

Examining the Relationship between School Administrators' Technological Leadership Competencies and School Effectiveness

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Abstract

The purpose of this study is to determine the relationship between school administrators' technological leadership competencies and school effectiveness. In this study, relational survey model, one of the quantitative research methods, was used. The sample of the study consists of 596 teachers and administrators working in primary, secondary and high schools in Sultanbeyli, Kartal, Pendik, Maltepe, Sancaktepe and Tuzla districts of Istanbul province in the 2019-2020 academic years. "School Administrators' Technology Leadership Roles Scale" and "School Effectiveness Scale" were used as data collection tools. Reliability analysis, frequencies, correlation analysis and regression analysis were applied to analyze the data. As a result, it was determined that there was a moderate positive relationship between technological leadership and school effectiveness, and that the sub-dimensions of technological leadership such as human-centeredness, support and vision had a positive effect on school effectiveness. As a result of the regression analysis, it was determined that technological leadership predicts school effectiveness.

Keywords: School Effectiveness, Technological Leadership, Educational Institutions.

1. Introduction

Technology is considered to play a major role in becoming a leader as technology literacy is critical to student engagement in the 21st century. Governments recognize that without effective leaders, schools and districts cannot meet the imperative needs for success. Schools striving to succeed in the information age need leaders who are experienced in the proper use and potential harms of information and communication technology. Many researchers and educational institutions recognize that strong leadership is essential for successful school reform (Creighton, 2011). There is also a strong relationship between the technological leadership of school leaders and school effectiveness and the integration of teachers and students with educational technology, and technological leadership is vital for the effective use of technology in organizations (Anderson & Dexter, 2005). For schools to be ready for the information age, school administrators are expected to demonstrate strong technological leadership. School administrators who aim to develop the skills of their students should have technological skills to facilitate school reform. Educators' use of technology increases the integration of technology into education and affects students' performance (Chang, 2012).

Research on increasing the effectiveness and quality of education in educational institutions has led to the emergence of the concept of school effectiveness. The fact that some schools are more successful than other schools has been the starting point of the concept of school effectiveness. The fact that different results have been achieved between schools according to the level of success has provided methods for reaching successful schools and has shown appropriate ways to increase school success (Helvacı & Aydoğan, 2011: 43). In order to increase success, it is important for educational institutions to get rid of the traditional structure and be open to innovation and change. Today, the management structure of schools should be structured as a dynamic educational ecology rather than a closed circuit. It is not possible for schools to ignore the impact of any technological development outside the school on education. Schools that show a reflex to protect them in the information age have to face the rapidly changing world. School administrators have to show not only curricular

leadership but also technological leadership. The most important task of an administrator is to determine how to be a good technological leader. If he/she does so, he/she can contribute to teachers' technological literacy and provide guidance to improve school effectiveness and students' academic achievement through educational reform (Chang, 2012).

1.1. Leadership

Leadership is defined as the process by which a person influences and directs the activities of others in order to achieve certain personal or group goals under certain conditions (Koçel (2018). Çelik (2000) states that leadership is the directing of two or more people through power and influence. Şişman (2014) defines leadership as the process of influencing and directing others to action in order to achieve certain goals and objectives. Söylemez (2019), on the other hand, defines leadership as "a process that affects the interpretation of the emerging processes by those who are determined as leaders in the selection of organizational goals and in determining the procedures and ways to be followed in achieving the goals, in ensuring the motivation of the followers in the process of achieving the goal, in creating team spirit and in integrating the internal and external processes of the organization".

Leadership is one of the most researched topics of the 20th century in the context of the development of social organization. The changes in the economic and social structure in which people live have made the concepts of management and leadership a subject that needs to be emphasized (Digman, 2001). Management and leadership have not only remained in the political field, but have started to manifest themselves in many fields. Leadership has been the subject of multidisciplinary studies since it has started to manifest itself in many channels from the smallest groups to state administration (Taşdan and Gül 2013: 13). Determining the technological dimension of leadership and its role in transforming schools into effective schools by associating it with school management also reveals a multidisciplinary perspective.

Leaders have the most critical role among the human capital of organizations' intellectual capital (Baydar, 2021). In this respect, leadership has an important place in predicting and managing the rapid and uncertain structure of change in organizations (Saylık, 2015). In terms of organizational goals, leaders ensure the effective use and control of resources in line with the determined organizational goals. Educational organizations are oriented towards these predetermined goals in line with the resources at their disposal (Bursalioglu, 1994). Leaders who will ensure transformation are needed to fulfill the objectives and to ensure the success and development of the education system. The main task in harmonizing the changes in information technologies with education falls to school administrators (Turan, 2006).

1.2. Technological Leadership

Technological leadership is defined as the level of appropriateness of the combination of strategies and techniques developed to ensure that school administrators use technology effectively in schools (Valdez, 2004). Technological leadership includes the concepts of monitoring technological development, creating role-models in the use of technology, taking an active role in solving problems, establishing technology commissions in making decisions, and engaging in motivational activities when technology is not used effectively (Matthews, 2002). On the other hand, it is also stated in the studies that technology leadership assumes an important responsibility in raising students' awareness about the harm caused by technology and increasing school-environment communication (Baydar, 2022).

There are many factors that cause environmental expectations from education and schools to increase. Foremost among these are the rapid development in technology, the global view of education and changes in educational policies. With the impact of these factors, there is a fierce competition in the field of education, new approaches to education are emerging, and accordingly, expectations from school administrators are increasing. One of the main expectations from school leaders is to create more effective and efficient learning communities. Therefore, it is becoming more important for school leaders to be aware of their leadership roles in issues such as technology use and implementation (Afshari et al., 2009; Akbaba-Altun & Gürer, 2008; Anderson, & Dexter, 2005).

Today, it is undeniable that technological innovations are valuable and effective educational tools in the field of education (Yu & Durrington, 2006). School administrators have an extremely effective role in the effective use of these educational tools. In this context, this role played by school leaders is conceptualized as technological leadership by Anderson and Dexter (2005). According to Tanzer (2004), technological leaders should put forth the highest effort for the effective use of technology in the organization, provide the right guidance and coordination. On the other hand, technological leaders should provide a combination of strategies and techniques developed to enable teachers to use technology effectively in schools (Valdez, 2004). In this context, the characteristics of technological leaders can be discussed under six headings. According to Matthews (2002), these characteristics can be limited as following technological development, creating role-models in the use of technology, taking an active role in solving problems, establishing technology commissions in making decisions, and engaging in motivational activities when technology is not used effectively.

The active and effective use of technology in learning and teaching processes facilitates the work of learners and teachers and increases the efficiency of education. In addition, the use of technology is also a very effective factor in ensuring equality of opportunity in the field of education. In this way, activities and studies with similar content can be transferred to each student in the same way. Moreover, with the use of technology in the field of education, access to the desired resources in learning-teaching processes has become easier and therefore learning activities have become richer (Yıldırım, 2017).

When the studies on the use of technology in the field of education in Turkey are examined, it is possible to say that these studies started in the early years of the Republic, but did not develop. In this context, these studies were mostly planned and implemented through the Ministry of National Education until the 1980s (Güvendi, 2014). When analyzed in the historical process, printed materials were predominantly preferred in the field of education in Turkey until the 1940s. And the preparation of these printed materials was carried out within the Ministry of National Education. Then, between 1950-1970, the reproduction of the equipment used in the field of education and training gained importance. In this context, the tools and equipment needed in the field of education and training were produced through the Ministry of National Education and offered to teachers for use in schools (Yörük, 2013). As can be seen from this, the importance given to education, and moreover to science, has continued to increase day by day in Turkey. In fact, Article 13 of the National Education Basic Law No. 1739 enacted in 1973 reads as follows: "Education methods, curricula, teaching aids and materials at all levels and types are continuously developed in accordance with technological and scientific principles, innovations, and the needs of the country and the environment. Ensuring continuous development and increasing efficiency in education is based on scientific evaluation and research" emphasizing the importance given to "planning and scientificity". However, it should be noted that although educational technologies are emphasized for increasing efficiency and quality in education, studies in the field of educational technology have not progressed as fast as desired (Tutar, 2015).

Developments in information technologies (IT) since the 1980s have closely affected all kinds of systems of societies today. Of course, one of the areas affected by these developments has been the field of education (Göktaş et al., 2008). As a result of this interaction, "According to a report published by the Organization for Economic Cooperation and Development (OECD), many countries are investing in ICT in schools in order to provide high quality learning and teaching services, to equip individuals in line with the requirements of modern society and to increase their economic and social success" (MoNE, 2007). Patrikas and Newton (1999) argue that for the effective use of information technologies in the field of education and for the integration of these technologies into education and training processes, sufficient economic resources should be allocated and used effectively and efficiently.

The development in information technologies has closely affected the Turkish education system. When the ICT data of the schools operating in Turkey are examined, it is possible to say that there is a generally optimistic situation (Seferoğlu, 2015). Of course, having the necessary technologies alone is not enough. The way to benefit from these technological tools in the most effective and efficient way is possible only if the people who will use these technologies have

knowledge about these tools and can use them in practice. Çakır and Oktay (2013) state that teachers use the technology they have in their lessons, but they need in-service trainings to follow the developments in technology closely and to use these technological tools effectively. In other words, in order to benefit from educational technologies effectively and efficiently, students and teachers need to be informed about how they can use technological tools. With this, the quality of technological tools can be better observed (Yıldırım, 2017).

1.3. School Effectiveness

The concept of effectiveness started to be used in the field of management after the Second World War (Etzioni, 1964). With the introduction of the concept into the field of management, it has also had an important place in terms of organizational and school management (Şişman, 2014). In order for the schools in our country to catch up with the rapidly changing information age, they are expected to raise individuals in accordance with the demands and needs of the society. This situation necessitates continuous change and development of people. The process of change can only be realized through a well-planned and quality education. Quality education is achieved by providing a high level of benefit through the effective application of limited resources within the dimensions of excellence in schools (Balcı, 2007).

While effectiveness focuses on appropriate goals and methods, efficiency and performance reveal the situation of obtaining as much product as possible from available resources (Şişman, 2002). School effectiveness, on the other hand, is the optimal support of students' affective, cognitive, social, psycho-motor and aesthetic development and the creation of an optimum learning context (Özdemir, 2000). In effective schools, important results such as academic, social, moral, emotional and aesthetic development, teacher satisfaction, and effective use of resources, realization of goals and objectives, and environmental adaptation are expected to emerge (Şişman, 2014).

Effective schools are associated with important outcomes such as academic, social, moral, emotional, aesthetic development, teacher satisfaction, effective use of resources, realization of goals and objectives, and environmental harmony (Şişman, 2014). Effective schools are schools that have methods, structure, purposefulness, a humane atmosphere and appropriate instructional techniques (Purkey & Smith, 1983). Effective schools have distinctive characteristics that are recognized. Effective schools are student-centered, full of productive academic content, enable student learning, have a positive school atmosphere, encourage creative solutions, and assume shared leadership with stakeholders (Sergiovanni, 1995; Levin & Lockheed, 2012).

The person who plays a key role in teacher and student effectiveness is the school principal (Balyer, 2013). The school principal is the person who will direct and lead the work of the teacher and ensure coordination with the goals of the organization (Korumaz & Kocabaş, 2013). School principals are expected to exhibit certain behaviors in order to be a leader personality. The school administrator is expected to embody the basic values of education and the importance of cooperation, the efficiency of the school, and ideals such as the development of students and translate them into behavior. In this way, he/she fulfills some of his/her leadership duties. In addition, the leader should be committed enough to his/her organization to balance the needs of the stakeholders of the organization with the goals of the school and should be able to fulfill his/her duties in management. Finally, the leader should create a harmonious and positive climate in the school and adopt an understanding that attaches importance to human relations. When the school administrator keeps in mind that leadership is a joint action with the organization in which he/she is involved and that the position of supervisor includes only personal rights and responsibilities, he/she can work for his/her organization and thus reach the leadership of the organization (Bursalıoğlu, 2015). Effective management of schools depends on effective administrators who can use their inputs in accordance with the purposes by achieving the desired goals through the use of individual and material inputs (Yenipinar, 1998). Administrators are individuals who are responsible for achieving organizational goals and who authorize the elements in the organization according to these goals (Göksoy et al., 2013). The main task of the effective administrator is to make the school successful by dealing with education and training. The effective school administrator can delegate the management task to vice principals through delegation of authority. In addition, the effective school administrator is in charge and responsible for very important tasks (Binbaşıoğlu, 1993).

It is possible for school principals to perform the roles expected of them only if they are aware of the differentiated roles of the education system and school administration and the environmental mobility that affects these roles (Gümüseli, 2001). In the open system approach, it is stated that schools exist in different environments in terms of various issues and have a structure that both affects and is affected by these environments (Şişman, 2014). When the school needs to do a joint work with other institutions in its environment and when it is necessary to ensure coordination, the leadership role may belong to the administrator (Aydın, 2014). Constructive relations of the school administrator with the environment are important. Due to his/her position, the administrator should be aware of the expectations of the environment from the school and the school's ability to respond to these expectations. The administrator should be able to interpret the expectations from the environment to his/her employees. In addition, he/she should take the responsibility of continuously monitoring the expectations of the environment (Aydın, 2014). Today, rapid technological differences and innovations make it necessary for schools to be dynamic, vibrant organizations that are ready to differentiate and innovate, which can move with the environment in which they are constantly developing. While providing social needs and realizing expectations, schools should act in partnership with the environment in order to raise expectations and take the environment as a basis (Özmen & Harktı, 2005).

As a result of rapidly changing modern educational paradigms and developing technology, educational technology has emerged as a branch of science. The implementation of the changes that have occurred is more of a necessity than a preference. Technology, which has become one of the requirements of contemporary life, is seen as a factor that increases quality and efficiency in the field of education. In addition, it has become obligatory for school administrators to have technological competence and technological knowledge and to lead the effective use of technologies in schools. Such school administrators' leadership in the technological field has started to be seen as important factors in the effectiveness of schools (Bostancı, 2010). Accordingly, the problem statement of this research is "What is the level of contribution of school administrators' technological leadership competencies to school effectiveness?". The purpose of this research is to determine the effect of technological leadership competencies of school administrators working in public schools affiliated to MoNE on school effectiveness. In line with this purpose, this research will seek answers to the following questions:

What is the level of school administrators' technological leadership competencies and teachers' perceptions of school effectiveness?

What is the relationship between school administrators' technological leadership competencies and school effectiveness?

Do school administrators' technological leadership competencies predict school effectiveness?

2. Methodology

2.1. Research Model

In this study, in which the relationship between the technological leadership competencies of school administrators and school effectiveness of teachers working in schools in Sultanbeyli, Kartal, Pendik, Maltepe, Sancaktepe and Tuzla districts of Istanbul province was addressed, correlational survey design was used among quantitative research models. Correlation analysis method is used to determine the direction and severity of the relationship between two or more variables (Creswell, 2012).

2.2. Research Sample

The population of the research consists of 27,288 teachers (3834 people from Sultanbeyli, 7644 people from Pendik, 4682 people in Maltepe, 3657 people in Kartal, 4564 people in Sancaktepe and 2907 people in Tuzla) working in public schools in the province of Istanbul. The sample of the study consists of 596 teachers working in different branches and in different schools in these districts. Simple random sampling technique was chosen to reach the teachers in the schools. Within the scope of the research, 650 questionnaire forms were answered by the participants. Incomplete and inappropriately completed questionnaire forms were excluded from the research. The 596 questionnaire forms that were found to be filled in appropriately were used in the analysis of the research. Thus, the sample of the study consisted of 596 participants. Descriptive information

indicating the distinguishing characteristics of the teachers who constituted the participants of the study is shown in Table 1.

Table 1. Descriptive characteristics of the participants

Variable	Group	Number (f)	Percentage (%)
Gender	Female	384	64,4
	Male	212	35,6
Marital Status	Married	421	70,6
	Single	175	29,4
Age	20-29	108	18,1
	30-39	281	47,1
	40 and above	207	34,7
Total years of experience	1-10 years	264	44,3
	11- 20 years	206	34,6
	21 years and above	126	21,1
Duration of employment at current school	1-5 years	397	66,6
	6-10 years	158	26,5
	11 years and above	41	6,9
Level of the school in which the position is held	Primary School	379	63,6
	Secondary School	147	24,7
	High School	70	11,7
How many hours a day do you use technological devices such as computers and tablets outside of work hours?	1 hour or less	133	22,3
	2-3 hours	340	57,0
	4 hours or more	123	20,6
Do you have an administrative position?	Yes	64	10,7
	No	532	89,3

According to Table 1, 64.4% of the teachers participating in the study were female, while 35.6% were male; 64.4% of the participants were married, while 35.6% were single. When the descriptive statistics in terms of age are analyzed, 18.1% of the participants are between the ages of 20-29, 47.1% are between the ages of 30-39, and 34.7% are teachers aged 40 and above. In terms of years of experience, teachers with 1-10 years of experience constitute the majority of the participants (44.3%). In addition, the proportion of participants with 11-20 years and 21 years or more of experience is 34.6% and 21.1%, respectively. Regarding the length of service at the current school, teachers with 1-5 years of service have the highest percentage (66.6%). Teachers with 11 or more years of service constituted the lowest group with a percentage of 6.9%. According to the descriptive statistics in terms of school level, the majority of the participants were primary school teachers (63.6%), middle school teachers (24.7%) and high school teachers (11.7%). 10.7% of the participants were teachers with administrative duties and 89.3% were teachers without administrative duties. The participants were asked the question "How many hours do you use technological devices such as computers and tablets outside of working hours on a daily basis?" and according to the answers given to this question; 57.0% of the participants use technological devices between 2-3 hours a day, 20.69% use technological devices for 4 hours or more a day, and 22.3% use technological devices for 1 hour or less a day. In addition, 58.9% of the participants answered yes to the question "Do you consider yourself sufficient in terms of using technological devices at school?", 6.7% answered no, and 34.4% answered partially.

2.3. Data Gathering Instruments

"Personal Information Form" prepared by the researcher, "Scale of Technological Leadership Competencies of School Administrators (Principals)" developed by Sincar (2009) and "School Effectiveness Scale" developed by McMahan and Hoy (2009) were used to collect data. In the study, face-to-face interviews were conducted with a total of 650 teachers and necessary information about the scales was provided. Teachers were given enough time to reflect their opinions objectively. However, 54 of these scales were excluded from the analysis because some of them were filled out incompletely and incorrectly. Therefore, 596 scales were made ready for analysis through SPSS 22.0 package program.

Personal information form: In the study, a "Personal Information Form" was prepared by the researcher to determine the personal information of the participant teachers and administrators. In this form, there are a total of 10 questions prepared to determine the variables of "age, gender, branch, marital status, duration of professional experience, school level, working time in the school, daily use of technological devices such as computer/tablet outside of working hours, whether there is an administrative duty or not, and whether they consider themselves sufficient in terms of using technological devices in the school.

School administrators' technological leadership competencies scale: In the study, the Technology Leadership Roles of School Administrators Scale developed by Sincar (2009) was used to determine the technological leadership competencies of school administrators. This scale consists of 4 sub-dimensions (human-centeredness, communication and collaboration, vision and support dimensions) and 29 items. The scale is a five-point Likert scale and is graded as "Strongly Agree (5)", "Agree (4)", "Undecided (3)", "Disagree (2)" and "Strongly Disagree (1)". The validity and reliability of the scale used by Sincar (2009) has been tested many times in the literature. In the study conducted by Gençay and Balyer (2019), the validity coefficients of the scale were determined between 0.91 and 0.97. The reliability coefficients are between 0.83 and 0.90. At the end of the analysis, items with factor loadings below the critical value of .40 were excluded from the analysis. A total of 24 items were analyzed, including 9 items on people-centeredness, 5 items on communication and collaboration, 5 items on support, and 5 items on vision.

School effectiveness scale: In the study, the "School Effectiveness Scale" developed by McMahan and Hoy (2009) was used to determine school effectiveness. This scale was adapted into Turkish by Şenel (2015). The one-factor scale consists of a total of 8 items. The items in the scale were graded as "Strongly Agree (5)", "Agree (4)", "Undecided (3)", "Disagree (2)" and "Strongly Disagree (1)" in accordance with the five-point Likert type. In the study in which the scale was translated into Turkish, the reliability coefficient was 0.855 and the KMO value was 0.829. In the study conducted by Yalçın (2019), the KMO value was 0.876 and the reliability coefficient was 0.910. There are 8 items in the scale consisting of a single dimension. At the end of the analysis, one item with factor loadings below the critical value of .40 was excluded from the analysis. The validity and reliability analyses of the "Scale of Technology Leadership Roles of School Administrators" and "School Effectiveness Scale" used in this study were conducted. The results obtained are presented in the "Findings" section of the study.

2.4. Data Collection and Analysis

The questionnaire and personal information form were sent to teachers and school administrators working in schools in Sultanbeyli, Kartal, Pendik, Maltepe, Sancaktepe and Tuzla districts in the sample by obtaining permission from the Istanbul Provincial Directorate of National Education (number of official permission letters) and data were collected. Voluntary participation was taken as a basis during data collection. No individual or institutional analysis was made in the study and personal information of the participants was not collected. SPSS 22.0 package program was used in the statistical analysis of the data obtained in the study. Factor analysis, reliability analysis, descriptive statistics, difference tests, correlation analysis and regression analysis were used to analyze the data. Kolmogorov-Smirnov and Shapiro-Wilk tests are used to determine whether the data are normally distributed, and another method is to examine kurtosis and skewness values. George and Mallery (2010) and Tabachnick and Fidell (2013) stated that normal distribution can be accepted if the kurtosis and skewness values are between -1.5 and +1.5. As seen in the Normal Distribution test

results table (Table 2), it is seen that the values are within the normal distribution range since the skewness and kurtosis values are between -1.5 and +1.5.

Table 2. Normal distribution test results

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistics	sd	Significance	Statistics	sd	Significance
School Effectiveness	,099	596	,000	,968	596	,000
Being Human Centered	,109	596	,000	,963	596	,000
Visionary	,111	596	,000	,963	596	,000
Communication and Cooperation	,127	596	,000	,949	596	,000
Support	,177	596	,000	,938	596	,000
	Skewness			Kurtosis		
School Effectiveness	-.465		,100	,701		,200
Being Human Centered	,618		,100	,540		,200
Visionary	-.540		,100	,255		,200
Communication and Cooperation	,034		,100	,950		,200
Support	-.728		,100	,844		,200

3. Findings

The technological leadership competencies of school administrators and teachers' perception levels of school effectiveness are shown in Table 3.

Table 3. Mean results for school administrators' technological leadership competencies and school effectiveness perception levels

Points	596 N	◆	SS
Technological leadership competencies		3,82	0,68
School effectiveness	596	3,90	0,63

In Table 3, teachers' perceptions of school administrators' technological leadership behaviors ($X = 3,82$; $SS = 0,68$) were found to be at a good level, while their perceptions of school ecology ($X = 3,90$; $SS = 0,63$) were found to be at a good level. In other words, according to teachers, school administrators have a good level of technological leadership competence. Teachers also consider schools as effective schools.

Regression analysis was used to determine the effect of school administrators' technological leadership behaviors on school effectiveness. Regression analysis is used to determine how independent variables affect the dependent variable. In order to conduct this analysis, it is important to first determine the relationships between the relevant variables. Therefore, correlation analysis is primarily utilized (Hair et al., 2014). Table 4 shows the analyses showing the relationship between the two variables.

Table 4. Scale-level correlation analysis results

	School effectiveness	Technological leadership
School effectiveness	Pearson Correlation	1
	Significance (2-tail)	
	N	596
Technological leadership	Pearson Correlation	,672**
	Significance (2-tail)	,000
	N	596

** . Significant at the .05 level (2-tail).

According to Table 4, it was determined that there was a positive, moderate relationship between school effectiveness and technological leadership ($R = 0.672$ and $p < .05$). In other words, the

increase in technological leadership behaviors of school administrators positively affects the effectiveness of educational organizations.

Table 5. Correlation analysis results between subscales

	A	B	C	D	E
Pearson Correlation					
School effectiveness (A)	1				
Significance (2-tail)					
N					
Being human centered (B)	,650**	1			
Significance (2-tail)					
N					
Communication and cooperation (C)	,566**	,739**	1		
Significance (2-tail)					
N					
Support (D)	,614**	,786**	,728**	1	
Significance (2-tail)					
N					
Vision (E)	,638**	,839**	,791**	,831**	1
Significance (2-tail)					
N					

** . Significant at the .05 level (2-tail).

Table 5 shows that there is a positive relationship between school effectiveness and being people-centered ($R=0.650$; $p<.05$). Similarly, a positive relationship was found between school effectiveness and communication and collaboration ($R=0.566$; $p<.05$). There is a moderate positive relationship between school effectiveness and support. This relationship is statistically significant ($R=0.614$; $p<.05$). There is also a positive relationship between school effectiveness and vision ($R=0.638$; $p<.05$). There is a positive relationship between people-centeredness and support ($R=0.786$; $p<.05$), between people-centeredness and communication and collaboration ($R=0.739$; $p<.05$), between people-centeredness and vision ($R=0.839$; $p<.05$), between communication and collaboration and vision ($R=0.728$; $p<.05$), between communication and cooperation and vision ($R=0.791$; $p<.05$), between vision and support ($R=0.831$; $p<.05$). The findings of the regression analysis conducted to determine the effect of technological leadership on school effectiveness are given in Table 6.

Table 6. Regression analysis model summary of the scales

Model summary				
Model	R	R2	Adjusted R2	Standard error of the estimates
1	,672a	,452	,451	,47347

a. Predictors: (Constant), Technological leadership

According to Table 6, $R^2 = 0.452$ (Adjusted $R^2 = 0.451$). According to these results, the independent variable technological leadership explains 45.1% of the variance of the dependent variable school effectiveness. In other words, 45.1% of the change in school effectiveness is caused by the effect of technological leadership variable.

Table 7. Regression analysis anova test results of the scales

Model		Sum of Squares	S.D	Mean Square	F	Significance
1	Regression	109,802	1	109,802	489,798	,000b
	Residue	133,162	594	,224		
	Total	242,964	595			

The results of the regression analysis Anova test are presented in Table 7. According to the results of the Anova test; there is a statistically significant relationship between the independent variable and the

dependent variable at 95% confidence interval ($F=489,798$ and $p \leq ,05$). It is possible to state that the research model is statistically significant.

Table 8. Regression model coefficient analysis results of the scales

Model	Non-standardized coefficients		Standardized coefficients	t	Significance
	B	Std. Error	Beta		
(Fixed)	1,522	,109		13,945	,000
1 Technological leadership	,623	,028	,672	22,131	,000

a. Dependent Variable: School effectiveness

The findings related to the regression model coefficient are presented in Table 8. According to Table 8, the relationship between the independent variable of technological leadership and the dependent variable of school effectiveness is statistically significant ($p=0.000$) and the β value is 0.672. Accordingly, a one unit increase in technological leadership leads to a 0.672 unit increase in school effectiveness. In other words, the adoption of technological leadership approaches in schools leads to a positive increase in the level of school effectiveness.

Table 9. Regression model summary of subscales

Model summary					
Model	R	R2	Adjusted R2	Standard error of the estimates	
1	,680a	,462	,459	,47021	

a. Predictors: (Fixed), people-centeredness, communication and collaboration, support, vision

Table 9 shows the results of the regression analysis conducted to determine the effect of the dimensions of technological leadership, namely human-centeredness, communication and collaboration, support and vision, on school effectiveness. According to these results, $R^2 = 0,462$ (Adjusted $R^2 = 0,459$). In other words, the independent variables of being people-centered, communication and cooperation, and support explain 45.9% of the variance of the dependent variable of school effectiveness. In other words, 45.9% of the change in school effectiveness is caused by the effect of the variables of being people-centered, people and cooperation, and support.

Table 10. Summary of regression analysis anova results of subscales

Model		Sum of Squares	S.D	Mean Square	F	Significance
1	Regression	112,293	4	28,073	126,970	,000b
	Residue	130,671	591	,221		
	Total	242,964	595			

Table 10 presents the Anova results of the regression analysis. According to the Anova test results, there is a statistically significant relationship between the independent variables and the dependent variable at 95% confidence interval ($F=126,970$ and $p \leq 0.05$).

Table 11. Regression model coefficient analysis results of sub-dimensions

Model	Non-standardized coefficients		Standardized coefficients	t	Significance
	B	Std. Error	Beta		
(Fixed)	1,442	,112		12,836	,000
1 Being human centered	,296	,054	,323	5,485	,000
Communication and cooperation	,053	,040	,067	1,314	,189
Support	,142	,049	,165	2,869	,004
Vision	,149	,058	,177	2,567	,010

a. Dependent Variable: School effectiveness

According to Table 11, the effect of the independent variables of being people-centered, support and vision on the dependent variable of school effectiveness is statistically significant ($p \leq$

0.05). On the other hand, the effect of communication and cooperation independent variables on the dependent variable of school effectiveness is not statistically significant. There is a significant relationship between being people-centered and school effectiveness ($p=0.000$) and the standardized β value was found to be 0.323. In other words, a one unit increase in human-centeredness leads to a 0.323 unit increase in school effectiveness. The adoption of a human-centered approach in schools leads to a positive increase in the level of school effectiveness. There is a significant relationship between support and school effectiveness ($p=0.004$) and the standardized β value was found to be 0.165. A one unit increase in communication and collaboration leads to a 0.165 unit increase in school effectiveness. The supportive nature of leaders in schools leads to a positive increase in the level of school effectiveness. A statistically significant relationship was also found between vision (foresight for the future) and school effectiveness ($p=0.010$) and the standardized β value was found to be 0.177. Accordingly, a one unit increase in support leads to a 0.177 unit increase in school effectiveness. In other words, school administrators' having a vision positively increases the level of school effectiveness. Since the independent variables of human-centeredness, support and vision have a statistically significant relationship on the dependent variable of school effectiveness and the constant value is also statistically significant ($\beta=1,442$ and $p=0,000$), the regression formula can be expressed with the following equation:

$$\begin{aligned} \text{School Effectiveness} &= Y \\ \text{Being Human Centered} &= M \\ \text{Support} &= N \\ \text{Vision} &= K \\ Y &= 1.442 + 0.323*M + 0.165*N + 0.177*K \end{aligned}$$

4. Conclusion and Discussion

When the arithmetic averages and standard deviations of school administrators' technological competencies and school effectiveness levels are examined, technological leadership behaviors are generally at a good level ($x=3,82$; agree). In other words, the teachers in the study see the technological leadership roles of school administrators as sufficient. In the study conducted by Biçer (2019), it was observed that they were moderately adequate. Their perception of School Effectiveness was found to be ($x=3,90$; good level of agreement).

According to the results of the study, technological leadership has a positive effect on school effectiveness. In the context of these results, the high level of technological leadership competencies of administrators shows that it positively affects school effectiveness. In the study, it was concluded that human-centeredness, support and visioning dimensions of technological leadership had a significant effect on school effectiveness, while communication and cooperation dimensions did not have a significant effect on school effectiveness. Technological leadership explains 45.1% of the variance of the dependent variable school effectiveness. In other words, 45.1% of the change in school effectiveness is caused by the effect of technological leadership variable. School effectiveness increases as a result of administrators' adoption and implementation of the human-centeredness, support and visioning dimensions of technological leadership. When school administrators exhibit a human-centered approach in technological leadership behaviors, the effectiveness level of the school increases positively. In other words, an increase in school effectiveness can be observed when school administrators solve problems related to the use of technologies by ensuring the participation of all individuals in the school, ensure that all members of the school benefit equally from educational technologies in the school, and consult the opinions of teachers and students for the effective use of educational technologies in the school.

On the other hand, it was concluded that administrators' support behaviors in technological leadership positively affect school effectiveness. Administrators' behaviors such as using technology for student development in process management, following technological developments to increase the effectiveness of education, creating an environment that will meet student needs in terms of technology, and ensuring the use of technologies that will ensure the development of students increase the effectiveness of the school. If school administrators have long-term technological development plans about the effective use of educational technologies, conduct research on the educational technology needs of the school, support the use of appropriate educational technologies that will

facilitate educational activities, etc. If they accept similar processes as a vision for themselves and implement practices in this direction, then the level of school effectiveness can also increase.

Since one of the main issues that ensure school effectiveness is the development of technological leadership skills of administrators, a program should be followed in the selection of school administrators, appointment criteria, promotion criteria, and ensuring their adaptation to new technologies. On the other hand, although schools are non-profit organizations, it is important for the emergence of developments in the field of education to create competition with other schools and to ensure school effectiveness based on this competition. The approach of school administrators to technology is seen as a factor that will increase the effectiveness of schools in today's world (Blau & Shamir-Inbal, 2016). Leaders should lead their followers to distinguish between the real world and the digital world, to be aware of their roles and responsibilities in both worlds, and to actively use technology in a beneficial way (Baydar, 2022).

With the findings and results to be obtained from this research, it is aimed to contribute to the research on the technological leadership levels and competencies of school administrators and the technological competencies of administrators in educational institutions. This research is a quantitative study limited to the province of Istanbul. Therefore, a qualitative study can be conducted in different provinces to address the variables examined in this study in a more comprehensive manner.

5. References

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