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## School Principals' Perspective on Technological Leadership, Technostress and Information and Communication Technology: A scoping review

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School principals act as the leader of students and teachers and always focuses on the academic achievement of students while making decisions in different areas of the school. A school principal's leadership skills, communication skills, analytical thinking skills, co-operation skills, creativity, flexibility, and openness to learning are important keys to success in schools and thus in education. In this last century, it has become impossible to think of all these skills independently of technology. With this quick glance in mind, the aim of this scoping review was to present a thorough analysis of pertinent theses and dissertations completed in Turkey that addressed the viewpoint of school principals on technological leadership, technostress, and Information and Communication Technology (ICT) proficiency. The five-stage framework developed by Arksey and O'Malley (2005) serves as the basis for the scoping review. Research questions are first determined. Second, the Council of Higher Education (HEC) database's most recent 20 years are investigated using the search term "School Principal." Third, studies are examined using inclusion and exclusion criteria, and articles are chosen using the PRISMA (2009) approach. Fourth, selected articles are analyzed in terms of a variety of metrics and summaries. In light of the study questions, the findings are then provided. The results of the scoping review are described in relation to a number of dimensions examined by the research questions.

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## Introduction

Leadership in the field of education is a challenging process and, in this process, an effective school administrator is vital for the journey of success (Açıklık, 1998). School administrators have a very important role in raising qualified individuals for social development and modernization within the education system (Tan, Gao, and Shi, 2020). A school principal acts as the leader of students and teachers and always focuses on the academic achievement of students while making decisions in different areas of the school. In addition to raising the

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standards of the school in order to achieve the targeted student performance, school administrators also need to fulfil tasks such as improving the performance of employees, using information effectively, and communicating with people and institutions around the school (Bolaji and Bolaji, 2022). Therefore, school administrators should work with students, teachers and other employees in a framework of trust and respect in order to organise the workforce, time and programmes in the school (Özdoğan, 2022; Valentine, 2001). This situation requires school administrators to know and apply administrative processes well (Bursalıoğlu, 2002). A school principal's leadership skills, communication skills, analytical thinking skills, co-operation skills, creativity, flexibility, and openness to learning are important keys to success in schools and thus in education. Mullen and Cairns (2001) state that informing parents about the successful behaviours of students and teachers will contribute to increasing the success of both children and teachers. School administrators have to effectively apply decision making, planning, organising, creativity, flexibility, communication, analytical thinking and evaluation processes in order to carry out functional processes such as student affairs, personnel affairs, teaching affairs, educational affairs and management (Şahin, 2023). Being open to learning is one of the most important characteristics that school administrators should have (Vanblaere and Devos, 2016). Being open to learning can be defined as constantly improving oneself and being open to learning. It is extremely important for school administrators to learn and use technology. The main reason here is that they can stay up to date in the rapidly changing technological environment of our age and guide students in this field. In this context, technology integration in education emerges as an important concept. Technology integration in education refers to a planned process in which all components (students, teachers, school administrators, curriculum, and alike), including school administrators, come together in harmony to make learning more effective (Koszalka & Wang, 2002; Wang & Woo, 2007).

In this context, the use of technology is also important in the online and distance education process and provides benefits in many areas such as preparing course materials, tracking students, collecting data, and analysing student performance. Developments in technology change the way individuals, groups and societies communicate, learn, work and manage (Meyers, Erikson, and Small, 2013; Bibri, 2022). School administrators should learn and use technology so that students in their schools are well prepared in this field and can keep up with the age. School administrators' learning technology also sets an example for their teachers, staff and other personnel (Utomo, 2022). Effective use of technological tools is useful for teachers to plan and present lessons. Students also have a better learning experience with technological tools and their learning process becomes more interactive. If school administrators use technology effectively, they can also increase the educational level of their school's students.

The International Society for Technology in Education (ISTE), an organisation established in the United States of America to promote the use of technology to spread innovations in learning processes and to encourage the use of technology to solve problems encountered in education, has identified 21 performance indicators under the headings of "Visionary Leadership", "Digital Age Learning Culture", "Excellence in Professional Practice", "Systematic Development" and "Digital Citizenship" for the technology standards of school administrators in its "National Educational Technology Standards for Administrators" study published in 2009 (ISTE, 2014).

School administrators can follow the performance of their students by using technology, identify students' weak points and provide special support when necessary. As in all areas, data is very important in the decision-making processes of school administrators (parent meeting, parent guidance, student attendance, strategic planning, solution-oriented management) and one of the determinants of this process is technology (Öz and Arastaman, 2022). It is possible to



follow the educational processes of students more effectively by taking advantage of technology (Almasri, 2022). Thus, as a result of these follow-ups, special courses can be given to students, their deficiencies can be eliminated, and their learning performance can be increased. As educational leaders, administrators use technology to create teaching environments compatible with technology, to create new methods to maximize learning and teaching, and to increase their own productivity and the productivity of others (Yu & Durrington, 2006). It is extremely important for school administrators to learn technology, use it properly and transfer these innovations to teachers, staff, and students to increase the success of their schools (Balmes, 2022; Maala and Lagos, 2022). It is of great importance how school administrators' relationships with technology affect themselves and their school environment (Aktaş and Karca, 2022). In this context, the purpose of this study is to systematically review the studies conducted in the last two decades on school administrators' technology leadership, their perspectives on technology, their perceptions of technological nativeness and technostress.

### **Method**

The study investigated thesis and dissertations written in Turkey on school principals' perspective on technological leadership, technostress, and ICT competence. The five-stage framework developed by Arksey and O'Malley (2005) is applied in this scoping review study. The five stages of Arksey and O'Malley's framework; (1) identifying research questions, (2) identifying relevant studies, (3) study selection, (4) charting the data, (5) summarizing and reporting the results were utilized to answer the research questions.

### ***Identifying research questions***

The review's main objective was to examine important facets of school administrators' perspectives on technological leadership, technostress, and ICT competence in the schools they oversee. In order to make sure that a wide range of literature on the topic of interest is gathered, the following research questions are provided to guide the research:

- (1) How is the technology focus in the studies? Or: How are the technology foci...?
- (2) Which methods were used in the studies?
- (3) What is the number of school administrators involved in the studies and from which schools?
- (4) What are the data collection tools used in the studies?
- (5) How do the studies vary according to their results?

### ***Identifying relevant studies***

The search term 'School Principals' was determined to be able to reach broad range of thesis and dissertations on the Perspectives of School Principles in Turkey. Following that, inclusion and exclusion criteria were established for the choice of relevant studies. Of course, the first criterion was that the studies should examine the technological perspective of school principals in some way. The substance of the theses and dissertations was taken into consideration when choosing other criteria. These criteria were illustrated in Table 1. To give a comprehensive picture of the situation the last 20 years (2004-2023) was used as the basis for the publication date. To find the relevant studies, the Council of Higher Education Thesis Center (HEC) database was used. The fundamental rationale for choosing this database was because it comprises all of the theses and dissertations completed in Turkey. HEC thesis center is regarded as a suitable database for reflecting the current inclination.

**Table 1: Inclusion and exclusion criteria**

<i>Criteria</i>	<i>Inclusion</i>	<i>Exclusion</i>
Time period	The last 20 years (2004 - 2023)	Studies outside these dates or time period
Study Focus	School Principals' technological leadership, technostress ICT competence and Perspective on ICT	Studies do not collect data from school administrators working in K12n
Literature Focus	In particular, studies on the ICT context (e.g., ICT awareness and usage levels, technology leadership levels, and perceptions of technostress) of K12 administrators	The studies focus on the teachers' perspectives, school, and general educational issues
Sample	School principals working in K12	Does not directly concern or is not collected from school principals

### ***Study selection***

Using the key search term; School Principals, in HEC database, a wide range of studies are gathered to be reviewed. HEC database is being searched on March 1, 2023, and 1021 Thesis and Dissertation were identified that were published between 2005 and 2022. An analysis of the titles and abstracts revealed that a considerable proportion of the papers were irrelevant, particularly those that had nothing to do with technology leadership, technostress or ICT in education. The article selection procedure was based on the PRISMA (2009) approach (Moher, Liberate, Tetzlaff, Altman, and The PRISMA Group, 2009). The article selection procedure is depicted in detail in Figure 1.

### ***Charting of Data***

The charting of selected articles was the fourth phase. After each study is evaluated to be included based on inclusion and exclusion criteria, summaries are created for each article based on a variety of variables, including the author, year, aim, method, sample, date collection, and outcomes. Table 2 shows a full breakdown of the factors that were concluded from the included research.

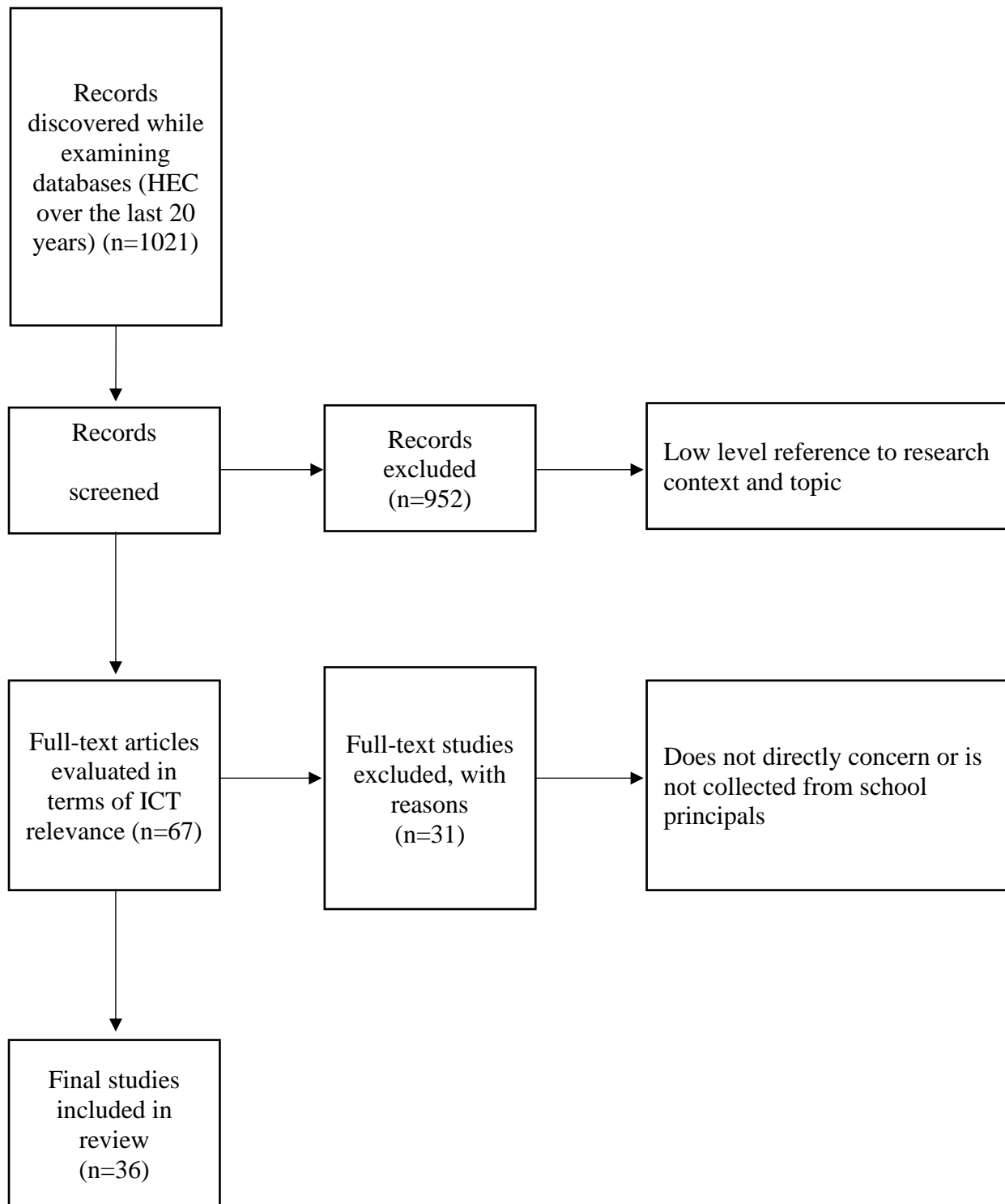


Figure 1. PRISMA flow diagram for article selection.

Table 2: Studies Included into Scoping Review

Author Degree	Aim	Method	Sample	Date Collection	Results
(1)E. Turhan(2005) Dissertation	to examine the opinions of school administrators about distance education technologies	Survey Model	245 (primary and secondary school)	Survey	expressed positive opinions about distance education technologies. (between 92.5 % and 75.2 %)
(2)K.Ergişi(2005) Thesis	to examine ICT awareness and usage levels	Survey Model	108 (primary and secondary school)	Survey	-intermediate level of knowledge in daily work -not sufficient in terms of determining the new technological tools to be purchased for the school
(3)G. Cantürk(2007) Thesis	To determin attitudes towards ICT and computer usage levels	Survey Model	161 (primary school)	Survey	- very high attitudes towards computer technology - high attitudes towards technology monitoring - Office software was frequently used
(4)M. Açar (2009) Thesis	Determination of opinions on the ICT usage	Survey Model	601 (primary school)	Survey	-Positive attitude towards the ICT usage - The level of ICT knowledge should improve
(5)N. Aysin Altun (2009) Thesis	ICT usage and integration into education	Case Study	19(primary school)	document analysis Interview Survey	-Positive attitude towards the ICT usage -not provided with sufficient number and quality of education to provide them with knowledge and skills in ICT.
(6)A. E.Akkaya (2010) Thesis	ICT usage and effect of in-service training	-single group pretest-posttest model	20 (K12)	Survey Achievement test	-In-service training was effective in terms of attitude towards ICT - in-service training has been effective in terms of ICT skills
(7)H. Bostancı (2010) Thesis	Investigation of technology leadership levels	Survey Model	249 (K12)	Survey	technological leadership competences at sufficient level
(8)C. Uğur (2010) Thesis	The effects of computer self-efficacy perceptions and computer anxiety on the ICT usage	-Relational survey model	126(K12)	Survey	-computer self-efficacy perception has a positive effect on the ICT usage -computer anxiety has a negative effect on the ICT usage
(9)B. Sezer (2011) Thesis	Investigation of technology leadership levels	Survey Model	879 (K12)	Survey	“Development and Evaluation”, “Support”, “Planning and Inspection” and “Ethics and Security” which were sub-dimensions of roles



					of school administrators in technology leadership, were high.
(10)N. U. Balaban (2012) Thesis	investigating the association between technology leadership responsibilities and levels of computer anxiety	Relational survey model	80(primary school)	Survey	- no relationship was found between technology leadership factors of human-centredness, vision, communication and cooperation and anxiety, -a significant negative relationship was found between support and anxiety.
(11)D. Görgülü (2013) Thesis	Investigation of technology leadership levels	Survey Model	282(K12)	Survey	technological leadership competences at middle level
(12)O. Kiroğlu (2014) Thesis	Investigation of ICT usage competences	Survey Model	152(primary and secondary school)	Survey	technological leadership competences at sufficient level
(13)H. Öz (2015) Thesis	Analysing their ideas on ICT integration	Case Study	8 (high school)	Interview	Administrators expressed their opinions on managerial, administration, technical support for interactive whiteboards, infrastructure preparation, feedback, communication, and project evaluation.
(14)G. Sunal (2015) Thesis	determination of ICT usage competences	Survey Model	140 (secondary school)	Survey	-technological leadership competences at middle level - The ICT usage competencies of institution administrators differ according to age, graduation, professional seniority, seniority in administration and ICT training variables.
(15)H. Şahin (2015) Thesis	Investigation of technology leadership levels	Survey Model	144 (K12)	Survey	"Development and Evaluation", "Support", "Planning and Supervision" and "Ethics and Safety", which are the sub-dimensions of technology leadership roles, were found to be high.
(16)E. Akdemir (2015) Dissertation	Determination and preparation of in-service training needs of Principals for ICT.	Mixed research method	411(K12)	Interview Focus grup interview Survey	Principals need the most knowledge and skills related to electronic spreadsheet programme and electronic presentation programme, especially web page editing.
(17)F. Ulukaya (2015) Thesis	Examining the relationship between school administrators' technological leadership competencies and school effectiveness.	Relational survey model	112(K12)	Survey	the relationship between school administrators' technology leadership self-efficacy and their school effectiveness was found to be positive and moderate in the general total and in all other sub-dimensions.



(18)N. Aktaş (2016) Thesis	Investigation of technology leadership levels	Survey Model	338(high school)	Survey	the technology leadership self-efficacy perceptions of the school administrators of secondary education institutions participating in the study are at the level of "Adequate".
(19)G. Cantürk (2016) Dissertation	To determine the technological leadership behaviours of school administrators and the use of information technologies in management processes.	Mixed research method	179(high school)	Survey Interview	school administrators' use of ICT in management processes greatly affects their technological leadership behaviours.
(20)D. Çetin (2017) Thesis	Determination of the relationship between school administrators' perceptions of technostress and individual innovativeness characteristics	Relational survey model	285(K12)	Survey	- perceptions of technostress were found to be at medium level. - a low level, negative and significant relationship between individual innovativeness and techno-complexity, -a low level, negative and significant relationship between individual innovativeness and technoinsecurity, and -a low level, positive and significant relationship between individual innovativeness and technouncertainty.
(21)N. Sayracı (2018) Thesis	Investigation of technology leadership levels	Survey Model	203(primary and secondary school)	Survey	technological leadership competences at high level
(22)A. Demiraçan (2019) Thesis	Examining the relationship between school administrators' technology leadership strategies and innovation management efficacy beliefs.	Relational survey model	236(K12)	Survey	There is a positive and moderate relationship between school administrators' technology leadership strategies and innovation management efficacy beliefs.
(23)Ö. Çağtaş (2019) Thesis	to investigate ICT usage competences	Survey Model	141(K12)	Survey	-ICT usage competences are at an adequate level -The use of ICT by young school administrators was found to be more adequate than older administrators. - There is no significant difference between male and female school administrators in terms of technology self-efficacy perception.
(24)E. Yumlu (2020) Thesis	Examining the relationship between school	Relational survey model	596(K12)	Survey	Among the sub-dimensions of technological leadership, human-centredness, support and



	administrators' technological leadership competencies and school effectiveness.				vision dimension were found to have a positive effect on school effectiveness. On the other hand, communication and cooperation dimension had no significant effect on school effectiveness.
(25)M. Arpa (2020) Dissertation	Examining relationship between school administrators' views towards ICT and their perceptions of autonomy.	Relational survey model	74(K12)	Survey	- Positive attitude towards the ICT -It was concluded that school administrators' views towards ICT did not differ according to gender, age and professional seniority. - The level of relationship between school administrators' views towards ICT and their perceptions of autonomy was found to be low.
(26)N. Kuday (2020) Thesis	examine views on technostress and to analyse these views according to various variables.	Survey Model	355(K12)	Survey	-the stress phenomenon experienced by the participant school administrators during the management task was caused by the current conditions in the school and that they partially accepted this as the nature of the management task. -The school administrators, who found the low level stress that can be managed useful, were of the opinion that their duties partially exposed them to stress and that this stress partially affected their duties negatively.
(27)M. Dülgar (2020) Thesis	Investigation of technology leadership levels	Survey Model	137(K12)	Survey	technology leadership competences to a great extent in their perceptions of themselves. - school administrators perceived themselves as competent mostly in the sub-dimensions of Excellence in Professional Practice and Digital Citizenship, and least in the sub-dimensions of Visionary Leadership and Systematic Development.
(28)R. S. Gürsel (2020) Thesis	to examine the relationship between school administrators' technology leadership competencies and ICT usage and attitudes.	Relational survey model	326 (K12)	Survey	-school administrators' technology leadership competences were at "high" level. -positive relationship between technology leadership competencies and the sub-dimensions of ICT usage and attitudes "Smartphone Use", "General Social Network Use", "E-Mail Use", "Social Network

					Friendship", "Positive Attitude Towards Technology" and "Preferences for Transition Between Tasks", and a positive relationship with the dimension of "Media Sharing" at a moderate level.
(29)O. Doğruöz (2021) Thesis	to examine school administrators' perceptions of ICT self-efficacy and school technology leadership efficacy perceptions and their relationship.	Relational survey model	214(K12)	Survey	- ICT self-efficacy perception levels were at "high" level and differed according to age, educational status, having an ICT counsellor in their schools, foreign language level and receiving ICT-related training. -Technology leadership efficacy perception levels were determined as "high", and it was seen that they differed according to their foreign language level, education level, and ICT-related education. - A positive and significant relationship was found between ICT self-efficacy and technology leadership efficacy perceptions.
(30)A.Koyuncuoğlu (2021) Thesis	to examine school administrators' views on their duties and responsibilities regarding ICT integration in education	Phenomenological design	40 (K12)	Interview	The administrators concentrated on the idea that the concept of technology and educational technologies are tools that make life easier and auxiliary tools used to increase efficiency in the educational environment. - They stated that their priorities in ensuring ICT integration are the infrastructure of the institution and finding resources, and that ICT environments can be created in the classrooms depending on the elimination of these problems.
(31)A. Kanber (2021) Thesis	to examine the relationship between school administrators' ICT usage competences and their managerial empowerment.	Relational survey model	375(K12)	Survey	school administrators' technology literacy levels and managerial empowerment levels were found to be at medium level. -No relationship was found between technology literacy and managerial empowerment.
(32)U. F. Ermiş (2021) Dissertation	to investigate ICT usage competences	Survey Model	329(K12)	Survey	school administrators' self-efficacy for the items in the scales of Protecting Equity and Citizenship, Empowering Leader, System Designer and Connected Learner was at a high

(33)T. Seven (2021) Thesis	to examine the relationship between school administrators' technological leadership self-efficacy and their distance education attitudes.	Relational survey model	182(K12)	Survey	level and their self-efficacy in the Visionary Planner scale was at a medium level. - The relationship between school administrators' technological leadership self-efficacy and distance education attitudes was not found. -The technological leadership self-efficacy of school administrators differs according to the educational status, but not according to the variables of school type, gender, total years of service, and the status of receiving any in-service training related to information and communication technologies.
(34)Ş.Yumuşak (2022) Thesis	to examine the relationship between school administrators' perceptions of technological leadership self-efficacy and perceptions of change management efficacy	Relational survey model	198(primary and secondary school)	Survey	-School administrators' perceptions of technological leadership self-efficacy were at a high level in all dimensions.  - There is a negative relationship between school administrators' perceptions of technological leadership self-efficacy and perceptions of change management efficacy.
(35)D. Durak (2022) Thesis	to examine school administrators' technology leadership self-efficacy and the use of 21st century teacher skills.	Relational survey model	102(K12)	Survey	School administrators' perceptions of technological leadership self-efficacy were at a high level. -A moderate, positive and significant relationship was found between school administrators' technology leadership self-efficacy and their use of 21st century teacher skills.
(36)A. B. Biberoglu (2022) Thesis	To examine the technological leadership behaviours of school administrators to solve the problems encountered during the pandemic period.	Case Study	10 (K12)	Interview	school administrators adopted contemporary leadership and had a transformational leadership approach, used technological leadership behaviours effectively in solving the problems by providing them as a model for teachers and solved the problems encountered by being in constant communication with school stakeholders.

### **Summarizing and reporting findings**

The final phase of the scoping review was to synthesize and submit results based on the steps taken. Creating summaries for each study made it easy to follow and debate the findings in light of the research questions.

### **Findings**

This scoping review covers 36 studies, 5 of which are dissertation (1,16,19,25,32) and 31 theses (2,3,4,5,6,7,8,9,10,11,12,13,14,15, 17,18,20,21,22,23,24,26, 27,28,29,30,31,33,34, 35,36). Selected studies are discussed regarding their aim, method, sample, data collection and results.

### **What is the technology focus in the studies?**

Four major themes emerge when the studies are analyzed with a technology focus. Table 3 illustrates the technology focus in the studies that are included into this scoping review.

Table 3. Technology focus in the studies

<i>Objective</i>	<i>Study Number</i>	<i>f</i>	<i>%</i>
Distance Education	1	1	3
Technostress	20, 26	2	6
ICT usage/ awareness/ attitudes/ integration/ competences	2,3,4,5,6,8,12,13,14,23,25, 30,31,32	14	39
Technology leadership	7,9,10,11,15,16,17,18,19,21, 22,24,27,28,29,33,34,35,36	19	52

As it is illustrated in Table 3, the most studies were conducted in the field of technology leadership (52%). This is followed by 39% of the studies in the ICT context. These studies cover a wide range of areas such as ICT use, attitudes and competences of school administrators towards ICT. Two studies were conducted in the field of technostress. One of them aimed to determine the relationship between school administrators' perceptions of technostress and individual innovativeness characteristics. The other one analyses the views on technostress and these views according to various variables. One study that is included into this scoping review was conducted in the field of distance education and to examine the opinions of school administrators about distance education technologies.

### **Which methods were used in the studies?**

The majority of the studies (44%) used the survey model method to determine the current situation. Relational survey model researches that reveal the relationship of the current situation in terms of other variables, for example the relationship of the technology leadership self-efficacy and the use of 21st century teacher skills are in second place (35%). Three studies that are included into this scoping review used case study method. In two studies, it was found that mixed method design was used in which both qualitative and quantitative data were collected and both designs were used together. In one study, single group pre-test post-test experimental design was followed. In another study, Phenomenological design, which is a qualitative research method in which the opinions of individuals who experience the



phenomenon are used to obtain information about the phenomenon, was preferred. Table 4 illustrates the methods were used in the studies.

Table 4. Methods used in studies

<i>Method</i>	<i>Study Number</i>	<i>f</i>	<i>%</i>
Experimental Study	6	1	3
Phenomenological Design	30	1	3
Mixed Design	16,19	2	6
Case Study	5,13,36	3	9
Relational Model	Survey 8,10,17,20,22,24,25,28,29,31, 33,34,35	13	35
Survey Model	1,2,3,4,7,9,11,12,14,15,18, 21,23,26,27,32	16	44

### ***What is the number of school administrators involved in the studies and from which schools?***

The school administrators in the studies are employed in schools at different levels. The majority of the studies in this review (61%) collected data from all principals and vice principals working in K12 schools. The studies conducted with administrators working in primary and secondary schools, except high schools, constitute 15% of the reviewed studies. In 12% of the reviewed studies, it was seen that school administrators were working at primary education level. On the other hand, 3 studies were conducted with school administrators working only in high schools and 1 study was conducted with school administrators working only in secondary schools. Table 5 illustrates the school level distributions of the studies included in this scoping review.

Table 5. School Sampling

<i>Schools</i>	<i>Study Number</i>	<i>f</i>	<i>%</i>
Secondary school	14	1	3
High school	13,18,19	3	9
Primary school	3,4,5,10	4	12
Primary and secondary	1,2,12,21,34	5	15
K12	6,7,8,9,11,15,16,17,20,22,23, 24,25,26,27,28,29,30,31,32, 33,35,36	23	61

As it is illustrated in Table 6, In the majority of the reviewed studies, the sample size is over 200. The largest sample size was reached in the study numbered 9 with 879. The sample size of 5 studies is below 100. The sample number in the studies is directly related to the method used in the study.

**Table 6. Number of Sample**

<i>Study Number</i>	<i>Less than 100</i>	<i>100-200</i>	<i>200-500</i>	<i>More than 500</i>
5,6,10,30,36	✓			
2,3,8,12,14,15,17,23,27,33,34,35		✓		
1,7,11,16,18,20,21,22,26,28,29,31,32,			✓	
4,9,24,				✓

***What are the data collection tools used in the studies?***

Surveys were employed in all but three of the research (13,30,36) when the data collection methods used in the studies included in the scoping review. Study 5 employed a combination of survey, document analysis, and interview to gather data. In study 6, survey was used together with achievement test. In 18 per cent of the studies, interview was used to collect data. Table 7 illustrates data collection tools of the studies.

**Table 7. Data collection tools in the studies**

<i>Date Collection</i>	<i>Study Number</i>	<i>f</i>	<i>%</i>
Document analysis	5	1	3
Achievement test	6,	1	3
Interview	5,13,16,19,30,36	6	18
Survey	1,2,3,4,5,6,7,8,9,10,11,12,14,15,16,17,18, 19,20,21,22,23,24,25,26,27,28,29,31,32, 33,34,35	33	90

***How do the studies vary according to their results?***

Although it is not easy to compile the results of the studies carried out by following different methods for different purposes, the studies have been summarised under seven headings. Sufficient level of school administrators' ICT usage/ awareness/ positive attitudes/ integration/ competences was found in 9 out of 36 studies. In two studies (3,9) it was found to be high. On the other hand, high level of technology leadership was found in seven studies and sufficient level of technology leadership in five studies.

Table 8. Results of the studies

<i>Results</i>	<i>Study Number</i>	<i>f</i>	<i>%</i>
Positive relation between computer self-efficacy and ICT usage	8,19	2	6
Middle level of technostress	20, 26	2	6
Positive relationship between technology leadership self-efficacy and school effectiveness/ innovation management	17,22,24	3	9
Sufficient level of ICT usage/ awareness/ positive attitudes/ integration/ competences	2,4,5,6,7,23,25,31,32	9	27
High level of ICT usage/ awareness/ positive attitudes/ integration/ competences	3,29	2	6
High level of technology leadership	9,15,21,27,28,29,35	7	21
Sufficient level of technology leadership	11,12,14,15,18	5	15

As it is illustrated in Table 8, in three studies, a positive relationship was found between school administrators' technology leadership self-efficacy and school effectiveness/innovation management. Positive relation between computer self-efficacy and ICT usage was found in two studies. In both studies on technostress, school administrators' technostress levels were found to be at medium level. Detailed results are given in Table 2. For example, in the study numbered 34, School administrators' perceptions of technological leadership self-efficacy were at a high level in all dimensions in other studies relationships emerge in some dimensions.

### Conclusion and Discussion

It is crucial to begin with a time period including the previous 20 years while doing this scoping review. It has been apparent in the last twenty years that computers are widely used in many facets of life. In fact, the group of people born in these years and the youngest generation of today is called Generation Z. This generation, (born between 1995 and 2012), is also called Generation Z or Gen Z or iGen or post-millennials (Meet, Kala, and Al-Adwan, 2022). Gen Z is highly tech-savvy, having grown up with the proliferation of digital technology and the rise of social media. They are also more independent and play a more active role in society than previous generations, often with better education and job opportunities. Generation Z is a generation with unique characteristics and values and is expected to have a major impact on the future world culture and economy. Determining the relationship between technology and school administrators, who will assume leadership in the field of education in the upbringing of this generation, is of course one of the important focal points of this study. Of course, technology includes all the tools and methods that are produced by the use of knowledge and skills and make our lives easier (Haleem, Javaid, Qadri, and Suman, 2022). These tools and methods can be different systems, devices and products used in many fields from communication to transport, from health to energy. The advancement of technology provides benefits in many areas such as facilitating communication between people, making work more efficient, making information more accessible, and improving the quality of life (Sen, Prybutok, and Prybutok, 2022). However, the reflection of technology on teaching basically refers to the use of



technology in the learning process and thus improving students' learning experiences, but it also includes all processes for teaching and instructional purposes. School administrators play an important role in the process of reflecting technology to teaching (Ribble and Park, 2022). They guide the use of technological tools in the school, the selection of educational materials and the training of teachers. School administrators also carry out regular follow-up to ensure more efficient use of technological tools and monitoring of students' learning processes. They also make decisions on time, resource and personnel management for the use of technology. Gonzales (2020) looked at the main difficulties that school administrators encounter. He discovered that negotiations and defining expectations for instructional use with teachers, as well as financing for and maintaining the project, are the biggest hurdles for school administrators. School administrators work to support teachers in the use of technology in teaching, to help them use technological tools more efficiently and to maximise student achievement. In this context, four main themes emerged when the purposes of the scanned studies were analysed; Technology leadership, ICT related topics, Technostress and Distance Education. The most studies were conducted in the field of Technology leadership.

School administrators provide leadership in the use of technological tools. This leadership is shown in many areas such as selection of educational materials, training of teachers, management of technological infrastructure and monitoring of students' learning processes. School administrators provide guidance to teachers who use technological tools, ensure that technological tools are used effectively in the learning process and use technology to increase the achievement level of students. Thomas, and Knezek (2008) emphasize that to assist new teachers as they integrate technology into their classroom education, administrators must be aware of and supportive of technology use at all levels. School administrators also provide leadership in time, resource and personnel management for the use of technological tools. They provide guidance on issues such as making the best use of the technological resources available in the school, regularly renewing the technological infrastructure, and organising the necessary training for teachers to use technology. According to Akbaba-Altun, S. (2004), who conducted a qualitative study on the topic, school administrators are required to play a variety of responsibilities, including leadership (both in the classroom and in technology), supervision, communication, staff development, planning, coordination, public relations, empowerment, ethics, and security. The technological leadership role of school administrators also helps to accelerate technological transformation in education and helps students learn more effectively. They also set an example in the use of technological tools for other staff and students in the school.

Undoubtedly, the methods followed in these studies, which are subject to scanning, provide us with information. Eight out of every ten studies used Survey Model or Relational Survey Model. Survey model research method is an important research method used in social, psychological, economic and market research. The survey's goal is to generate statistics, or quantitative or numerical descriptions of some feature of the research population (Fowler, 2013). This research method allows data to be collected by reaching a large number of people and results are obtained by statistical analyses of this data. Of course, survey modelling research is particularly useful for large-scale research that seeks generalized results. In addition to supporting the results of previous research, it can help to guide future actions. In the analysed studies, it was seen that survey management was used intensively in the Investigation of technology leadership levels of school administrators (Bostanci, 2010; Sezer, 2011, Sayracı, 2018). On the other hand, it was found to be used in determining technostress levels in two studies (Çetin, 2017, Kудay, 2020) and in ICT related issues in many studies (Ergişi,2005; Cantürk,2007; Çağdaş,2019). A highly preferred method is the relational survey method, which



is a multivariate research method and is generally used in social sciences. It aims to obtain results by examining the relationships between different variables. For example, in the study conducted by Yumlu (2020), the relationship between school administrators' technological leadership competencies and school effectiveness was examined. The fact that there is an experimental and a phenomenological design study among the studies examined is important in terms of revealing the need in this direction. In experimental studies, researchers can obtain information about cause-effect relationships by changing variables in a controlled manner. Therefore, experimental studies are very powerful research methods to confirm or refute a hypothesis (Creswell, 2012). Phenomenology, on the other hand, is the detailed study of an individual event or phenomenon. It is done by examining a number of illuminating features and cause-effect relationships are investigated. For this reason, we think that it is important to carry out new studies by utilising these two methods in school administrators' relations with technology.

The use of survey method has brought about the use of survey as a measurement tool. In six of the analysed studies, it was determined that data were collected through interviews. Only one study used document analysis and achievement test. The data were generally collected from principals and assistant principals working at all levels of K12. In a significant number of the studies, the sample size was over 200.

These studies, which are conducted from various perspectives to understand the relationships of school administrators with technology, shed light on the researchers. It can be said that the studies scanned within the scope of this scoping review study show saturation in terms of screening studies and the number of samples is sufficient. In addition, it has been observed that there is a need for experimental and phenomenological studies to be conducted with school administrators. Another field of study seems to be relational studies on the predictors of technostress variable.

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