



| Review Article / Derleme Makale |

A Review of Studies on School Administrators' Technology Leadership in Türkiye

Okul Yöneticilerinin Teknoloji Liderliği Üzerine Türkiye'de Gerçekleştirilen Çalışmaların İncelenmesi

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1. Technology leadership
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Abstract

Purpose: The swift progress in technology brings about significant digital transformations in the education system, which places a significant emphasis on the actions that school administrators will exhibit in terms of technology leadership to successfully manage and navigate this change. Based on this, the purpose of this current study is to examine the trends in research regarding the technology leadership of school administrators in Türkiye.

Design/Methodology/Approach: In this study, which examines articles originating from Türkiye on school administrators' technology leadership between 2010 and 2023, a document analysis technique was employed. A total of 64 articles were included in the review based on the eligibility criteria, and these articles were analyzed using content analysis method.

Findings: It is noteworthy that there has been an increase in studies conducted after the year 2019. It was observed that quantitative research methods dominate in studies and school administrators and teachers primarily selected through non-probability sampling methods constitute the general participant group. The data collection process significantly relied on scales, and the collected data were mostly analyzed using quantitative analysis methods. Lastly, a total of 27 different variables, mainly linked to school administrators' technology leadership, have been addressed in the studies.

Highlights: Upon examining the studies, it is recommended that researchers in this field place greater emphasis on conducting mixed-methods research in the future. Additionally, there is a need for more studies aimed at identifying the factors influencing school administrators' technology leadership and determining its impact on teachers' technology integration competencies. Furthermore, conducting future research with larger sample sizes and using probability sampling methods is considered important as it contributes to a more accurate representation of the population within the findings.

Öz

Çalışmanın amacı: Teknolojideki hızlı gelişmeler eğitim sisteminde önemli dijital dönüşümleri beraberinde getirmektedir. Bu dönüşümün başarılı bir şekilde yönetilmesi ise okul yöneticilerinin teknoloji liderliği konusundaki sergileyeceği eylemleri önemli hale getirmektedir. Buradan yola çıkılarak, mevcut çalışmada bu olgunun Türkiye'deki durumunu daha iyi anlayabilmek için okul yöneticilerinin teknoloji liderliği konusunda Türkiye'de gerçekleştirilen araştırmalardaki eğilimin incelenmesi amaçlanmıştır.

Materyal ve Yöntem: 2010-2023 tarihleri arasında okul yöneticilerinin teknoloji liderliği üzerine yapılan Türkiye menşeli makalelerin incelendiği bu çalışmada doküman incelemesi tekniği kullanılmıştır. Uygunluk kriterlerine göre tarama kapsamına 64 makale dahil edilmiş ve bu makaleler içerik analizi yöntemine göre analiz edilmiştir.

Bulgular: Gerçekleştirilen çalışmalarda 2019 yılından sonra bir artış yaşandığı dikkati çekmektedir. Çalışmalarda nicel araştırma yönteminin baskın olduğu ve daha ziyade seçkisiz olmayan örnekleme yöntemiyle belirlenen okul yöneticileri ve öğretmenlerin genel katılımcı grubunu oluşturduğu gözlenmektedir. Veri toplama sürecinde daha ziyade ölçeklerden yararlanılmış olup toplanan veriler çoğunlukla nicel analiz yöntemleri kullanılarak analiz edilmiştir. Son olarak, çalışmalarda okul yöneticilerinin teknoloji liderliği başta olmak üzere bununla ilişkili toplam 27 farklı değişken ele alınmıştır.

Önemli Vurgular: Çalışmaların incelenmesi sonucunda bu alandaki araştırmacıların gelecekte karma yöntem araştırmalarına daha fazla ağırlık vermeleri önerilmektedir. Buna ek olarak, okul yöneticilerinin teknoloji liderliği değişkenini etkileyen faktörlerin ortaya konmasını ve ayrıca bu değişkenin öğretmenlerin teknoloji entegrasyonu yeterlikleri üzerindeki etkisini saptamayı amaçlayan çalışmalara daha fazla yer verilmesi gerektiği anlaşılmaktadır. Bunun yanı sıra, araştırmacıların gelecekteki çalışmalarını geniş katılımcı sayılarıyla ve seçkisiz örnekleme yöntemi kullanarak yürütmesi araştırma sonuçlarının evreni daha iyi ve doğru temsil etmesi açısından önemli görülmektedir.

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INTRODUCTION

Recent years have witnessed rapid technological advancements that profoundly influence and reshape individuals' behaviors, habits, and overall lifestyles within society. When compared to a few decades ago, it is readily observable that nearly every society, including Türkiye, has undergone a transformation into a technology-rich and a technology-centric environment, signifying a direction wherein technology is expected to further embed itself into society in the years ahead. Indeed, when observing individuals in today's digital era, it is evident that they are becoming increasingly reliant on technology for managing daily routines, seeking entertainment, accessing information, and facilitating communication. This trend is clearly mirrored in both current national (TÜİK, 2023) and international (STATISTA, 2023) statistics.

One of the areas influenced by technology across numerous domains such as communication, healthcare, industry, finance, transportation, energy, and entertainment is education (Chua & Chua, 2017). Utilizing technology in schools offers a diverse range of instructional benefits, including providing flexibility in terms of time and space (Means et al., 2010), supporting both individual and collaborative learning (Davies, Dean & Ball, 2013; Resta & Laferriere, 2007), enhancing motivation in learning (Haefner, 2004), fostering an active learning environment (Ghavifekr & Rosdy, 2015), accommodating various learning styles (Al-Azawei, Serenelli & Lundqvist, 2016), offering lifelong learning opportunities (Sullivan et al., 2019), minimizing barriers (O'Sullivan et al., 2023) and reducing educational costs (Borup, Graham & Velasquez, 2011). Moreover, the benefits of incorporating technology in schools are not limited solely to instructional outcomes; they extend to enhancing the efficiency and functionality of administrative tasks within the school management, such as student affairs and accounting (Aktay & Çakır, 2018). In addition, educational institutions require technology, particularly the internet, to ensure uninterrupted educational activities even under adverse conditions such as unexpected events like pandemics and earthquakes, which have recently affected Türkiye as well (AlAjmi, 2022; Avcı, 2023). These mentioned factors highlight the significance of integrating technology in education. Furthermore, it is possible to come across studies in the literature that suggest the constructivist approach in education represents another potential factor that influences technology integration. A recurring theme in studies addressing this topic is that constructivist pedagogy contributes to the use of technology in classrooms, and teachers who embrace this pedagogy and develop educational beliefs in this direction are more inclined to incorporate instructional technologies into their teaching practices. (Chen, 2008; Ertmer, 2005; Kaya & Koçak-Usluel, 2011; Hermans et al., 2008; Overbay et al., 2010). Lastly, the onset of generation Z, a cohort whose lives are significantly intertwined with technology, entering education institutions has necessitated the integration of digital technologies into education due to the inadequacy of traditional teaching methods in meeting the expectations and preferences of this generation (Somyürek, 2014).

Fundamentally, technology integration, defined as the use of information and communication technologies (ICT) such as computers and the internet for educational purposes (Hew & Brush, 2007), has prompted many countries to implement high-budget projects (Apsorn, Sisan & Tungkunan, 2019; Korumaz & Gölçek, 2021). When tracing the history of steps taken towards technology integration in Türkiye, it is possible to highlight the significance of the "Computer-Assisted Education Project" initiated by the Ministry of National Education (MoNE) in 1984. This project entailed equipping schools with computer hardware, arranging in-service training programs for teachers on computer usage, and incorporating computer courses into the curriculum (Deniz, 1992; Karadağ, Sağlam & Baloğlu, 2008). Another pivotal development in terms of technology integration is the Basic Education Project. Launched in 1998 with the support of the World Bank's \$300 million funding, this project involved the establishment of information technology classrooms, the provision of extensive hardware and software support to thousands of schools, and the organization of in-service training programs to enable teachers to become digitally literate (Akbaba-Altun, 2004; Koçak-Usluel, Mumcu & Demiraslan, 2007). These initiatives for technology integration continued with the FATİH Project in 2010, allocating a budget of 1.8 billion dollars, marking it as the country's largest ICT investment into education (Uluyol, 2013). On the other hand, such large-scale projects generally remain limited to the mere acquisition of hardware and software and equipping classrooms with these tools (Cuban, 2001; Demir, 2023; Flanagan & Jacobsen, 2003). However, while providing technological resources in schools is a fundamental prerequisite, it is not sufficient alone for successful technology integration (Weng & Tang, 2014). This further necessitates not only the technical utilization and maintenance of the acquired technologies but also their seamless incorporation into the curriculum and the application of an appropriate pedagogy (Mishra & Koehler, 2006). Therefore, it can be argued that technology leadership, which is deemed crucial for instigating technological transformation in schools, requires a broad spectrum of knowledge and expertise, spanning financial and administrative domains to technical and academic fields. This understanding, grounded in the distinction between individualistic and distributed dichotomy within the leadership literature, suggests that technology leadership, while may often led by the school administrators in this context due to their role as the school's top executive, is essentially a process that requires the involvement of multiple stakeholders within the school (Petersen, 2014).

Defined as organizational decisions, policies, and actions that facilitate the effective use of ICT throughout the school (Anderson & Dexter, 2005), technology leadership stands as a critical determinant of the success or failure of ICT implementations in educational settings (Stuart, Mills & Remus, 2009; Thannimalai & Raman, 2018). Hence, given the complexity of the technology integration process, school administrators bear significant responsibilities in achieving effective technology leadership. In this context, it is expected that school administrators, rather than adhering to the individualistic leadership paradigm, collaborate and work in a sustained manner with other stakeholders within the school, including teachers and ICT managers (Seong & Ho, 2012). In other words, they are tasked with fostering an atmosphere within the school where technology leadership is distributed, as

opposed to an approach characterized by a single heroic figure (Azorin, Harris & Jones, 2020; Tan & Aloysius, 2011). This has highlighted the importance of focusing on school administrators' technology leadership practices and has consequently resulted in a plethora of studies being conducted in both national and international literature on this topic. Building upon this, the present study aims to conduct a comprehensive literature review to unveil the most up-to-date information concerning to the domain of technology leadership of school administrators at the national level. In this context, studies addressing the technology leadership of school administrators have been scrutinized, starting from the year 2010 when the FATİH project, which played a pivotal role in initiating technological transformation in Turkish schools, was launched.

Technology Leadership

Adapting to the digital age and transforming traditional schools into technology-equipped institutions by integrating technology is a significant responsibility that primarily falls upon school administrators (Karaköse, Polat & Papadakis, 2021; Yu & Darrington, 2006). Successfully fulfilling this responsibility mostly hinges on the technology leadership practices and approaches adopted by school administrators (A'mar & Eleyan, 2022; Hacifazlıoğlu, Karadeniz & Dalgıç, 2011). Technology leadership involves guiding the effective utilization of technology to ensure the maximum benefits of it in establishing and sustaining an efficient educational system (Durnalı, 2019).

In the leadership literature, there is a clear distinction between individualistic and distributed paradigms, which also have significant implications in the context of technology leadership (Hauge & Norenes, 2015). In the individualistic leadership approach, the management of the school, the making of key driving decisions in the process, and the administrative power are handed over to a solitary individual, typically the school principal, who assumes a central, heroic and dominant role in school management (Galdames-Calderon, 2023). However, given the complexity of school organizational management and operations, along with the recognition that a single person successfully handling all of these tasks seems highly improbable, it has been widely acknowledged that the individualistic leadership approach is no longer a viable option (Arabacı, Karabatak, & Polat, 2016; Göksoy, 2015). Consequently, there has been a move away from the idea of entrusting the entire school management to a single individual (Galdames-Calderon, 2023). As a result, the individualistic leadership approach has given way to distributed leadership, one of the most innovative and widely embraced leadership models in the 21st century, where the focus shifts from specific individual behaviors to collective and participatory actions, and administrative power and authority are shared among stakeholders within the school organization (Bennett, 2008; Bolden, 2011; Bush, 2013; Spillane, Halverson, & Diamond, 2004).

Since technology integration is a multifaceted process that encompasses managerial, technological, and pedagogical dimensions, its successful initiations and sustainability necessitate collaborative efforts from individuals within the school (Petersen, 2014). Therefore, insights gleaned from individualistic and distributed leadership approaches suggest that school administrators, when leading technology integration initiatives, should align more closely with a distributed leadership approach and share technology leadership responsibilities with relevant stakeholders (Gurr, 2004; Tan & Aloysius, 2011). However, in doing so, it is also expected that school administrators possess individual competencies like possessing a solid grasp of fundamental concepts related to computers and technology, having knowledge and experience in the technical and pedagogical aspects of technology use, being open to innovation and enthusiastic about exploring and adapting to new technologies that can be used in education, developing a vision for technology use in schools, and providing financial resources for technology acquisition (Karaköse, Polat & Papadakis, 2021; Stuart, Mills & Remus, 2009; Topçu & Ersoy, 2020; Ünal, Uzun & Karataş, 2015; Yu & Darrington, 2006).

In a technology integration process guided by the distributed leadership approach, the sharing of responsibilities may reduce the school administrators' position from being the sole decision-maker and authority figure in technology leadership. Nevertheless, their role and duties in this context still hold significance. This is because it is the school administrators who will implement and disseminate the distributed leadership approach within the school (Leithwood & Mascall, 2009). In this regard, Harris (2011) emphasizes that without the support of school administrators, distributed leadership is unlikely to flourish or be sustained. Therefore, in schools where the distributed technology leadership is the prevailing model, school administrators carry essential duties, including recognizing the leadership potential of various stakeholders within the school, particularly teachers and ICT experts, assessing and enhancing their capabilities in technology integration, and providing support to others in leading innovation and driving change (Harris, 2011; Yıldırım, 2017). Moreover, the International Society for Technology in Education (ISTE) has established a set of standards outlining the expectations from a technology leader, which was initially introduced in 2002 and later revised in 2009, and once more in 2018. These standards basically address the responsibilities of school administrators as technology leaders under the following five headings (ISTE, 2018):

- “Equity and Citizenship Advocate: Education leaders use technology to increase equity, inclusion, and digital citizenship practices.
- Visionary Planner: Education leaders engage others in establishing a vision, strategic plan and ongoing evaluation cycle for transforming learning with technology.
- Empowering Leader: Education leaders create a culture where teachers and learners are empowered to use technology in innovative ways to enrich teaching and learning.
- Systems Designer: Education leaders build teams and systems to implement, sustain and continually improve the use of technology to support learning.

- Connected Learner: Education leaders model and promote continuous professional learning for themselves and others.”

Upon a closer analysis of the ISTE standards listed above, the choice of terminology emphasizing collaboration and interaction with others makes it reasonable to affirm that these standards were prepared through the lens of distributed leadership. In summary, possessing technology leadership-related qualities and fulfilling the associated responsibilities by school administrators brings benefits to both instructional and managerial aspects of schools. Technology has become indispensable in various stages of educational activities. Additionally, technology is also utilized in other administrative tasks of schools, such as student affairs, accounting, and planning. Hence, it can be stated that the technology leadership of school administrators holds significance across various dimensions within the school environment.

Significance of the Study

It can be posited that the pathway to a successful technology integration lies in the technology leadership approach and practices of school administrators. Therefore, it is of paramount importance to implement practices that enable school administrators to take appropriate technology leadership actions. The underpinnings of these practical applications, however, are rooted in a thorough understanding of theoretical concepts in the field and the examination of conducted studies. Thus, this study aims to address nationally conducted research related to the topic of technology leadership of school administrators in order to comprehend its state in Türkiye. However, it is worth noting that certain limitations exist in terms of a comprehensive review of existing studies on the research regarding technology leadership in the context of school administrators. In one study, 29 national postgraduate theses conducted between 2009 and 2020 were examined (Korkmaz, Kutlu & Yavuz, 2022). In another study, 32 research carried out between 2010 and 2016 focusing on school administrators' technology leadership were reviewed (Köybaşı-Şemin, 2020). As seen, one of the existing review studies has only focused on theses, while the other has included studies up until the year 2016, and these two studies collectively cover works up to 2020. However, given the heightened number of studies, particularly due to the impact of the COVID-19 pandemic, it is important to consider the examination of research conducted after 2020 as well. Based on this consideration, this study includes a total of 64 studies conducted until 2023, thus offering a more up-to-date and comprehensive analysis. Furthermore, this study also addresses a greater number of research questions, which contributes to its originality within the literature. In addition, the significance of this study also lies in its comprehensive approach towards examining research on school administrators' technology leadership, which allows for the identification of trends and patterns in this field. Besides, this study provides insights into the types of studies conducted in the field, areas of focus within these studies, and the existing gaps in the literature, shedding light on potential future research needs to fill these gaps. For this reason, this study is believed to be significant due to the aforementioned aspects.

Purpose of the Study

The purpose of this research is to examine the trends in studies conducted on technology leadership of school administrators in Türkiye. In line with this purpose, the following research questions have been addressed:

How is the distribution of the examined studies by;

- years?
- published languages?
- published journals?
- indexes of published journals?
- research methods and designs?
- sample group?
- sample size?
- sampling methods?
- data collection tools?
- data analysis methods?
- keywords?
- examined variables?

METHOD

In this study, document analysis method was adopted to explore research related to school administrators' technology leadership in Türkiye. Document analysis is a method involving the analysis of existing written materials containing information about the subject being studied (Yıldırım & Şimşek, 2016). In this context, the present study extensively examined research within the national domain concerning the topic of school administrators' technology leadership.

Data Collection Tool

For the examination of studies, a data collection instrument was utilized in the form of a spreadsheet prepared using Microsoft Excel. This spreadsheet comprises rows listing the articles examined within the scope of the study. The columns, on the other hand, contain the evaluation criteria for each article (year, journal, research method, sample group, etc.). Accordingly, each article was scrutinized by the authors based on the specified criteria, and necessary information was entered into the cells where rows and columns intersect.

Data Collection Process

An initial search using the keyword "technology leadership" was conducted on the Google Scholar and Web of Science database between March and April 2023, with periodic updates made until its final version in October 2023. To be included in the scope of the review, accessed studies were subjected to specific eligibility criteria established by the researchers. Studies were deemed eligible for inclusion in the review if they were (i) written in the form of articles, (ii) conducted in Türkiye between 2010 and 2023, (iii) addressing technology leadership of school administrators, and (iv) accessible in full-text. On the other hand, studies were excluded from the review if they were (i) written in the form of books, conference papers, or theses, (ii) addressing technology leadership of a different sample group than school administrators, and (iii) conducted before 2010. Following the Google Scholar search, it was determined that 64 articles conformed to the defined eligibility criteria. Subsequently, an additional search was conducted in the Web of Science database to retrieve articles from journals with a high-impact factor. This search yielded 14 articles, of which 6 were found to meet the criteria. However, it was observed that these same 6 articles were already part of the initial set of 64 articles identified through the Google Scholar search. As a result, 64 articles, whose full list is provided in the Appendix, were included in the study and examined based on the research questions.

Data Analysis

The content analysis method was employed for the analysis of the collected data in the study. Content analysis involves organizing and interpreting data that are considered similar and related to one another under specific codes and themes, subsequently expressing the results in numerical terms (Yıldırım & Şimşek, 2016). Building upon this, in this study, the articles were analyzed according to the content analysis method in alignment with the objectives outlined in the research questions. The resulting outcomes were presented by calculating percentages and frequency values. During the content analysis process, two researchers were involved. Initially, the researchers independently reviewed the 64 studies and entered the required information into the Microsoft Excel spreadsheet. Afterward, the two researchers collaborated to reach a consensus on the information to be included in the spreadsheet pertaining to the examined 64 articles, thereby seeking to ensure the reliability of the analysis.

FINDINGS

This section presents the findings derived from the analysis of 64 articles conducted on school administrators' technology leadership in Türkiye, with the results presented in an organized manner under separate subheadings corresponding to each research question. The description of findings mainly includes percentages and frequency values, accompanied by the use of tables and figures for presentation.

Distribution of Articles by Years

The distribution of articles by years in which they were conducted is provided in Table 1.

Table 1. Distribution of articles by years

Years	f	%
2010	1	1,56
2011	6	9,38
2012	3	4,69
2013	2	3,13
2014	1	1,56
2015	4	6,25
2016	5	7,81
2017	2	3,13
2018	3	4,69
2019	7	10,9
2020	5	7,81
2021	6	9,38
2022	14	21,9
2023	5	7,81
TOTAL	64	100,00

As shown in Table 1, the fewest studies were conducted in 2010 (f=1) and 2014 (f=1), whereas the highest number of studies took place in 2022 (f=14). Particularly noteworthy is the increase in the number of studies conducted from 2019 onwards. Furthermore, it is observed that within the span of 14 years, 57.81% of the studies (f=37) were conducted in just the last five years.

Distribution of Articles by Published Languages

The distribution of articles by the languages in which they were published in journals is illustrated in Figure 1.

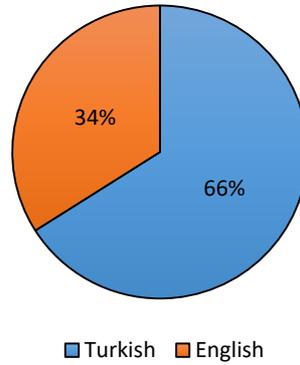


Figure 1. Distribution of articles by published languages

Upon examining Figure 1, it can be observed that out of the 64 articles, 22 of them were published in English (34%), while 42 were published in Turkish (66%).

Distribution of articles by published journals

The distribution of articles by the journals in which they were published is presented in Table 2.

Table 2. Distribution of articles by published journals

Journals	f	%
1. Academic Platform Journal of Education and Change	1	1,56
2. Anadolu University Journal of Education Faculty	1	1,56
3. Ankara University Journal of Faculty of Educational Sciences	1	1,56
4. Balkan Journal of Social Sciences	2	3,13
5. Bartın University Journal of Faculty of Education	1	1,56
6. Bilecik Şeyh Edebalı University Journal of Social Sciences	1	1,56
7. Çankırı Karatekin University Faculty of Letters Journal	1	1,56
8. Croatian Journal of Education	1	1,56
9. Düzce University Journal of Social Sciences	1	1,56
10. Education	1	1,56
11. Education and Sciences	2	3,13
12. Education Quarterly Reviews	1	1,56
13. Educational Administration: Theory & Practice	2	3,13
14. Educational Policy Analysis and Strategic Research	1	1,56
15. Educational Research and Reviews	1	1,56
16. Educational Sciences: Theory & Practice	1	1,56
17. Educational Sciences: Theory and Practice	1	1,56
18. Educational Technology Theory and Practice	2	3,13
19. Gazi University Gazi Journal of Faculty of Education	1	1,56
20. Gaziantep University Journal of Social Sciences	1	1,56
21. Inonu University Journal of the Faculty of Education	1	1,56
22. International Journal of Human and Behavioral Science	1	1,56
23. International Journal of Karamanoglu Mehmetbey Educational Research	1	1,56
24. International Journal Of Social Humanities Sciences Research	1	1,56
25. International Journal on Lifelong Education and Leadership	2	3,13
26. International Journal on New Trends in Education & Their Implications	1	1,56
27. Journal of Computer and Education Research	1	1,56
28. Journal of Educational Sciences Research	1	1,56
29. Journal of Educational Sciences Research	1	1,56
30. Journal of History School	1	1,56
31. Journal of Muallim Rifat Faculty of Education	1	1,56
32. Journal of National Education	2	3,13

33. Journal of School Leadership	1	1,56
34. Journal of Social Sciences of Mus Alparslan University	1	1,56
35. Journal of Teacher Education and Lifelong Learning	1	1,56
36. Journal of the Human and Social Science Researches	1	1,56
37. Journal of Theoretical Educational Science	1	1,56
38. Karadeniz International Scientific Journal	1	1,56
39. Kırıkkale University Journal of Social Sciences	1	1,56
40. Marmara University Atatürk Faculty of Education Journal of Educational Sciences	1	1,56
41. Mehmet Akif Ersoy University Journal of Education Faculty	2	3,13
42. Muğla Sıtkı Koçman University Journal of the Faculty of Education	1	1,56
43. Participatory Educational Research	2	3,13
44. Procedia-Social and Behavioral Sciences	1	1,56
45. Sustainability	1	1,56
46. The Journal of International Social Research	1	1,56
47. The Turkish Online Journal of Educational Technology	2	3,13
48. The Western Anatolia Journal Of Educational Sciences	1	1,56
49. Turkish Studies	1	1,56
50. Uluborlu Journal of Professional Sciences	1	1,56
51. Universal Journal of Educational Research	1	1,56
52. Uşak University Journal of Social Sciences	1	1,56
53. Van Yüzüncü Yıl University Journal of Education	1	1,56
TOTAL	64	100,00

As evident in Table 2, the 64 articles conducted on school administrators' technology leadership have been published in a total of 53 different journals. Out of the examined studies, 9 journals had two articles each, while the remaining 44 journals featured a single study each.

Distribution of Articles by the Indexes of Published Journals

The distribution of articles by the publication year indexes of the journals is shown in Figure 2.

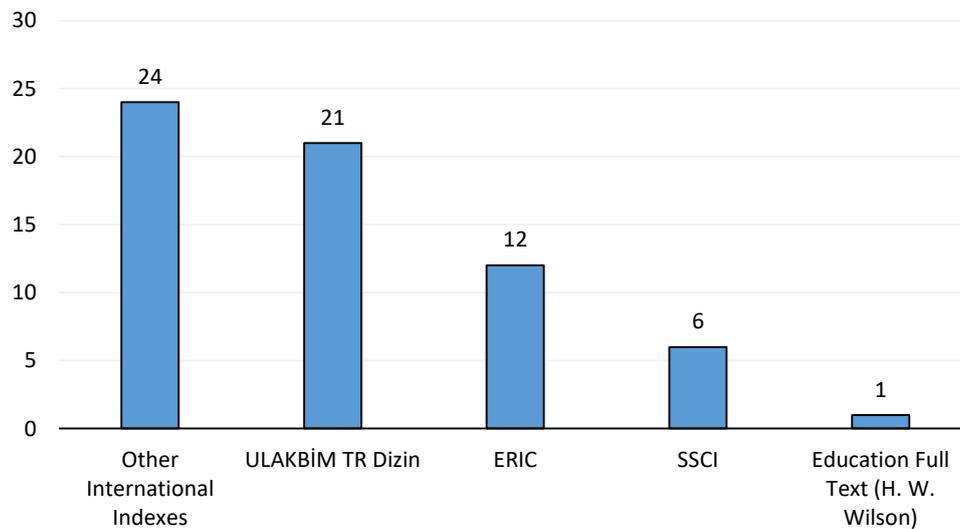


Figure 2. Distribution of articles by the indexes of published journals

When considering Figure 2, it can be seen that a substantial portion of Türkiye-originated articles related to school administrators' technology leadership are primarily indexed in other international indexes ($f=24$) and ULAKBİM TR Dizin ($f=21$). Furthermore, among the 64 examined articles, 12 are indexed in ERIC (Educational Resource Information Center), 6 in SSCI (Social Science Citation Index), and 1 in Education Full Text (H. W. Wilson).

Distribution of Articles by Research Methods and Designs

The distribution of the examined articles by research methods and designs is presented in Table 3.

Table 3. Distribution of articles by research methods and designs

Research Methods	Research Design	f	%
Quantitative	Relational Survey	22	34,38
	Survey	21	32,81
	Scale Development	3	4,69

	Meta-Analysis	2	3,13
	Causal Comparative Design	1	1,56
	Scoping Review	1	1,56
	Total	50	78,13
Qualitative	Phenomenology	4	6,25
	Case Study	2	3,13
	Document Analysis	1	1,56
	Meta-Synthesis	1	1,56
	Not Specified	3	4,69
	Total	11	17,19
Mixed	Exploratory Sequential Design	2	3,13
	Not Specified	1	1,56
	Total	3	4,69
TOTAL		64	100,00

As indicated in Table 3, it is notable that a significant proportion of articles on school administrators' technology leadership predominantly utilized quantitative research methods (f=50), followed by qualitative research (f=11), and mixed (f=3) methods studies. Furthermore, when examining the most preferred research designs in each method, it is noteworthy that within the quantitative approach, relational survey (f=22) and survey (f=21) designs stand out. In the qualitative approach, phenomenology (f=4) and case study (f=2) designs are prominent, while in the mixed methods approach, explanatory sequential design (f=2) precedes. Additionally, it can be observed that researchers seem to have shown less interest in employing meta-analysis (f=2), scoping review (f=1), and causal comparative (f=1) designs in quantitative methods, and document analysis (f=1) and meta-synthesis (f=1) designs in qualitative methods. Lastly, it was observed that the design of 3 studies in qualitative research and 1 study in mixed methods was not specified.

Distribution of Articles by Sample Group

The distribution of articles by their sample group is presented in Figure 3.

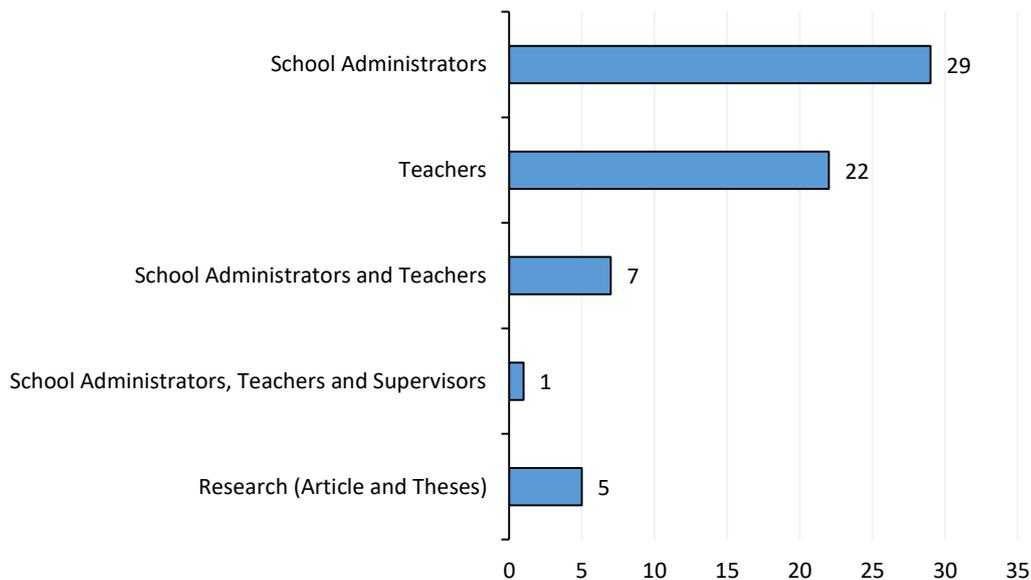


Figure 3. Distribution of articles by sample group

Upon examining the frequency values presented in Figure 3 regarding the sample group of the 64 examined articles, it is revealed that there are 5 distinct sample groups. Accordingly, in this field of research, school administrators (f=29) and teachers (f=22) are the most frequently chosen sample group. Additionally, in 7 studies, the sample consists of both school administrators and teachers, while in 1 study, the sample includes school administrators, teachers, and supervisors together. Finally, 5 studies were conducted in the form of literature reviews and meta-analyses, with 4 of them involving researchers analyzing articles and 1 involving the examination of theses.

Distribution of Articles by Sample Size

The distribution of articles by their sample size is provided in Table 4.

Table 4. Distribution of articles by sample size

Sample Size	Research Methods						TOTAL	
	Qualitative		Quantitative		Mixed			
	f	%	f	%	f	%	f	%
n ≤ 100	11	17,19	5	7,81	1	1,56	17	26,56
100 < n ≤ 200	0	0,00	13	20,31	1	1,56	14	21,88
200 < n ≤ 300	0	0,00	7	10,94	0	0,00	7	10,94
300 < n ≤ 400	0	0,00	11	17,19	1	1,56	12	18,75
400 < n ≤ 500	0	0,00	6	9,38	0	0,00	6	9,38
500 < n ≤ 1000	0	0,00	4	6,25	0	0,00	4	6,25
1000 < n ≤ 2000	0	0,00	3	4,69	0	0,00	3	4,69
n > 2000	0	0,00	1	1,56	0	0,00	1	1,56
TOTAL	11	18,03	50	78,13	3	4,69	64	100,00

The sample sizes of the studies have been presented in eight different categories encompassing specific value ranges, delving into each category's status with regards to qualitative, quantitative, and mixed methods. Accordingly, a significant portion of the studies (f=17) comprised 100 or fewer participants, primarily employing qualitative methods. Following this are studies with sample sizes between 100-200 and 300-400. Notably, the studies falling into these two categories are mostly quantitative in nature. Another considerable finding is the relatively small number of studies with sample sizes exceeding 1000 participants.

Distribution of Articles by Sampling Methods

The distribution of articles by sample size is presented in Table 5.

Table 5. Distribution of articles by sampling methods

Sampling Methods	Sampling Method Types	f	%
Probability (Random) Sampling	Simple Random Sampling	9	13,64
	Stratified Sampling	6	9,09
	Cluster Sampling	3	4,55
	Total	18	27,27
Non-Probability (Non-Random) Sampling	Convenience Sampling	28	42,42
	Maximum Likelihood Sampling	7	10,61
	Purposive Sampling	2	3,03
	Snowball Sampling	1	1,52
	Quota Sampling	1	1,52
	Total	39	59,09
Others	Census	2	3,03
	Not Specified	7	10,61
	Total	9	13,64
TOTAL		66	100,00

In the examined 64 articles, it has been revealed that three different sampling methods were utilized: probability sampling, non-probability sampling, and other methods. Among these, the most frequently used method is non-probability sampling (f=39), followed by probability sampling (f=18) and other methods (f=9) respectively. Furthermore, within the probability sampling method, the most common type is simple random sampling (f=9), whereas within the non-probability sampling method, convenience sampling (f=28) stands out. It is worth highlighting that cluster sampling, purposive sampling, snowball sampling, and quota sampling types, each occurring in 3 instances or fewer, are less prominent. Additionally, census is adopted in 2 studies, and the sampling type is not specified in 7 studies.

Distribution of Articles by Data Collection Tools

The data in Table 6 illustrates the distribution of articles by data collection tools.

Table 6. Distribution of articles by data collection tools

Data Collection Tools	f	%
Scale	48	65,75
Semi-Structured Interview Form	11	15,07
Questionnaire	4	6,85
Personal Information form	2	2,74
Written Form	2	2,74

Audio Recording	1	1,37
Not Specified	5	6,85
TOTAL	73	100,00

Table 6 reveals that a significant majority of the studies employed scales (f=48) as their data collection instrument. Following this, semi-structured interview forms were used in 11 studies, whereas audio recording emerged as the least frequently utilized data collection tool. Additionally, data collection tools were not explicitly specified in 5 studies.

Distribution of Articles by Data Analysis Methods

Table 7 provides the distribution of articles by data analysis methods.

Table 7. Distribution of articles by data analysis methods

Data Analysis Methods	Data Analysis Techniques	f	%
Descriptive Quantitative	Frequency	54	16,82
	Percentage	49	15,26
	Mean	43	13,40
	Standard Deviation	40	12,46
	Maximum - Minimum	6	1,87
	Reliability Analysis	3	0,93
	Median	2	0,62
	Mod	1	0,31
	Total	198	61,68
Inferential Quantitative	ANOVA	27	8,41
	T-test	26	8,10
	Pearson Correlation Analysis	16	4,98
	Mann Whitney U Test	9	2,80
	Kruskal Wallis H Test	8	2,49
	Regression Analysis	9	2,80
	Exploratory Factor Analysis	5	1,56
	Confirmatory Factor Analysis	5	1,56
	Tukey HSD Test	5	1,56
	Spearman Correlation Analysis	4	1,25
	Effect Size	4	1,25
	Scheffe Test	2	0,62
	Structural Equation Modeling	2	0,62
	Latent Class Analysis	2	0,62
	MANOVA	2	0,62
Canonical Correlation Analysis	1	0,31	
Cluster Analysis	1	0,31	
	Total	128	39,88
Qualitative	Content Analysis	15	4,67
	Total	15	4,67
	TOTAL	341	100,00

In the examined 64 studies, a total of 341 instances of data analysis techniques were identified under three main data analysis methods. Among these, the descriptive quantitative analysis method (f=198) is the most prevalent, followed by the inferential quantitative method (f=128) and qualitative analysis method (f=15). In descriptive quantitative analysis, frequency (f=54), percentage (f=49), mean (f=43), and standard deviation (f=40) values are extensively addressed, while mode (f=1) and median (f=2) values are less frequently included in the studies. Within the inferential quantitative analysis method, researchers most frequently rely on ANOVA (f=27), t-test (f=26), and Pearson correlation (f=16) analyses, while techniques like cluster analysis (f=1), canonical correlation analysis (f=1), and MANOVA (f=2) were rarely chosen or deemed unnecessary or not applicable in their studies. Notably, content analysis technique (f=15) seems to be consistently used in all qualitative analysis methods.

Distribution of Articles by Keywords

It was found that 64 articles include a total of 118 distinct keywords, amounting to 270 instances in total. As depicted in the network analysis in Figure 4, the most frequently used keyword in the studies is "technology leadership," occurring 41 times. Following this, in order of frequency, are the keywords "leadership" (f=16), "school administrators" (f=14), "technological leadership" (f=12), "school administrator" (f=9), "technology" (f=7), "school principals" (f=6), "NETS-A" (f=5), "teacher" (f=5), "technology integration" (f=4), "ISTE" (f=4), and "ISTE standards" (f=4).

a variable that is only considered descriptively and not examined for its relation to any other variable or its effect on that variable) in 36 studies, as an independent variable in 10 studies, as a dependent variable in 1 study, and as a relational variable in 16 studies. In the study where "school administrators' technology leadership" is considered a dependent variable, "the school administrators' participation in technology courses" is chosen as an independent variable. Furthermore, the predictive effect of the "school administrators' technology leadership" variable has been investigated on 11 dependent variables, including school administrators' acceptance of ICT, level of knowledge management, technostress level, attitudes towards use of technology in education, and teachers' technology integration competencies. Additionally, the relationship between this variable and 18 other variables, such as school administrators' technology use efficacy, personality traits, crisis management skills, leadership style, attitudes towards technology use in education, and teachers' perceptions of school effectiveness and attitudes towards distance education, has also been examined.

DISCUSSION AND CONCLUSION

This study aims to reveal the general trend in articles originating from Türkiye that focus on school administrators' technology leadership between 2010 and 2023. In this context, a detailed examination of 64 articles indicates that the number of studies, which was only one in 2010, started to increase in the subsequent years. This phenomenon can be ascribed to the escalating rate of implementation of the FATİH project in schools during those years, coupled with the acceleration of efforts to enhance technological infrastructure in schools. Indeed, the mentioned aspect related to the FATİH project demands school administrators' technology leadership-related actions, which, in turn, might have driven researchers to conduct studies focusing on this particular field. Another notable finding is the significant increase in the number of studies, especially from 2019 onwards. More than half of the studies have been conducted in just the last 5 years, a finding that aligns with the research by Korkmaz, Kutlu, and Yavuz (2022). In this regard, it can be argued that the significant rise in the popularity of this topic in recent years is largely attributed to the substantial role of the COVID-19 pandemic. With the transition to remote education during the pandemic, the significance of educational technologies, especially online technologies, has come to the forefront (Williamson, Eynon & Potter, 2020). Also, there has been an increased recognition of the need for school administrators to exhibit technology leadership to coordinate the use of these technologies (Aydın-Güngör & Ayar, 2022). This might have led to an increased interest from researchers in the field of school administrators' technology leadership, subsequently contributing to the growth in the number of studies in this area. This is evident as there has been a noted rise in publications regarding online and distance education during the pandemic (Avcı, 2023; Mishra, Sahoo & Pandey, 2021), which could have opened the door for the consideration of the topic of technology leadership for school administrators who bear significant responsibilities in the process of distance education.

When considering the language of publication related to school administrators' technology leadership in the national literature, it is clear that articles in Turkish have outnumbered those in English. This finding is consistent with the results of Köybaşı-Şemin (2020). Given that the research is conducted by Turkish scholars in Türkiye, it is natural and expected that a significant portion of the articles are published in Turkish language. Additionally, the fact that educators, administrators, and policymakers who would benefit from and implement the insights of these articles are likely to be Turkish citizens, and their English proficiency may not be at the desired level, could be factors contributing to researchers' preference for the Turkish language of publication to cater the local audience. Moreover, the number of articles published in English is not to be underestimated. Factors such as aiming to address the international academic audience, sharing their findings with them, and facilitating cross-country comparisons in the domain of technology leadership might have motivated Turkish researchers to turn towards English, which is universally acknowledged as the language of scholarly communication.

The examined 64 articles are dispersed across 53 different journals, indicating that articles related to school administrators' technology leadership are distributed across various journals rather than being confined to particular ones. Given the subject's relevance to the field of education, a significant portion of the articles has been published in journals specializing in education. Additionally, a majority of the journals are of Turkish provenance, with only a minority being international origin. Due to the nature of the subject matter being pertinent to Türkiye and the prevalence of articles being written in Turkish, researchers may have preferred Turkish journals as their primary choice for publication.

A significant portion of the examined articles was indexed in other international indexes and ULAKBİM TR Dizin, followed by ERIC, SSCI, and Education Full Text (H. W. Wilson) indexes, respectively. Considering that the journals primarily originate from Türkiye, this distribution can be interpreted as a natural and anticipated outcome. This is due to the fact that most journals in Türkiye are indexed in ULAKBİM TR Dizin and other international indexes, with a relatively smaller portion being indexed in more internationally-oriented indexes like ERIC and SSCI.

In studies conducted on technology leadership of school administrators in Türkiye, it has been determined that quantitative methods are predominantly utilized, followed by qualitative and mixed methods, respectively. A similar ranking in terms of the use of methods by Turkish researchers is also observed in the study by Korkmaz, Kutlu and Yavuz (2022). Similarly, Köybaşı-Şemin (2020) also identified a higher preference for quantitative methods compared to others. Not only in this specific field, but in many educational studies as well, it can be stated that the quantitative method is often favored. The ease and efficiency of data collection using standardized instruments, the reduction of researcher bias leading to more objective results, and the potential for generalization to larger populations might have prompted researchers to lean more towards quantitative methods. Furthermore, the fact that technology leadership is often treated as a quantitative variable in the literature may also have

contributed to the emergence of this result. Besides, the preference for quantitative methods may have been influenced by the quantitative nature of variables frequently investigated by researchers in the context of technology leadership of school administrators, such as their technology usage competencies, ICT acceptance, and attitudes towards technology use in education. In addition, the prevalence of descriptive aims to portray the existing state of technology leadership and the mentioned variables, along with the relationships between them, can be observed in the analyzed studies. This might explain why researchers have often deemed survey and relational survey designs appropriate for their investigations. On the other hand, in some studies, albeit to a lesser extent, researchers turned to qualitative and mixed methods. The primary reason behind this choice could be the recognition that quantitative methods and mere numerical values might fall short in fully explaining the phenomenon, leading some researchers to desire a more detailed and in-depth examination of the topic of school administrators' technology leadership (Fraenkel, Wallen & Hyun, 2009; Johnson, Onwuegbuzie & Turner, 2007). To achieve this objective, researchers have shown a preference for phenomenology and case study designs in qualitative research, while utilizing an explanatory sequential design in mixed methods studies.

The most commonly used sample group in studies related to school administrators' technology leadership consists of school administrators themselves. Given the direct relevance of the subject to school administrators, it is natural for researchers to choose them as the primary source of data in their studies. In addition, it is noteworthy that teachers are also chosen as sample group in studies almost as frequently as school administrators. The involvement of a technology leadership approach in line with the distributed perspective may have had an influence on the emergence of such a result (Tan & Aloysius, 2011). This is because teachers, who are one of the key stakeholders in the school, play a crucial role when technology leadership is shared within the school (Galdames-Calderon, 2023). Furthermore, given that teachers are the ones responsible for directly integrating technology into their teaching, it would be valid to assert that having a leadership team without their involvement or without recognizing their contributions may not be feasible. However, contrary to the findings of this study, in another research, it was determined that teachers were more prominently featured as the sample group compared to school administrators (Korkmaz, Kutlu & Yavuz, 2022). In that study, postgraduate theses conducted in Türkiye were examined. It can be stated that the general tendency and practice in theses is to reach as many participants as possible, which could have led researchers to focus on teachers who clearly outnumber school administrators in quantity. Additionally, in a small portion of the analyzed 64 articles, both school administrators and teachers were included as participants. The intention behind this might be to compare the self-assessments of school administrators regarding technology leadership performance with the evaluations of teachers or to gather data from various sources to gain a more holistic understanding of the technology leadership in the school.

It is worth to recognize that the sample sizes of the analyzed studies vary based on the adopted research methods. Accordingly, studies with 100 or fewer participants are primarily qualitative in nature. Qualitative methods, which enable researchers to delve deeply into technology leadership and access detailed information, do not necessarily require a large number of participants, unlike quantitative methods. Conducting qualitative data collection with a reasonable number of participants is sufficient to achieve the stated goals. This is because qualitative methods are often associated with small sample sizes, and beyond a certain point, adding more participants does not contribute to the analysis (Malterud, Siersma & Guassora, 2016) due to data saturation (Glaser & Strauss, 1999). On the other hand, it is noteworthy that studies with more than 100 participants are mostly characterized by a quantitative orientation. The majority of quantitative research has sample sizes ranging from 100 to 500 participants, which aligns with the findings of Korkmaz, Kutlu, and Yavuz (2022). In addition, although less common, it is also noticeable that some researchers aim to achieve sample sizes ranging from 500 to 2000 in their studies. Quantitative studies are often considered to be comparatively easier in terms of data collection. Furthermore, achieving robust statistical outcomes, enhancing external validity for improved generalizability of results, and improving the accuracy, reliability, and credibility of findings are crucial in quantitative research. Accomplishing these goals objectives requires larger sample sizes (Andrade, 2020), which could help explain researchers' intentions to attain larger sample sizes in some of the examined quantitative studies.

In studies focused on school administrators' technology leadership, non-probability sampling methods are employed significantly more often than probability sampling methods, with the latter being used approximately half as frequently. Researchers' preference for non-probability sampling, particularly the convenience sampling technique within it, can be attributed to factors like suitability, convenience, and practicality (Büyüköztürk et al., 2015). Also, researchers typically refrain from utilizing probability sampling methods in quantitative research because they aim to reach a larger number of participants. This is due to the fact that probability sampling methods often involve a more rigid participant selection process, which can complicate the attainment of the desired participant count. However, it is essential to note that while non-probability sampling methods offer convenience and ease, they come with disadvantages as well. Non-probability sampling can introduce bias and weaken the generalizability of research outcomes in quantitative research, as it may not adequately represent the population of interest. Consequently, it appears that in Turkish articles related to school administrators' technology leadership, researchers seem to prioritize increasing the number of participants over aiming for generalizability of results, leading them to prefer techniques like convenience sampling.

The prevalence of quantitative research in the analyzed studies has naturally led to the increased use of scales as data collection instruments. This is followed by semi-structured interview forms, which are commonly used in qualitative and mixed methods research, as well as surveys. This finding is consistent with the results obtained by Köybaşı-Şemin (2020). As mentioned earlier, the choice of research methods influences the selection of data collection tools. Furthermore, it can be noted that the

development of scales by Turkish researchers following the establishment of NETS-A standards by ISTE (2009) has garnered attention, leading to a rise in the number of studies employing scales. Additionally, it can be stated that the variables addressed in the research also guide the selection of appropriate data collection instruments.

It is notable that the majority of the analyzed studies heavily rely on quantitative data analysis. The adoption of a quantitative approach in these studies has naturally led to the predominance of quantitative data analysis methods, which is in parallel with the findings of Köybaşı-Şemin (2020). In the studies, the prevalence of methods like survey and relational survey research for describing the existing state of technology leadership has led to the frequent use of descriptive statistics such as frequencies, means, and percentages. On the other hand, a significant portion of researchers has also turned to inferential statistical methods like t-tests, ANOVA, correlation and regression analyses. The primary reason for this could be that researchers aim to move beyond mere description and seek to derive more meaningful insights by examining differences and relationships between data, which is achievable through inferential statistical methods. Lastly, in all studies conducted using qualitative methods, content analysis, a common qualitative analysis technique, has been employed.

In studies related to school administrators' technology leadership, a total of 118 different keywords have been used. Not surprisingly, the standout keyword among them is "technology leadership". This phrase, which forms the core of the subject matter, has been commonly chosen as a keyword by many researchers. Additionally, since the subjects of the study are school administrators, keywords such as "leadership", "school administrators", and "school principals" are also prevalent. Furthermore, the technological context of the subject has led to the preference for keywords like "technology", "technology integration", "ISTE", and "NETS-A".

Finally, in the examined studies, a total of 27 different variables, including school administrators' technology leadership, have been utilized. Among these, there are 36 single variables, 10 independent variables, 1 dependent variable, and 16 relational variables. It is worth noting that the variable of school administrators' technology leadership is predominantly treated as a single variable in most of the studies, with only one study considering it as a dependent variable. This suggests that the focus of these studies is often on the descriptive aspects of school administrators' technological leadership qualities rather than considering the factors that influence them.

RECOMMENDATIONS

The primary goal of conducting review studies is to illuminate potential avenues for future research after presenting the current state of the literature. Therefore, within this study that examines Turkish research on school administrators' technology leadership, it is possible to provide recommendations for future researchers by leveraging from the current literature and identifying research gaps.

To begin with, the majority of conducted studies have been quantitative in nature, often resulting in superficial evaluations of school administrators' technology leadership that tend to describe the existing state rather than delving into deeper analysis. Given the limited number of mixed methods studies, upcoming researchers might consider conducting mixed methods research to combine quantitative and qualitative data, offering a more comprehensive understanding of the phenomenon of school administrators' technology leadership.

Additionally, there is a noticeable scarcity of studies taking the technology leadership of school administrators as a dependent variable. However, given the significant role it plays on technology integration within schools, it can be argued that identifying variables that could influence technology leadership holds importance. This can be achieved through conducting research that treats school administrators' technology leadership as a dependent variable and examines independent variables that can predict it. Therefore, researchers are recommended to take this into account in their future studies and investigate the impact of variables such as technology proficiency, perceived ease of use and perceived benefits towards technology, school culture and climate, innovation management, and leadership styles on school administrators' technology leadership.

Although the literature underlines the critical role of school administrators' technology leadership in technology integration, there is limited research on this topic in Türkiye. Therefore, it is considered crucial for researchers to investigate the impact of school administrators' technology leadership on teachers' technology integration competencies.

Nearly all of the examined studies primarily focused on school administrators and teachers as the sample. However, distributed technology leadership extends beyond school administrators and teachers, involving students, parents, and other school staff (Spillane, 2006). Hence, future research could explore these stakeholders as well, allowing for a broader and more comprehensive understanding of technology leadership in the school context.

Considering the sample sizes, it turns out that most studies involved 500 or less participants. In terms of sampling methods, a significant portion of the studies appear to adopt non-probability sampling methods. However, for the sake of enabling more robust statistical analyses and better generalizations, it is advisable for future studies to aim for larger sample sizes whenever possible and, if feasible, opt for probability sampling methods to determine the sample. This approach would enhance the validity and reliability of the research outcomes.

LIMITATIONS

This review study is not without its limitations. It focuses solely on articles published between 2010 and 2023, omitting theses from consideration. Consequently, a more comprehensive approach could involve expanding the scope to include theses as well, thereby conducting a review that provides a better representation of the state of school administrators' technological leadership in Türkiye. This adjustment could result in a more holistic understanding of the subject matter.

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Statements of publication ethics

We hereby declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

Researchers' contribution rate

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Ethics Committee Approval Information

As this is a document analysis study, ethical committee approval is not required.

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APPENDIX

List of 64 articles included in the review

- Akada, T., & Şahin-Fırat, N. (2022.) İSTE-A 2018 standartlarına dayalı olan okul müdürlerinin teknoloji liderliği ölçeğinin geliştirilmesi. *Batı Anadolu Eğitim Bilimleri Dergisi*, 13(2), 1262-1289.
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