integration, the proposed scale conceptualizes digital leadership as a broader leadership process involving organizational transformation, digital governance, pedagogical adaptation, and sustainable innovation. By providing a valid and reliable measurement instrument, this study seeks to contribute to the conceptualization of digital leadership and support future empirical research on leadership in digitally transformed and AI-driven schools.

Literature Review

Leadership has long been a central concept in organizational studies because of its critical role in guiding individuals and organizations toward shared goals. Yukl (2009) conceptualizes leadership as a social process through which leaders influence group members' interpretations, motivation, goal setting, and power relations. Over time, leadership research has evolved through multiple theoretical perspectives. Early approaches emphasized individual traits, suggesting that certain personal characteristics, such as intelligence, knowledge, and communication skills, predispose individuals to leadership roles (Yeşil, 2016; Yukl, 2009). Subsequent studies shifted toward behavioral approaches that focused on leaders' actions and interactions with followers (Koçel, 2015; Yeşil, 2016). Later, situational perspectives highlighted the importance of contextual factors such as organizational structure, task characteristics, and environmental conditions in shaping leadership practices (Hoy & Miskel, 2012; Yukl, 2009).

In contemporary organizations, leadership increasingly operates within environments characterized by volatility, uncertainty, complexity, and ambiguity (VUCA) (Bennett & Lemoine, 2014). Under such conditions, traditional leadership approaches are often insufficient for responding to rapid technological

change and organizational complexity. Consequently, contemporary leadership perspectives place greater emphasis on adaptability, innovation, collaboration, and continuous learning (Mihardjo, Sasmoko, Alamsyah & Elidjen, 2019; North Aramburu & Lorenzo, 2018). In this changing environment, digital leadership has become a critical response to digitally mediated organizational transformation. Although technology leadership and digital leadership are sometimes used interchangeably, digital leadership is a broader, more integrative construct. It extends beyond the operational use of technological tools and encompasses the transformation of organizational culture, communication practices, and learning environments through digital technologies (Çelik Şahin, Avcı, & Anık, 2020). In this regard, Sheninger (2014) defines digital leadership as a dynamic combination of behaviors, competencies, and mindsets required to lead effectively in technology-rich environments.

Scholars conceptualize digital leadership from multiple perspectives. Zeike, Bradbury, Lindert, and Pfaff (2019) emphasize the integration of digital competencies with the leadership capabilities necessary to manage digital transformation processes. Similarly, Oberer and Erkollar (2018) conceptualize digital leadership as an innovation-oriented and collaborative leadership approach, while Miller (2018) highlights the role of digital technologies in enhancing organizational effectiveness and individual well-being. In educational settings, Ordu and Nayır (2020) define digital leadership as the ability to establish an innovative vision by effectively integrating digital technologies into managerial processes, whereas Asri and Darma (2021) emphasize the importance of digital leaders in facilitating collaboration through information technologies. Taken together, these perspectives suggest that digital leadership is not merely a matter of technological proficiency but rather a multidimensional construct that emerges from the interaction between leadership capacities and the strategic use of digital technologies. This multidimensionality underscores the need for comprehensive measurement approaches that capture the complexity of digital leadership in educational contexts.

Digitalization and Digital Transformation

Technological advancements have profoundly reshaped organizational structures and processes across sectors. Digitalization generally refers to the integration of digital tools, platforms, and technologies into organizational processes to improve efficiency, productivity, and communication (Telli Yamamoto & Kalaç, 2018). In contrast, digital transformation represents a broader, more systemic change that affects organizational culture, strategies, structures, and service delivery (Oberer & Erkollar, 2018). While digitalization primarily concerns the adoption and use of digital technologies, digital transformation entails a deeper reconfiguration of organizational practices and value-creation processes within digitally mediated environments. This distinction is important because digital transformation requires organizations not only to adopt technologies but also to reconsider how they operate, collaborate, and innovate. Such transformation processes require adaptive and strategic leadership. Digital transformation is an organizational change process that demands leaders capable of managing technological disruption and uncertainty. In educational settings, digital transformation extends beyond technological integration and requires school leaders to support innovative teaching practices, establish strategic digital visions, and guide teachers and students in adapting to digitally mediated learning environments. Therefore, digital transformation in schools should be understood as a leadership-driven process in which principals function as key agents of organizational change.

Digital Leadership in Schools

Technological developments have substantially influenced educational institutions and school management processes. Since the mid-twentieth century, technological tools ranging from telephone communication to internet-based digital platforms have gradually become integrated into educational environments. In the twenty-first century, digital technologies have transformed both instructional practices and administrative processes in more visible and systematic ways. Schools are no longer institutions that merely transmit knowledge; they are also expected to equip students with the skills necessary to access, evaluate, and use information effectively. From this perspective, school leadership plays a central role in integrating digital technologies into educational environments and sustaining digital learning cultures (Sheninger, 2014).

Another factor shaping digital leadership in schools is the emergence of digitally native students who have grown up in technology-rich environments. These students frequently engage with digital tools and often prefer multimedia learning, collaboration, and digital communication (Spector et al., 2016). However, familiarity with technology does not automatically lead to responsible and critical digital practices. Students require structured guidance and pedagogically meaningful support in order to develop responsible digital citizenship (MEB, 2020). This further expands the responsibilities of school leaders, who are expected to create learning environments where digital technologies support both academic development and ethical participation.

Accordingly, educational leaders are expected to move beyond operational technology management and assume more strategic leadership roles. They need to establish a clear digital vision, support teachers' professional development in digital competencies, and create innovative learning environments in which digital tools are effectively integrated into teaching and learning. Empirical studies also indicate that principals' digital leadership positively influences teachers' digital teaching competencies, organizational learning, and school effectiveness (Banoğlu, Vanderlinde, & Çetin, 2016; Hamzah, Nasir, & Wahab, 2021). In this sense, digital leadership in schools should be understood as a multidimensional practice that integrates technological, pedagogical, and organizational dimensions. As digital transformation deepens in educational settings, the growing influence of artificial intelligence has further expanded these leadership responsibilities and reshaped expectations regarding school governance and decision-making.

Digital Leadership in AI-Driven Schools

The expanding role of artificial intelligence (AI) in educational systems has significantly transformed school leadership and further strengthened the relevance of digital leadership. AI is no longer limited to technical support systems or administrative automation; rather, it increasingly shapes decision-making processes, instructional planning, student assessment, communication practices, and organizational governance within schools. As AI-driven technologies such as learning analytics, adaptive learning platforms, predictive monitoring systems, and algorithm-based administrative tools become more widespread, school leaders are expected to develop competencies extending beyond traditional digital literacy. In this context, digital leadership emerges as a critical leadership capacity for managing organizational transformation and guiding AI-supported educational change.

In AI-driven schools, digital leadership extends beyond technology integration to include creating a vision for digital transformation, fostering a digital culture, and sustaining organizational adaptation in technology-rich environments (Cortellazzo, Bruni, & Zampieri, 2019; El Sawy, Kræmmergaard, Amsinck, & Vinther, 2016). Similarly, Sheninger (2014) conceptualizes digital leadership as a dynamic combination of behaviors, mindsets, and competencies required to lead effectively in digitally mediated environments. In educational settings, Ordu and Nayır (2020) emphasize principals' ability to establish innovative visions by integrating digital technologies into both administrative and instructional processes. In the age of AI, however, leadership increasingly extends beyond technology use to include data governance, algorithmic decision-making, ethical responsibility, institutional trust, and human-centered governance.

Recent studies suggest that AI should not be viewed merely as an additional technological tool, but rather as a transformative force capable of reshaping leadership itself. Quaquebeke and Gerpott (2023) argue that AI changes authority structures, decision-making processes, and leader–follower relationships through increasing reliance on data-driven systems and algorithmic recommendations. Similarly, González-Reyes, Ficapal-Cusí, and Torrent-Sellens (2026) emphasize that AI-supported leadership depends more strongly on predictive analytics, evidence-based decision-making, and digital governance mechanisms. These developments indicate that digital leadership in AI-driven schools requires leaders to balance technological efficiency with ethical responsibility, transparency, organizational trust, and educational equity.

In educational settings, this transformation becomes even more complex. Arar, Tlili, and Salha (2024) describe the emerging concept of human–machine symbiosis in educational leadership, where school leaders are expected to work collaboratively with AI systems rather than simply manage them. Within this perspective, digital leadership involves interpreting algorithmically generated insights, critically evaluating AI-supported recommendations, and ensuring that human judgment remains central in pedagogical and ethical decision-making. This interpretation is also consistent with Zeike, Bradbury, Lindert, and Pfaff (2019), who define digital leadership as the integration of digital competencies and leadership capabilities necessary for managing transformation processes in complex organizational environments. In this sense, digital leadership functions as the mechanism through which school administrators translate AI-related opportunities into meaningful educational and organizational outcomes.

AI also directly influences teaching and learning environments. AI-supported systems enable school administrators to monitor student performance, evaluate instructional effectiveness, personalize learning pathways, and support evidence-based decision-making more efficiently (Çayır, 2023; Deniz & Bağçeçi, 2025). Previous studies further indicate that integrating AI into educational settings reshapes instructional practices and leadership responsibilities, requiring school leaders to balance technological innovation with pedagogical quality, ethical responsibility, and data-informed decision-making (Ceylan & Mnzile, 2025). Robinson and Hollett (2024) similarly argue that literacy itself is being redefined in the age of AI, as learners increasingly interact with intelligent systems mediating access to knowledge and meaning-making processes. Consequently, school leaders are expected to support teachers' pedagogical adaptation, facilitate AI-integrated instructional practices, and sustain digital learning cultures that remain both innovative

and equitable.

From an organizational perspective, AI also reshapes communication practices and leadership interactions. Digitally mediated communication, stakeholder participation through digital platforms, and data-informed organizational dialogue have become central components of contemporary school governance. Paiuc (2024) emphasizes that digital leadership requires communication competence and multicultural sensitivity, particularly within diverse digital communities. Likewise, Oberer and Erkollar (2018) define digital leadership as an innovation-oriented and collaborative leadership approach that facilitates participation, communication, and institutional adaptability. In school settings, this means that principals are responsible not only for technological infrastructure, but also for institutional trust, ethical transparency, and sustainable organizational adaptation.

Despite the growing significance of AI and digital transformation, most existing studies continue to conceptualize leadership primarily through technology leadership or digital competence frameworks. Existing measurement tools largely operationalize digital leadership through technological competence and infrastructure management while overlooking leadership capacities related to AI governance, ethical responsibility, strategic transformation, and digitally mediated learning environments (Anderson & Dexter, 2005; Banoğlu et al., 2016). Consequently, an important gap remains in understanding how digital leadership operates in AI-responsive schools and how these leadership practices can be systematically measured. Understanding digital leadership in the age of AI, therefore, requires moving beyond technology integration toward a broader conceptualization of leadership as the management of organizational transformation, pedagogical innovation, and algorithmically informed decision-making. These developments require reconceptualizing digital leadership not as a technology-centered competency, but as a multidimensional leadership capacity shaped by AI-mediated organizational transformation. AI does not replace digital leadership; rather, it expands the scope and strategic significance of digital leadership. The dimensions identified in this study—digital transformation, digitalization, and distance and hybrid education—reflect the leadership capacities increasingly required in AI-driven schools. School leaders are not passive users of technology, but strategic actors who shape learning environments, guide institutional adaptation, and ensure that technological advancement remains aligned with educational values, equity, and human-centered governance. For this reason, developing a valid and reliable measurement tool to assess these multidimensional leadership behaviors is essential for advancing research and practice in educational leadership.

Purpose of the Study

In response to these theoretical and methodological gaps, the present study aims to develop and validate a multidimensional Digital Leadership Scale for assessing the digital leadership behaviors of school principals in AI-responsive educational environments. The proposed scale conceptualizes digital leadership not merely as technological competence or technology integration, but as a broader leadership capacity shaped by digital transformation, organizational adaptation, pedagogical innovation, and digitally mediated governance. Rather than directly measuring AI-specific technical competencies, the scale focuses on the broader leadership capacities increasingly required in AI-responsive educational settings. Accordingly, the scale addresses leadership capacities related to digital transformation, digitalization, and distance and hybrid education, reflecting the strategic, pedagogical, organizational, and ethical dimensions of leadership in contemporary schools.

By providing a valid and reliable measurement instrument, this study seeks to contribute to the reconceptualization of digital leadership in the age of artificial intelligence and support future empirical research on leadership in digitally transformed and AI-driven educational settings. More specifically, the study aims to provide a context-sensitive framework for understanding how school principals respond to emerging challenges related to AI-supported decision-making, institutional transformation, and human-centered educational governance.

Methodology

This study was designed as an instrument development and validation study to develop a theoretically grounded and psychometrically robust scale for measuring school principals' digital leadership behaviors. The scale development process followed established methodological frameworks in the literature (DeVellis, 2017; Worthington & Whittaker, 2006) and was implemented through a systematic and iterative procedure. The process included generating an initial item pool through an extensive literature review and focus group interviews, conducting a pilot study to improve item clarity and usability, performing Exploratory Factor Analysis (EFA) to identify the underlying factor structure, and applying Confirmatory Factor Analysis (CFA) to test and validate the proposed measurement model.

Within this framework, a quantitative research approach was adopted to examine the scale's psychometric properties. Quantitative methods are particularly appropriate for scale development studies because they enable the identification of latent constructs and the statistical evaluation of measurement models (Creswell, 2012). In this study, EFA was employed as an exploratory technique to uncover the latent structure of the construct without imposing a predefined model, whereas CFA was used as a theory-driven approach to evaluate the extent to which the hypothesized factor structure fit the observed data (Brown, 2006; Tabachnick & Fidell, 2013). The sequential use of EFA and CFA is widely recognized as a rigorous strategy for establishing construct validity and ensuring the structural stability of newly developed measurement instruments.

Data were collected from school principals working at different educational levels (primary, lower secondary, and upper secondary) within the Turkish Ministry of National Education. To strengthen the robustness and cross-validity of the findings, independent samples were used for the EFA and CFA stages. The use of separate samples reduced the risk of sample-specific bias and provided stronger evidence for the generalizability and stability of the proposed factor structure. Construct validity was assessed through factor analytic techniques, while reliability was evaluated using Cronbach's alpha coefficients, which are widely accepted indicators of internal consistency in scale development research (DeVellis, 2017). All analyses were conducted in accordance with established psychometric standards.

Participants

Focus Group Participants

To generate the initial item pool for the Digital Leadership Scale, three separate focus group interviews were conducted. Participants were purposefully selected to ensure the inclusion of both practitioner-based experiences and academic expertise. The focus groups consisted of five school principals working at different educational levels and eight academics from the fields of Computer Education and Instructional Technology and Educational Administration. The participating school principals represented primary, middle, and high school settings, including both general and vocational schools, thereby providing variation in educational and organizational contexts. The academic participants were drawn from three different universities and held various academic ranks, including Professor, Associate Professor, and Assistant Professor. In line with ethical considerations, pseudonyms were used to protect participant confidentiality. The focus group process facilitated the integration of practical experiences and theoretical perspectives, thereby enhancing the content validity and contextual relevance of the initial item pool.

Pilot Study Participants

Following the development of the draft items, a pilot study was conducted with 10 school principals working at different educational levels. Participants represented primary, middle, and high school settings to ensure diversity in administrative experiences and institutional conditions. The pilot implementation aimed to evaluate the clarity, comprehensibility, and practical usability of the scale items, as well as the overall administration process. The completion time ranged from approximately 8 to 15 minutes, indicating that the instrument was practical and manageable to administer. Based on participant feedback, several revisions were made to improve the wording, clarity, and structural coherence of the items, thereby strengthening the scale's face validity.

Participants for Exploratory Factor Analysis

Exploratory Factor Analysis (EFA) was conducted on data collected from 302 school principals in Eskişehir affiliated with the Turkish Ministry of National Education. Participants represented different educational levels, including primary, lower secondary, and upper secondary schools. The sample size was considered adequate for factor analytic procedures, as samples of 300 or more are generally regarded as sufficient for producing stable and reliable factor structures (Field, 2013; Tabachnick & Fidell, 2013). Figure 1 presents the demographic characteristics of the participants in detail. Since Eskişehir is classified as a first service region by the Ministry of National Education, the service region variable was not included in the analysis.

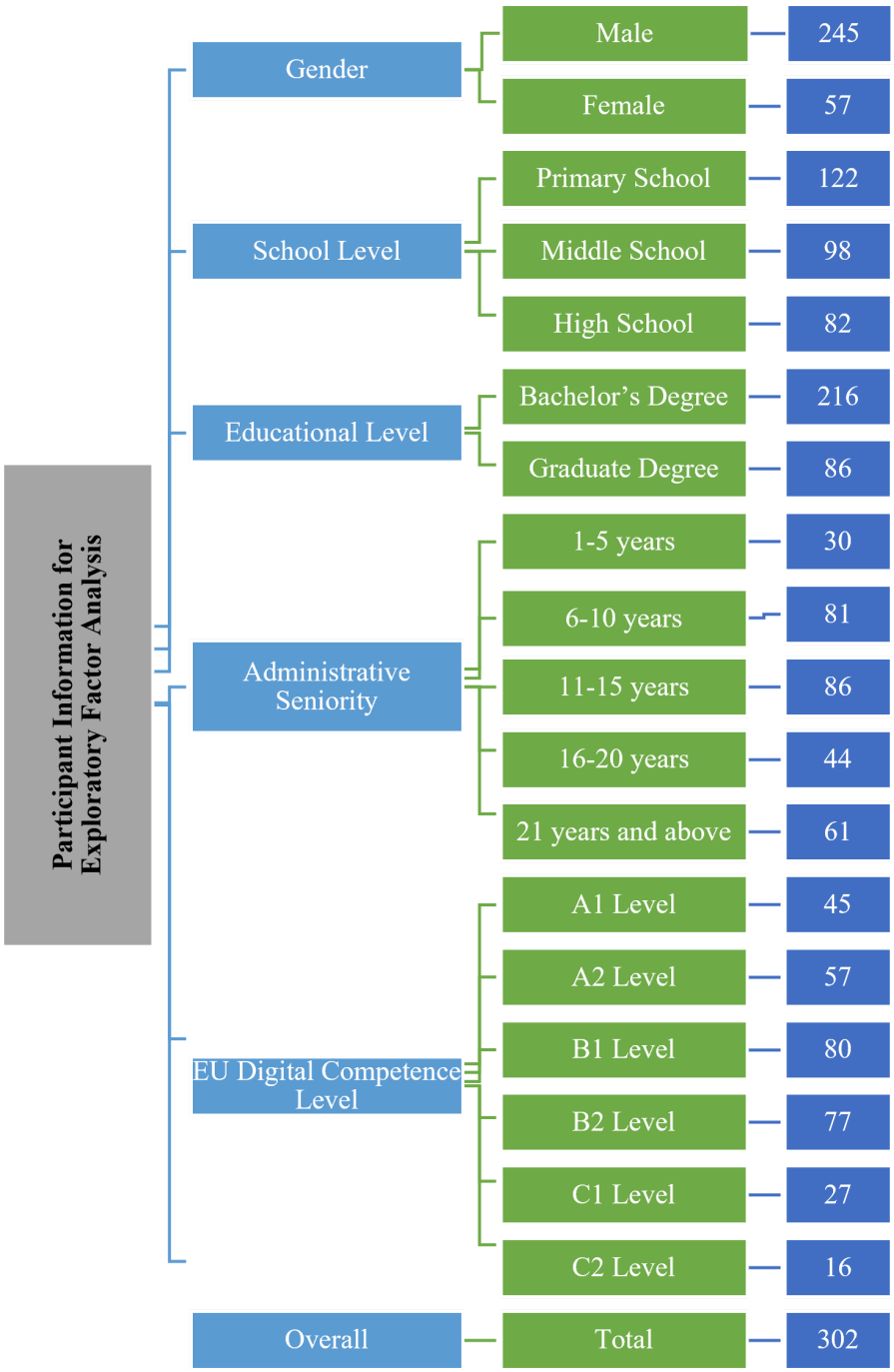


Figure 1. *Demographic Characteristics of Participants in the Exploratory Factor Analysis*

Participants for Confirmatory Factor Analysis

Confirmatory Factor Analysis (CFA) was conducted to validate the factor structure identified through the Exploratory Factor Analysis and to examine the structural stability of the proposed measurement model. The data for this phase were collected from 227 school principals working in Uşak and affiliated with the Turkish Ministry of National Education. Participants represented different educational levels, including primary, lower secondary, and upper secondary schools. Using an independent sample in the CFA stage provided additional evidence of the cross-validity and generalizability of the factor structure. The sample size also met commonly accepted criteria for confirmatory factor analysis and structural validation (Kline, 2016). Figure 2 presents the demographic characteristics of the participants in detail. Since Uşak is classified as a first-service region by the Ministry of National Education, the service-region variable was not included in the analysis.

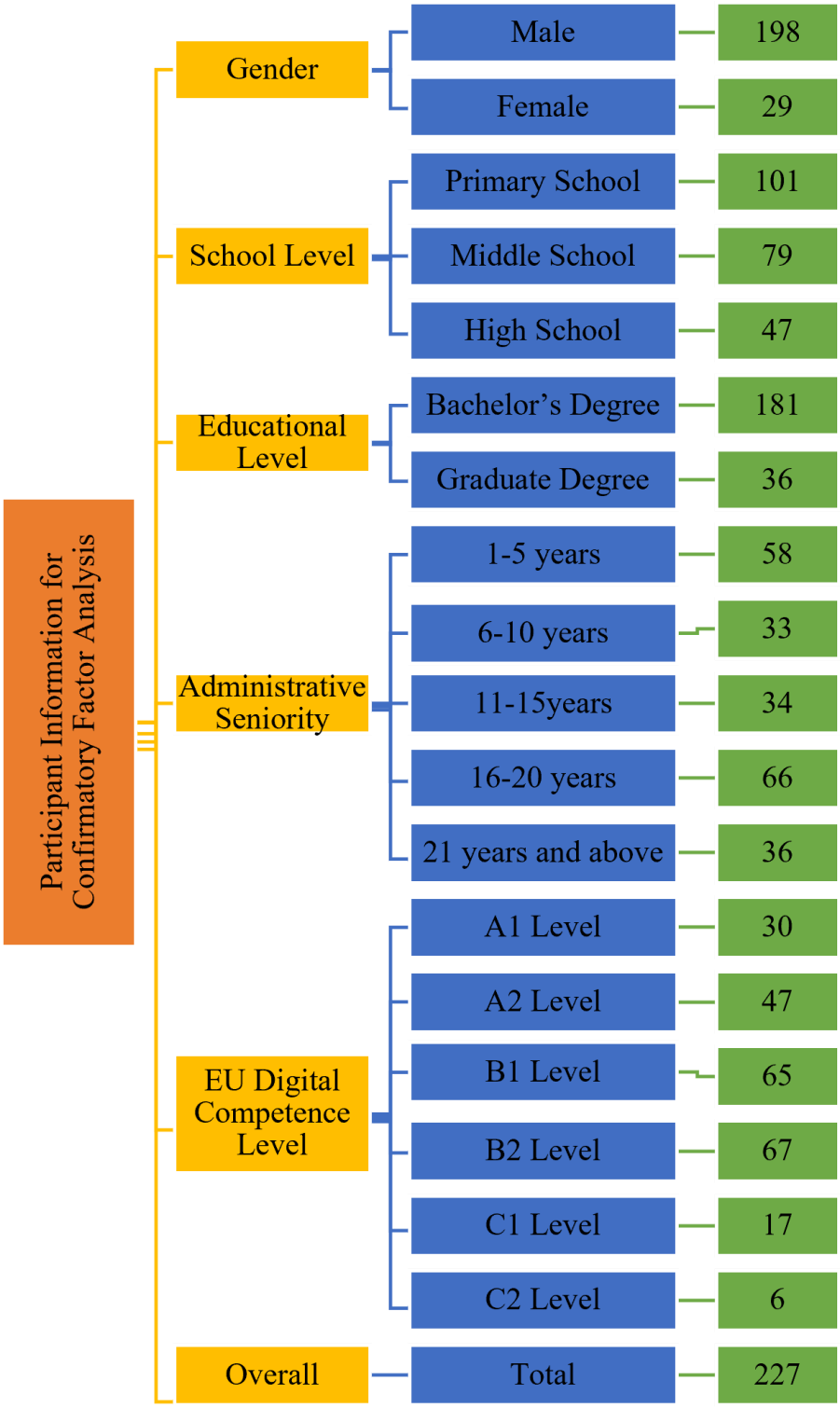


Figure 2. *Demographic Characteristics of Participants in the Confirmatory Factor Analysis*

Scale Development Process

The development of the Digital Leadership Scale was conducted through a systematic, multi-stage process grounded in established scale-development principles. The process integrated both qualitative and quantitative stages, including item generation, expert evaluation, pilot implementation, exploratory factor analysis, and confirmatory factor analysis. This sequential structure aimed to ensure the content validity, construct validity, and psychometric robustness of the proposed measurement instrument. The overall scale development process is presented in Figure 3.

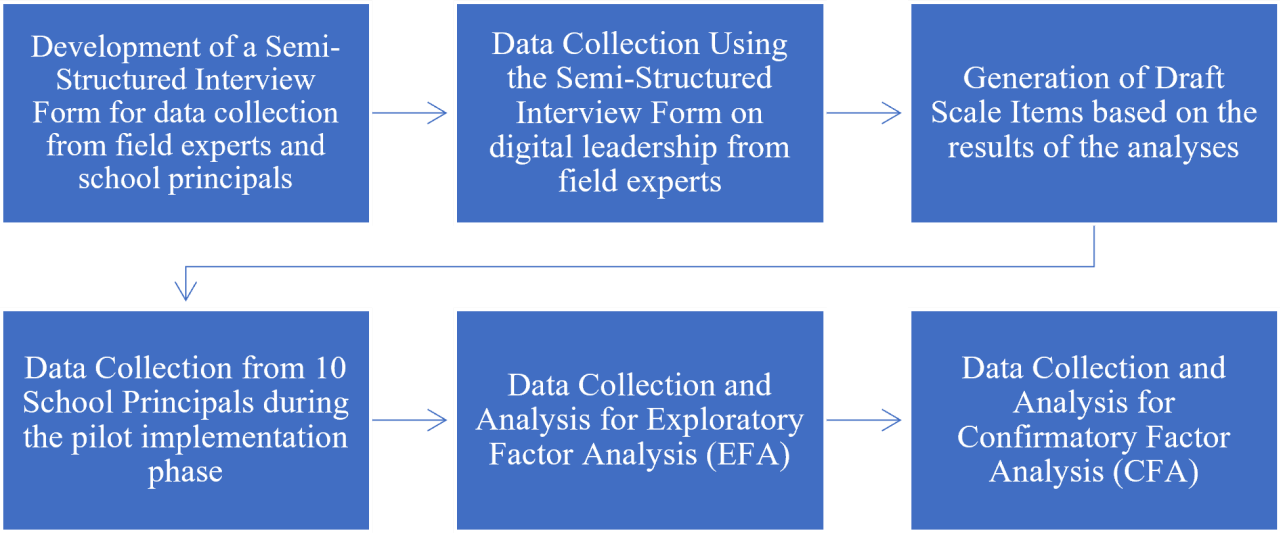


Figure 3. *Scale Development Process*

As illustrated in Figure 3, the development and validation of the Digital Leadership Scale followed a sequential, iterative process that integrated both qualitative and quantitative procedures. The integration of qualitative insights and quantitative validation stages strengthened the theoretical grounding, contextual relevance, and psychometric robustness of the scale. The following sections present the findings from these stages: item development, exploratory factor analysis, confirmatory factor analysis, and reliability analyses.

Findings

Development Process of the Digital Leadership Scale

A review of the relevant literature revealed the absence of a measurement instrument specifically designed to assess school principals' digital leadership competencies within AI-responsive educational environments. In response to this gap, the present study aimed to develop a context-sensitive, theoretically grounded scale that reflects the multidimensional nature of digital leadership in contemporary schools. Initially, a comprehensive literature review was conducted to identify potential indicators of digital leadership practices. Subsequently, we incorporated the perspectives of both practitioners and academic experts through focus group interviews to strengthen the contextual relevance and theoretical grounding of the item development process.

Semi-structured interview protocols were developed for this purpose. The initial interview forms consisted of 10 questions for school principals and 9 for academics; however, based on expert feedback, both forms were refined to include 6 core questions to improve conceptual clarity and thematic focus. The focus group interviews were conducted in three stages. The first session, involving school principals from different educational levels, lasted approximately 72 minutes. This was followed by a session with academics in the field of Computer Education and Instructional Technology (CEIT), lasting approximately 56 minutes. The final session, conducted with academics in Educational Administration, lasted approximately 52 minutes.

The qualitative data obtained from these interviews were analyzed using content analysis. This process involved the systematic examination of the data to identify underlying concepts, categories, and themes (Baltacı, 2019). Participants' statements were initially coded, and these codes were subsequently grouped into broader thematic categories that informed the development of the scale items. Throughout the analysis, pseudonyms were used to ensure participant confidentiality and ethical consistency. The conceptual model developed from the identified codes and themes is presented in Figure 4. The model reflects the multidimensional structure of digital leadership derived from both practitioner experiences and academic perspectives, thereby providing the theoretical and contextual foundation for the subsequent scale development and validation procedures.



Figure 4. *Conceptual Model of Digital Leadership Based on Focus Group Findings*

The findings indicate that digital leadership in educational settings encompasses a broad range of practices that extend beyond the operational use of digital technologies. More specifically, digital leadership was associated with strategic orientation, organizational transformation, instructional innovation, stakeholder engagement, digital communication, and the development of sustainable digital culture within schools.

Based on the themes identified through the focus group analyses, an initial item pool was generated for the Digital Leadership Scale. The resulting items reflected multiple dimensions of leadership in digitally transformed and AI-responsive educational environments. These dimensions included the strategic management of digital transformation processes, the integration of innovative digital learning practices, the effective use of digital communication and stakeholder engagement tools, and the promotion of digital culture within schools.

The item pool also reflected leadership responsibilities for instructional innovation and organizational adaptation, including supporting teachers' production of digital content, encouraging participation in professional development activities on digital technologies, fostering students' digital creativity, and facilitating the integration of digital resources into educational processes. In addition, several items focused on ethical and organizational dimensions of digital leadership, such as data security, cyber-risk awareness, institutional coordination, and the effective functioning of school-based technology teams.

Taken together, these findings demonstrate that the item pool was grounded in both empirical evidence and theoretical considerations, thereby strengthening the content validity, contextual relevance, and multidimensional structure of the scale. Rather than conceptualizing digital leadership solely as technology use or digital competence, the findings suggest that digital leadership in contemporary schools involves strategic, pedagogical, organizational, ethical, and governance-related leadership capacities.

Digital Leadership Scale

To develop the draft items for the Digital Leadership Scale, three separate focus group interviews were conducted with school principals, academics in Computer Education and Instructional Technology (CEIT), and academics in Educational Administration. Prior to the interviews, semi-structured interview protocols were developed and reviewed by field experts to ensure conceptual clarity and content relevance. The initial item pool was generated from the findings of these focus group interviews. During both the Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) stages, school principals evaluated the scale items from their own professional perspectives. The final versions of the Digital Leadership Scale in Turkish

and English are presented in Appendices A and B.

Exploratory Factor Analysis (Digital Leadership Scale)

The initial version of the Digital Leadership Scale consisted of 49 items measured on a five-point Likert scale. To examine the construct validity of the scale and identify its underlying factor structure, Exploratory Factor Analysis (EFA) was conducted. The maximum-likelihood extraction method was preferred, and Varimax orthogonal rotation was applied to obtain a simpler, more interpretable factor structure by minimizing inter-factor correlations (Tabachnick & Fidell, 2013). Factor retention criteria were defined as an eigenvalue greater than 1.00, a minimum factor loading of .40, and a minimum difference of .10 between cross-loadings. These criteria ensured that only statistically and theoretically meaningful items were retained in the final structure.

Prior to the analysis, the suitability of the data for factor analysis was evaluated. The Kaiser–Meyer–Olkin (KMO) value was calculated as .779, indicating adequate sampling adequacy, while Bartlett's Test of Sphericity was found to be statistically significant ($p < .001$), confirming the suitability of the correlation matrix for factor analysis (Field, 2013; Sharma, 1996; Tabachnick & Fidell, 2013). The sample size was also considered adequate for factor analytic procedures, as samples of approximately 300 participants are generally considered sufficient to produce stable factor structures (Field, 2013; Tabachnick & Fidell, 2013).

During the iterative factor extraction process, 21 items (Items 1, 2, 8, 9, 13, 15, 16, 17, 18, 25, 29, 30, 32, 33, 34, 35, 36, 39, 43, 45, and 47) were removed due to low factor loadings or cross-loadings. The application of Varimax rotation contributed to a more stable and interpretable factor structure by allowing items to cluster more clearly within distinct dimensions. As a result of the analysis, the scale demonstrated a three-factor structure explaining 60.585% of the total variance, which is considered acceptable in social sciences. Factor loadings ranged between .477 and .888, indicating moderate to strong relationships between the items and their respective factors. The eigenvalues, explained variances, and cumulative variance values of the identified factors are presented in Table 1.

Table 1. *Factor Structure and Loadings of the Digital Leadership Scale (Exploratory Factor Analysis Results)*

Dimension / Item	**Factor Loading**
Digital Transformation (Eigenvalue = 11.478; Explained Variance = 22.004%; α = .923)	
DL26	.773
DL27	.782
DL24	.696
DL38	.715
DL37	.689
DL48	.671
DL23	.538
DL22	.477
DL28	.624
DL49	.624
DL20	.590
DL19	.547
DL12	.726
DL10	.699
DL11	.739
DL21	.540
DL31	.636

Table 1. *Factor Structure and Loadings of the Digital Leadership Scale (Exploratory Factor Analysis Results Continued)*

Dimension / Item	Factor Loading
Distance Education (Eigenvalue = 3.190; Explained Variance = 19.543%; α = .905)	
DL41	.860
DL42	.806
DL40	.888
DL44	.631
DL46	.635
Digitalization (Eigenvalue = 2.295; Explained Variance = 19.038%; α = .892)	
DL6	.641
DL7	.610
DL4	.704
DL5	.620
DL3	.698
Note. Total explained variance = 60.585%. Overall reliability (Cronbach's α) = .945.	

Confirmatory Factor Analysis (Digital Leadership Scale)

The factor structure identified through the Exploratory Factor Analysis was subsequently tested using an independent sample to evaluate the structural validity and stability of the proposed measurement model. Confirmatory Factor Analysis (CFA) was employed to examine the extent to which the hypothesized factor structure was supported by the observed data (Brown, 2006). To evaluate model fit, multiple goodness-of-fit indices commonly recommended in the literature were considered, enabling a comprehensive assessment of the measurement model's adequacy. The CFA path diagram illustrating the relationships between latent constructs and observed variables is presented in Figure 5, while the goodness-of-fit criteria and obtained values are reported in Table 2.

Table 2. *Goodness-of-Fit Indices for the Confirmatory Factor Analysis of the Digital Leadership Scale*

Index	Good Fit*	Acceptable Fit**	Value
χ^2/df	< 2	< 5	3.58
GFI	> .95	> .90	.91
AGFI	> .95	> .90	.90
CFI	> .95	> .90	.92
RMSEA	< .05	< .08	.05
RMR	< .05	< .08	.07

Note. χ^2/df = chi-square/degrees of freedom; GFI = goodness-of-fit index; AGFI = adjusted goodness-of-fit index; CFI = comparative fit index; RMSEA = root mean square error of approximation; RMR = root mean square residual. Threshold values are based on Hooper, Coughlan & Mullenet (2008), Schumacker and Lomax (2010), Tabachnick and Fidell (2013), and Wang and Wang (2012).

The results indicated that the goodness-of-fit indices were acceptable, providing empirical support for the previously identified three-factor structure and confirming the scale's structural validity. The standardized factor loadings and t-values are presented in Table 3.

Table 3. *Standardized Factor Loadings and Parameter Estimates for the Digital Leadership Scale (Confirmatory Factor Analysis)*

Items and Factors			B	Std. β	SE	t	P
DL7	<---	F1	1,000	0,600			
DL9	<---	F1	1,421	0,627	0,152	9,343	p<0,001
DL10	<---	F1	1,569	0,810	0,140	11,218	p<0,001
DL11	<---	F1	1,453	0,794	0,131	11,071	p<0,001
DL23	<---	F1	1,249	0,685	0,125	9,987	p<0,001
DL18	<---	F1	1,439	0,769	0,133	10,838	p<0,001
DL13	<---	F1	1,461	0,690	0,146	10,036	p<0,001
DL14	<---	F1	1,477	0,742	0,140	10,576	p<0,001
DL22	<---	F1	1,269	0,712	0,124	10,268	p<0,001
DL20	<---	F1	1,282	0,678	0,129	9,909	p<0,001
DL21	<---	F1	1,275	0,679	0,129	9,916	p<0,001
DL15	<---	F1	1,545	0,837	0,135	11,465	p<0,001
DL17	<---	F1	1,531	0,773	0,141	10,874	p<0,001
DL16	<---	F1	1,637	0,807	0,146	11,196	p<0,001
DL24	<---	F2	1,000	0,662			
DL25	<---	F2	1,053	0,737	0,093	11,332	p<0,001
DL26	<---	F2	1,314	0,703	0,121	10,886	p<0,001
DL27	<---	F2	1,472	0,880	0,113	13,075	p<0,001
DL28	<---	F2	1,208	0,815	0,098	12,317	p<0,001
DL4	<---	F3	1,000	0,753			
DL5	<---	F3	0,851	0,678	0,074	11,431	p<0,001
DL2	<---	F3	0,719	0,646	0,066	10,867	p<0,001
DL3	<---	F3	0,897	0,653	0,082	10,979	p<0,001
DL1	<---	F3	0,664	0,581	0,068	9,706	p<0,001
DL6	<---	F3	1,172	0,743	0,093	12,596	p<0,001
DL8	<---	F1	1,098	0,665	0,112	9,769	p<0,001
DL12	<---	F1	1,542	0,798	0,139	11,108	p<0,001
DL19	<---	F1	1,477	0,794	0,133	11,076	p<0,001

Note. β = unstandardized coefficient; Std. β = standardized coefficient; SE = standard error; t = t-value; $p < .001$ for all significant paths.

The standardized coefficients indicated high factor loadings, low standard errors, and statistically significant t-values, collectively providing strong empirical support for the construct validity of the proposed factor structure.

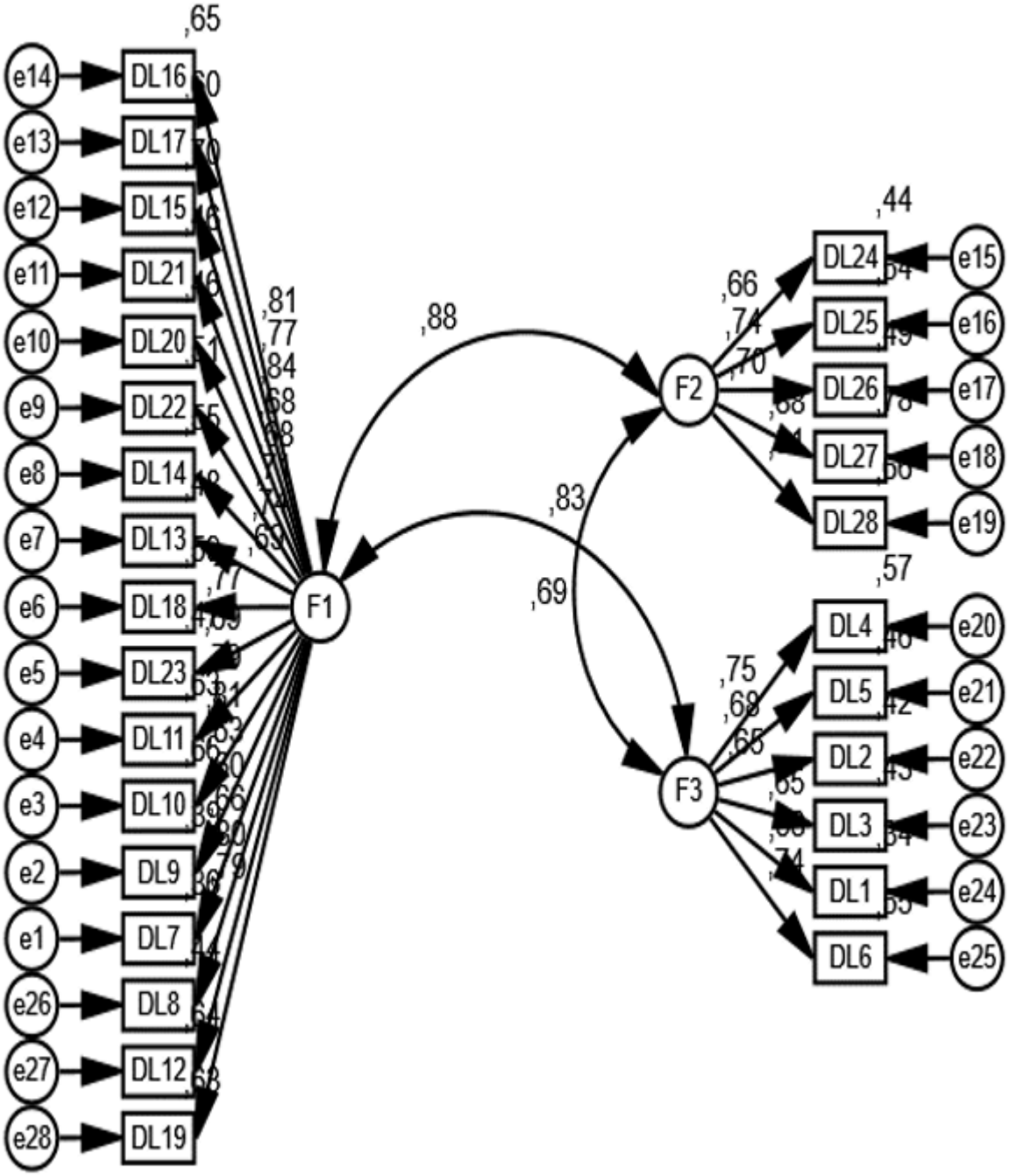


Figure 5. *Path Diagram of the Confirmatory Factor Analysis for the Digital Leadership Scale*

Reliability Analysis (Digital Leadership Scale)

The internal consistency of the 28-item Digital Leadership Scale was assessed using Cronbach's alpha coefficients. The overall reliability coefficient of the scale was calculated as α = .945, indicating a high level of internal consistency (Özdamar, 2004). The reliability coefficients for the sub-dimensions were also satisfactory: Digital Transformation (α = .923), Distance and Hybrid Education (α = .905), and Digitalization (α = .892). All coefficients exceeded the commonly accepted threshold of .80, demonstrating strong internal consistency across the scale's dimensions. These findings provide evidence that the scale produces reliable and consistent measurements across its multidimensional structure.

The original form of the instrument was developed and validated in Turkish (Appendix A). To improve accessibility for international readers, an English version of the scale is also presented in Appendix B. However, this version is provided for informational purposes only and has not undergone a formal translation, back-translation, or cross-cultural validation procedure. Therefore, all psychometric analyses reported in this study are based exclusively on the scale's original Turkish version.

Discussion

This study contributes to the field of educational leadership by developing and validating a context-specific, multidimensional Digital Leadership Scale for school principals in educational environments increasingly shaped by artificial intelligence (AI), digital transformation, and data-driven decision-making. As schools become more digitally interconnected and AI-responsive, leadership can no longer be understood merely as managing technological infrastructure or integrating digital tools into routine administrative practices. Rather, contemporary school leadership increasingly involves guiding institutional transformation, supporting pedagogical adaptation, sustaining organizational trust, and managing digitally mediated governance processes. In this respect, the study addresses an important gap in the literature, where existing instruments have largely focused on technology leadership or digital competence, while the broader leadership capacities required in AI-driven schools remain underexplored (Anderson & Dexter, 2005; Banoğlu, Vanderlinde, & Çetin, 2016).

The findings revealed a three-factor structure consisting of Digital Transformation, Distance and Hybrid Education, and Digitalization. Together, these dimensions demonstrate that digital leadership should be understood not as a purely technical issue, but as a multidimensional leadership process involving strategic, pedagogical, organizational, ethical, and governance-related responsibilities. The identified dimensions are also closely aligned with the conceptual framework discussed under Digital Leadership in AI-Driven Schools and reflect the evolving expectations placed on school leaders in digitally transformed educational contexts. More specifically, the Digital Transformation dimension reflects principals' capacity to guide institutional change, establish a shared digital vision, and sustain long-term digital development. This finding supports arguments that digital leadership requires leaders not only to manage technology use but also to shape organizational culture and strategic direction in digitally transformed environments (Cortellazzo, Bruni, & Zampieri, 2019; Sheninger, 2014). In this sense, digital transformation emerges not as a technological process alone, but as a leadership-driven process requiring institutional coordination, organizational adaptability, and strategic vision.

The Distance and Hybrid Education dimension highlights leadership responsibilities related to technology-mediated and AI-supported learning environments, including instructional continuity, pedagogical adaptation, and teacher support. This dimension became particularly visible following the expansion of remote and hybrid learning models and reflects the increasing importance of sustaining instructional quality within digitally mediated educational contexts (Hamzah, Nasir, & Wahab, 2021). The findings suggest that school leaders are expected not only to manage digital learning systems but also to support adaptive teaching practices, maintain equitable learning opportunities, and respond to rapidly changing instructional demands.

The Digitalization dimension represents principals' capacity to manage communication processes, stakeholder participation, and organizational coordination through digital systems. This finding reinforces the argument that digital leadership extends beyond operational technology management to encompass broader responsibilities for institutional communication, organizational efficiency, stakeholder engagement, and digitally mediated governance. Taken together, the three-factor structure demonstrates that digital leadership in AI-responsive schools involves managing organizational transformation, pedagogical innovation, and institutional adaptation rather than simply the effective use of technological tools. Another important finding of the study is that effective leadership in AI-driven educational environments requires substantially more than technological awareness or digital competence. School leaders are increasingly expected to manage change, support innovation, interpret data-driven insights, and respond to algorithm-supported decision-making processes while ensuring that technological developments remain aligned with educational values and ethical principles (Arar, Tlili, & Salha, 2024; Quaquebeke & Gerpott, 2023). Similarly, Ordu and Nayır (2020) emphasize that digital leadership involves not only technological competence but also the ability to establish innovative visions that support institutional development. These findings suggest that AI does not diminish the importance of leadership; rather, it intensifies the strategic, pedagogical, and ethical demands placed upon school leaders. This interpretation is also consistent with instructional leadership perspectives emphasizing that effective school leadership depends on sustaining collaborative professional cultures, supporting continuous learning, and maintaining human-centered decision-making processes rather than relying solely on technological systems (Ceylan & Mnzile, 2025). At the same time, the findings indicate that traditional leadership approaches, primarily based on administrative control and routine management, may no longer be sufficient in contemporary educational contexts. In AI-responsive schools, principals are increasingly required to address issues such as data governance, algorithmic bias, transparency, equity, and ethical responsibility. Accordingly, digital leadership should not be treated simply as an extension of technology leadership. Instead, it should be understood as a distinct leadership capacity combining strategic decision-making, pedagogical responsibility, organizational adaptation, and human-centered governance. From this perspective, the scale developed in the present study reflects the broader leadership capacities

increasingly required in AI-responsive educational environments rather than narrowly focusing on AI-specific technical skills.

This perspective becomes particularly important when technological advancement is expected to support educational equity rather than reinforce existing inequalities. In this regard, the human–machine symbiosis perspective proposed by Arar et al. (2024) provides an important conceptual framework, positioning school leaders not as machine managers but as leaders responsible for preserving human judgment, ethical balance, and educational values within AI-supported systems. The findings of this study support this perspective by demonstrating that digital leadership increasingly involves balancing technological efficiency with pedagogical quality, institutional trust, transparency, and ethical accountability.

The consistency between the exploratory and confirmatory factor analyses provides strong support for the scale's structural validity. The acceptable fit indices obtained through CFA indicate that the identified factor structure is stable and supported across independent samples. Likewise, the high factor loadings and reliability coefficients demonstrate that the scale measures digital leadership behaviors consistently across dimensions. These findings suggest that the developed instrument is not only theoretically meaningful but also methodologically robust enough to support future empirical research and practical leadership assessment processes in digitally transformed educational settings.

Beyond its psychometric strength, this study also contributes to a broader conceptual understanding of digital leadership. Much of the existing literature tends to reduce digital leadership to technology integration or digital competence. However, the findings presented here indicate that digital leadership in AI-driven schools is fundamentally concerned with leading systemic transformation processes. School principals are not passive users of technology; they are strategic actors who shape digital culture, mobilize stakeholders, sustain innovation, and guide organizational adaptation within increasingly data-rich educational environments. This interpretation is also supported by Oberer and Erkollar (2018), who conceptualize digital leadership as an innovation-oriented and collaborative leadership approach, and by Zeike, Bradbury, Lindert, and Pfaff (2019), who emphasize the relationship between digital leadership and organizational effectiveness.

One of the original contributions of this study lies in moving beyond traditional technology leadership approaches by offering a scale that integrates leadership, pedagogy, organizational transformation, ethical responsibility, and governance within AI-responsive school contexts. Previous measurement tools have often focused primarily on technological infrastructure or principals' digital competence. In contrast, the present study provides a multidimensional structure that captures how leadership functions within digitally transformed and AI-supported educational environments. In this sense, the study contributes not only a valid and reliable measurement instrument but also a broader conceptual framework for understanding what effective school leadership increasingly requires in the age of artificial intelligence.

Conclusion

This study developed and validated a multidimensional Digital Leadership Scale that reflects the evolving nature of school leadership in educational environments increasingly shaped by artificial intelligence (AI), digital transformation, and data-driven governance processes. The findings demonstrated that the scale possesses strong psychometric properties, including a stable factor structure, satisfactory construct validity, and high internal consistency. The final structure consisted of 28 items organized under three dimensions: Digital Transformation, Distance and Hybrid Education, and Digitalization.The identified dimensions indicate that digital leadership extends far beyond technological competence or technology integration. Rather, digital leadership in AI-responsive schools involves strategic vision, pedagogical adaptation, organizational transformation, stakeholder engagement, ethical responsibility, and digitally mediated governance. In this respect, the study contributes to the growing literature emphasizing that school leadership in the AI era requires leaders not only to adopt digital technologies, but also to interpret data-driven insights, sustain institutional trust, support equitable learning environments, and guide long-term organizational adaptation. The scale therefore reflects the broader leadership capacities increasingly necessary for navigating AI-responsive educational systems.

One of the major contributions of this study lies in moving beyond traditional technology leadership approaches by offering a context-sensitive and theoretically grounded framework for understanding digital leadership in contemporary schools. The developed scale captures leadership capacities associated with AI-supported educational environments and provides a multidimensional structure for assessing how principals respond to the complex demands of digitally transformed schools. Accordingly, the study contributes not only a valid and reliable measurement instrument, but also a broader conceptual understanding of digital leadership as a strategic, pedagogical, organizational, and human-centered leadership capacity. By providing a rigorously validated measurement tool, this study offers a strong foundation for future empirical research and evidence-based leadership development practices in digitally transformed educational systems.

As artificial intelligence continues to reshape educational processes, digital leadership will become increasingly central to sustaining innovation, ethical governance, organizational adaptability, and educational equity. In the age of artificial intelligence, digital leadership should no longer be viewed as an optional administrative competency, but as a foundational leadership capacity for building sustainable, adaptive, and future-oriented schools.

Implications and Future Research

This study provides a valid and reliable Digital Leadership Scale for school principals and contributes to a broader understanding of leadership in AI-driven educational environments. Nevertheless, several limitations should be acknowledged. First, the study was conducted with school principals from specific regional contexts in Türkiye, which may limit the generalizability of the findings across different educational systems and cultural contexts. Second, although construct validity was supported through Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA), convergent and discriminant validity indicators such as Average Variance Extracted (AVE), Composite Reliability (CR), and Heterotrait–Monotrait Ratio (HTMT) could not be fully reported due to the absence of raw covariance matrix outputs from the original model estimation process. This should be considered a methodological limitation of the study. Future studies are encouraged to examine these indicators using larger and independent samples to provide stronger evidence for construct validity and to further strengthen the psychometric properties of the scale. In addition, future research may investigate how digital leadership influences organizational outcomes such as innovation capacity, instructional quality, teacher practices, school effectiveness, and stakeholder engagement. Particularly important will be examining how digital leadership mediates or moderates the integration of AI technologies into teaching, learning, and school governance processes.

Future studies may also validate the scale across different educational systems, cultural contexts, and linguistic settings in order to establish broader cross-cultural applicability. Given the rapidly evolving nature of artificial intelligence and digital technologies, longitudinal studies examining how digital leadership practices change over time may provide important insights into the future of educational leadership. In particular, emerging issues such as AI literacy, data governance, algorithmic decision-making, digital ethics, transparency, and human-centered governance require further investigation. Understanding how school leaders respond to these challenges will be critical for explaining the future trajectory of digital leadership in AI-responsive educational systems.

Declarations

This article is derived from the doctoral dissertation entitled The Relationship Between Digital Leadership and Organizational Wisdom in Educational Organizations, conducted by Kamuran Aydın under the supervision of Assoc. Prof. Dr. Müyesser Ceylan at Anadolu University, Faculty of Education. The Digital Leadership Scale used in this study was developed as part of this dissertation. The authors would like to thank the school principals, academic experts, and all participants who contributed to the data collection process and supported the development of the scale.

AI-assisted tools were used only for language editing, grammar checking, and readability improvement during manuscript preparation. All conceptualization, data analysis, interpretation of findings, and final academic decisions remain entirely the responsibility of the authors.

Ethical Considerations

Ethical approval for this study was obtained from the Scientific Research and Publication Ethics Committee of Anadolu University, Social and Human Sciences Division, prior to the data collection process (Decision Date: June 7, 2021; Protocol No: 71178). Participation in the study was voluntary, informed consent was obtained from all participants, and confidentiality and anonymity were ensured throughout all stages of the research.

Conflict of Interest

The authors declare no conflict of interest.

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Appendix A. *Digital Leadership Scale (Original Turkish Version)*

Dijital Liderlik Ölçeği Her zaman (5), Sık sık (4), Bazen (3), Nadiren (2), Hiçbir Zaman (1)
Dijitalleşme
1. Velilerle iletişim kurmak için dijital araçları kullanırım.
2. Diğer kurumlarla iletişim kurmak için dijital araçları kullanırım.
3. Markalaşma çalışmalarımızda dijital uygulamalardan yararlanırım.
4. Okulun sosyal medya hesaplarının güncellenmesini sağlarım.
5. Okul web sitesinin güncellenmesini sağlarım.
6. Okul dergisi, gazetesi gibi çalışmaların dijital ortamda yayımlanmasını sağlarım.
Dijital Dönüşüm
7. Paydaşların görüşlerini almak (memnuniyet anketleri vb.) için dijital uygulamalardan yararlanırım.
8. İhtiyaç halinde toplantıları çevrimiçi toplantı uygulamaları yoluyla yaparım.
9. Okul yönetim süreçlerini (karar alma, planlama, örgütleme, bütçeleme, eşgüdümleme, değerlendirme) hızlandırmak için dijital uygulamalardan yararlanırım.
10. Okulumun dijital dönüşümünü sağlamak için tüm çalışanların katılımı ile belirlenen dijital dönüşüm vizyonundan yararlanırım.
11. Okulumun dijital dönüşüm vizyonuna yönelik tüm çalışanların katılımıyla hedefler belirlerim.
12. Çalışanların okulun dijital dönüşümünü içselleştirecekleri faaliyetler (toplantı, seminer vb.) düzenlerim.
13. Dijital yaşamla ilgili yayınların okul kütüphanesinde bulunmasına özen gösteririm.
14. Yenilikçi dijital eğitim uygulamalarının okulumda uygulanmasını sağlarım (Tersyüz edilmiş eğitim, maker atölyesi vb.).
15. Eğitim programlarında öğrencilerin dijital yaşama uyum sağlamalarına yönelik kazanımlara (dijital yeterliliklerini arttıracak, dijital vatandaşlık davranışlarını içeren vb.) yer verilmesine özen gösteririm.
16. Çalışanların dijital yeterliliklerini arttırmak amacıyla okul içinde eğitimler düzenlerim.
17. Çalışanların dijital yeterliliklerini arttırmak amacıyla okul dışında eğitim almalarını sağlarım.
18. Çalışanlara dijital uygulamaların kullanımı konusunda rehberlik yaparım.
19. Öğrencilerin dijital ortamda yaratıcılıklarını ortaya koyabilecekleri etkinlikler düzenlerim.
20. Okulumda veri güvenliği konusunda öğrencilere eğitim verilmesini sağlarım.
21. Okulumda veri güvenliği konusunda çalışanlara eğitim verilmesini sağlarım.
22. Okul Teknoloji Geliştirme Ekibinin (OGYE Ekibi) etkin faaliyet göstermesini sağlarım.
23. Öğretmenlerin dijital eğitim araçları konusunda uzmanlaşmaları için gereken eğitimlere katılımlarını sağlarım.
Uzaktan ve Hibrit Eğitim
24. Uzaktan ve hibrit eğitimle verilebilecek dersler için öğretmenleri motive ederim.
25. Uzaktan ve hibrit eğitimle verilebilecek dersler için öğrencileri motive ederim.
26. Uzaktan ve hibrit eğitimle verilebilecek derslerin planlamasını yaparım.
27. Uzaktan ve hibrit eğitimle verilen derslerin değerlendirmesini yaparım.
28. Uzaktan ve hibrit eğitim için gerekli olan yazılım altyapısını oluştururum.

Appendix B. Digital Leadership Scale (English Version)

Digital Leadership Scale Always (5), Often (4), Sometimes (3), Rarely (2), Never (1)
Digitilization
1. I use digital tools to communicate with parents.
2. I use digital tools to communicate with other institutions.
3. I utilize digital applications in branding activities.
4. I ensure that the school's social media accounts are regularly updated.
5. I ensure that the school website is regularly updated.
6. I ensure that school publications (e.g., magazines, newsletters) are published in digital formats.
Digital Transformation
7. I use digital tools (e.g., satisfaction surveys) to gather stakeholder feedback.
8. I conduct meetings via online platforms when necessary.
9. I use digital applications to enhance school management processes (decision-making, planning, organizing, budgeting, coordination, evaluation).
10. I use a shared digital transformation vision, developed with staff participation, to guide school transformation.
11. I set goals aligned with the school's digital transformation vision with the participation of all staff.
12. I organize activities (e.g., meetings, seminars) to help staff internalize digital transformation.
13. I ensure that publications related to digital life are available in the school library.
14. I promote the implementation of innovative digital learning practices (e.g., flipped learning, maker spaces).
15. I ensure that curricula include competencies related to digital literacy and digital citizenship.
16. I organize in-school training to improve staff's digital competencies.
17. I support staff participation in external training programs to improve digital competencies.
18. I provide guidance to staff on the use of digital applications.
19. I organize activities that enable students to express creativity in digital environments.
20. I ensure that students receive training on data security.
21. I ensure that staff receive training on data security.
22. I ensure the effective functioning of the School Technology Development Team.
23. I encourage teachers to participate in training programs to specialize in digital educational tools.
Distance and Hybrid Education
24. I motivate teachers to deliver courses through distance and hybrid education.
25. I motivate students to participate in distance and hybrid learning.
26. I plan courses suitable for distance and hybrid education.
27. I evaluate courses delivered through distance and hybrid education.
28. I establish the necessary software infrastructure for distance and hybrid education.