School Principals' Personal Constructs Regarding Technology: An Analysis Based on Decision-making Grid Technique

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Abstract

This study aims to determine the similarities and differences between existing school principals' personal constructs of "ideal principal qualities" in terms of technology by means of the decision-making grid technique. The study has a phenomenological design, and the study group consists of 17 principals who have been serving at the same school since the last three years. Data were obtained using a structured interview technique and one of the grid techniques, i.e., the decision making technique. Content analysis, grid similarity analysis, and principal components analysis were used for data analysis. Results showed that there are differences in terms of the perception of fear and suspicion in ideal and non-ideal principal's qualities and attitudes toward technology in Turkey.

Keywords

Decision-making Grid Technique, Personal Construct, School Principal, Technology Leadership.

The school principal has the greatest authority in the management of the school, but the legal power and authority that he/she possesses is not solely sufficient for the management and success of the school (Şişman, 2004). Studies on the roles and responsibilities of principals show a longing for an adventure from management to leadership (Early & Weindling, 2004; Topping, 2004). In the literature, there are various studies on different leadership behaviors of principals (Bass, 1997; Bass & Steidlmeier, 1999; Harris, 2004; Kouzes & Posner, 2003; Turan & Bektaş, 2011), and *technology leadership* has been an area of focus in recent years (Akbaba-Altun & Gürer, 2008; Anderson & Dexter, 2005; Flanagan & Jacobsen, 2003; Hacıfazlıoğlu, Karadeniz & Dalgıç, 2010; Owen & Demb, 2004; Persaud, 2006; Sincar, 2013).

It is hard to make a clear distinction between technology leadership and management. However, the difference between these concepts result from the management's approach to building a future with stakeholders regarding technological maintenance and coordination, while leadership aims to build a future with stakeholders by way of adapting to changes. In general terms, technology leadership can be defined as the process of coordination for efficient and effective use of technology and adaptation to changes in an organization (Weng & Tang, 2014). In terms of the education system, technology leadership is the process of facilitating and supporting the effective use of educational technology in integrating all organizational decisions and policies at school with learning and teaching process (Schiller, 2003). We can talk about eight aspects of technology leadership, namely, (*i*)

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setting up a budget, (*ii*) getting regional support for technology, (*iii*) receiving donations, (*iv*) creating a technology plan, (*v*) making time for the use of technology, (*vi*) use of e-mails, (*vii*) staff development policy, and (*viii*) setting up a council for technology (Anderson & Dexter, 2005).

With the integration of technology into every branch of the education system, principals are expected to take a leading role in the use and application of technology (Afshari, Bakar, Luan, Samah, & Fooi, 2009; Hacıfazlıoğlu, Karadeniz & Dalgıç, 2011; Razik & Swanson, 2010). In parallel with this expectation, for technological leaders, there is an emphasis on understanding change and the process of change, planning, ethics, teaching and learning, security, curriculum, staff improvement, infrastructure, as well as staff support and leadership (Bailey, 1995). As the expectation from schools to create more effective and efficient learning communities grows, it is becoming more important for principals to understand their role of leadership in using and applying technology (Afshari et al., 2009; Saban, 2007; Şişman-Eren, 2010).

In parallel with this importance, it is underlined that students, teachers and particularly principals need to become adept in the efficient use of technology (Persaud, 2006, p. 26). During the development phase, designating the technology leadership role of school managers and standardizing this role has become significant, and various studies emphasize the importance of the technology leadership role of principals in delivering and using technology (Anderson & Dexter, 2005; Bülbül & Çuhadar, 2012; Byrom & Bingham, 2001; Chang, Chin & Hsu, 2008; Golden, 2004; Kozloski, 2006; Schiller, 2003; Weber, 2006).

While teachers are considered a catalyst for supplying the need for technology in education, this process revealed a close connection to principals - resulting in a focus on the basic roles of principals in adapting computer technology to the learning-teaching process (Booth, 2011; Brockmeier, Sermon, & Hope, 2005; Şişman-Eren & Şahin-İzmirli, 2012). Related studies (Anderson & Dexter, 2005; International Society for Technology in Education, 2002, 2009; Yu & Durrington, 2006) define and evaluate the qualifications of principals regarding technology leadership. Some other studies (Bozeman & Spuck, 1994; Collis, 1988; Davies, 2010; Kearsley, 1995; Merriman, 1986; Richardson & Mcleod, 2011) emphasize that principals are required to have (*i*)

vision, (*ii*) communication, (*iii*) staff improvement, (*iv*) infrastructural support, (*v*) procurement, (*vi*) widespread use, (*vii*) budget, (*viii*) evaluation and research, and (*ix*) guidance skills.

It is stated that a principals' perspective on technology is influential in having and exhibiting the qualifications expected of them with regards to technology leadership (Chang et al., 2008; Turan, 2002). Thus, first of all, it is required to learn the perceptions of principals toward technology before developing the technology leadership qualifications of principals and applying such qualifications to them and their ideal or non-ideal concepts of a school principle. In this context, personal construct theory, which asserts that the individual develops a perception system based on his/her own life experience, and that more comprehensive results can be achieved to explain the relevant conditions (Adams-Weber, 2003; Kelly, 1955, 1991), is taken as a reference. The aim of this study is, therefore, to identify the personal construct of principals with regards to technology, taking personal construct theory as a reference.

Method

Design

The study aims to determine the school principals' personal construct on technology. In this study, phenomenological design, which is a type of qualitative research approach, was used to investigate the constructs. In phenomenology studies, the individual's experiences in his/her environment have great impact on his/her perception of the world. Moreover, phenomenology is an effective qualitative research approach in providing rich data about the individual's feelings, experiences, as well as revealing individual perceptions (Aydın, 2014; Bogdan & Biklen, 2003).

Study Group

The study group was determined by use of a criterion sampling method. As a prerequisite that principals have an idea about other principals in their schools and regions, service at the same school for the last 3 years is taken as the criterion. Moreover, this criterion is taken as a base-line, because principals need to spend some time in their institution in order to exhibit various behaviors regarding technology. All 17 principals participating in the study are male, and the average professional seniority is 8.56.

Procedure

The study is conducted in four stages, namely, (*i*) definition of the phenomenon, (*ii*) preparing the data collection instrument, (*iii*) data collection, (*iv*) data analysis and interpretation (Karadağ, 2011; Turan & Bektaş, 2011).

(*i*) *Definition of phenomenon:* Conceptual tools required to identify and compare ideal principal qualities toward technology are designated together with the principals. Moreover, data obtained at this stage constitutes the basis of the study.

(*ii*) *Preparing the data collection instrument:* Data collection instruments used in the study were prepared in two stages. First, a *"repertory grid"* technique, decision-making grid technique is used to set up the first stage on the basis of a questionnaire (Shaw & McKnight, 1981). The repertory grid includes both qualitative and quantitative data. While assessing the relations between the elements and structures with quantitative information, structures and elements are created with qualitative information (Bell, 2003; McQualter, 1986; Zuber-Skerrit, 1987). Therefore, school principals were first asked about their ideas about technology in order to identify the structure dimension of the decision-making grid technique. After taking the principals' views on technology, a content analysis method was used to determine the structural categories of the decision-making grid The most commonly held views and qualifications of the principals about technology are included in the study, and 13 structures within the data collection instrument are finalized according to the opinion of three educational administration experts (see Table 1). During the second stage of the study, six elements suited to the decision-making grid technique are designated by the principals and experts. Elements are identified as the participants

themselves, their ideal selves and two ideal and two non-ideal principals personally known to each principle (Ilbery & Hornby, 1983).

(*iii*) *Data collection*: The researcher applied the questionnaire and decision-making grid form to the school principals in the study group. The questionnaire asked the school principals in the study group to state their opinion about technology. The decision-making grid form was first filled in by the researcher before being given to the school principals, and participants were asked to identify the schools according to the relevant elements and rate the predetermined structures by taking the principals of the selected schools into consideration. Participants were asked to rate on a scale of 1 to 5, depending on the effect level based on their observation of the different structures. For example, participants gave the highest score to principals they thought were influential in the innovative structure, while they gave the lowest score to principals whom they thought demonstrated the lowest level of participation.

(*iv*) *Data analysis:* First, the content analysis method was used to analyze data obtained from the questionnaire in order to identify the principals' perception of technology. The prominent qualifications constitute the structure of the decision-making grid. The following similarity formula was used to calculate the similarities/relations between elements and structures in the decision-making grid in relation to content analysis and expert opinion (Jankowicz, 2004):

$$Element = 100 - \frac{SD}{(LR-1)x\ C} \times 100$$

$$Structure = 100 - \frac{SD}{(LR-1)x\ E} \times 200$$

Table 1
Decision-making Grid Questionnaire Sample used in the Study

Structures	Element					
	1	2	3	4	5	6
	Self	Ideal self	Ideal principal (A)	Non-ideal principal (A)	Ideal principal (B)	Non-ideal principal (B)
1-Fear						
2-Innovation						
3-Productivity						
4-Confidence						
5-Follow-Up						
6-Self-Efficacy						
7-Necessity						
8-Quick Change						
9-Support						
10-Orientation						
11-Suspicion						
12-Utility						
13-Adaptation						

Absolute values of the difference between cells in the decision-making grid are added for each column and line for the element and structure formula calculation, then after subtracting 1 from the score range (on a scale of 1–5), the result is multiplied by the number of structures for element, and with the number of elements for structure and then divided by the absolute total of differences. The result is multiplied by 100 for element, and by 200 for structure, and the result is subtracted from 100 to calculate the similarity value. This operation is repeated for scores in elements and structures in each line and column.

After this stage, principal component analysis was employed to get more detailed information about the relation between structures and elements. Principal component analysis was used to identify polarization between elements and structures, and prominent structures between the ideal and non-ideal principal qualifications regarding technology which were identified with the principal component analysis (Ilbery & Hornby, 1983).

Validity and Reliability

In order to enhance the validity of the study, the structure part of the measurement tool was created by participants based on their perceptions of technology. A significant factor in improving reliability of the measurement tool in qualitative studies is having the measurement tool established by participants (McMillan & Schumacher, 2006). The element part was limited to the participants' view of themselves, their ideal selves, and four principals they knew personally, in order to present the differences between cognitive perceptions of participants according to the "decision-making" technique.

For the reliability of the study, ideal principal qualities stated by the participants were reviewed by three education administration experts, excluding the principals and the researcher, and principal qualifications included in the measurement tool were calculated using the reliability formula of Miles and Huberman (1994), and continued until a reconciliation of 90% was achieved.

Findings

In attitude toward technology perceived by the principals, the similarity percentage among six principals vary between 55% and 98.7%. The highest similarity percentage among the personal construct of the six principals regarding technology was found to be in their construct of their ideal selves as principals and ideal principals [98.75%]. The lowest similarity percentage was found between those personally known to the principal and a non-ideal principal [55%].

Table 2
Repertory Grid Average of the Similarities Element according to Principals' Perceptions

Principal	1	2	3	4	5	6
1-Self	-	90	91.2	63.7	91.2	66.2
2-Ideal self		-	98.7	56.2	98.7	58.7
3-İdeal principal (A)			-	55.0	98.7	57.5
4-Non-ideal principal (A)				-	55.0	97.5
5-Ideal principal (B)					-	57.5
6-Non-ideal principal (B)						-

The similarity between structures created by principals regarding ideal principal qualities in terms of technology varies between 27.2% and 70.6%. The

Table 3
Repertory Grid Average Structure Similarities according to the Principals' Perceptions

*	1	2	3	4	5	6	7	8	9	10	11	12	13
1-Fear	-	38.9	42.2	32.8	42.8	25.0	38.3	32.2	27.8	32.2	49.4	34.4	27.2
2-Innovation		-	61.1	55	56.1	57.2	57.2	61.1	53.3	56.7	36.1	52.2	50.6
3-Productivity			-	62.8	59.4	60.6	58.3	60.0	57.8	58.9	33.9	56.7	55.0
4-Confidence				-	55.6	65.6	62.2	57.2	55.0	57.2	26.7	59.4	53.3
5-Fallow-Up					-	58.9	60.0	65.0	53.9	61.7	36.7	57.2	50.0
6-Self-Efficacy						-	65.6	63.9	62.8	72.8	33.3	68.3	65.6
7-Necessity							-	65.	53.9	62.8	35.6	63.9	60.0
8-Quick Change								-	58.9	67.8	39.4	70	58.3
9-Support									-	66.7	30.6	63.3	62.8
10-Orientation										-	40.6	65.6	60.6
11-Suspicion											-	38.3	37.8
12-Utility												-	70.6
13-Adaptation													-

highest similarity percentage between structures [70.6%] is between the structures of utility and adaptation. Moreover, the lowest similarity percentage between structures is found to be between fear of technology and adaptation to technology [27.2%].

Data from the decision-making grid according to the *Kaiser Meyer Olkin* (KMO) measure of data adequacy shows a score of .89, and the same data shows a *Bartlett* score of *p* < .01. From this, test analysis results can be used for principal component analysis, with the eigenvalue of data orthogonally rotated by means of the varimax technique, since element and structures were multi-factor, giving two dimensions with an eigenvalue higher than 1 (Kline, 1994; Tavşancıl, 2005). The negative and positive values in the dimensions point to the separate levels of elements and structures, or different polarities of elements and structures. This result is important in terms of providing detailed information about the separation between the element and structure perceptions of principals as to ideal and non-ideal principals (Ilbery & Hornby, 1983).

Table 4
Factor Analysis Results of the Repertory Grids Created by Principals

Structures	Load	Load
1-Fear	,11	,85
2-Innovation	,57	,40
3-Productivity	,71	,38
4-Confidence	,68	,18
5-Follow-Up	,68	,42
6-Self-Efficacy	,86	,02
7-Necessity	,76	,24
8-Quick Change	,81	,19
9-Support	,81	,04
10-Orientation	,82	,07
11-Suspicion	,005	,73
12-Utility	,80	,03
13-Adaptation	,80	-,01
Elements		
1-Self	,79	,08
2-Ideal self	,84	-,15
3-İdeal principal (A)	,76	-,30
4-Non-ideal principal (A)	-,03	,85
5-Ideal principal (B)	,57	-,09
6-Non-ideal principal (B)	-,17	,79
Total variance [%]	49.63	14.67
Cumulative variance [%]	49.63	64.30

Table 4 shows that the variance in the first dimension stands at 49.63%, with 14.67% in the second dimension and the total variance of both dimensions combined being 64.30%. Moreover, repetition of the factor

analysis on thirteen of the structures showed that only one dimension has a high factor load. Analysis of the obtained dimensions show that the perceptions of ideal and non-ideal principals regarding element and structures are on different dimensions. While the "ideal self" is in the first dimension [.84], the "non-ideal principal" is in the second dimension [.85]. Factor scores show (*i*) innovation, (*ii*) productivity, (*iii*) confidence, (*iv*) follow-up, (*v*) self-efficacy, (*vi*) necessity, (*vii*) quick change, (*viii*) support, (*ix*) orientation, (*x*) utility, and (*xi*) adaptation structures for the "ideal principal" dimension, while the "non-ideal principal" dimension contains only (*i*) fear *and* (*ii*) suspicion structures.

Discussion

This study aims to find out the cognitive perception of principals regarding technology, and it employs decision-making grid technique for this purpose. As a result of the content analysis applied on the data taken from participants for the structures, the personal construct of principals regarding ideal technology leader qualifications are grouped under "fear, innovation, productivity, confidence, follow-up, self-efficacy, necessity, quick change, support, orientation, suspicion, utility, and adaptation" headings. Calculations based on the dual nature of the decision-making grid show that the highest level of similarity in elements is between the "ideal self" and a personally known "ideal principal." The highest similarity in terms of structures was found between the "utility" and "adaptation" structures.

An exploratory factory analysis was carried out in order to get detailed information about structures and elements, and this analysis shows that only "suspicion" and "fear" are included in the "non-ideal principal" dimension. In this context, suspicion and fear about use of technology is typically named as "*anxiety*" (Chua, Chen, & Wong, 1999; Çevik & Baloğlu, 2007). Thus, it can be said that the fear and suspicion structures in the study reflect technological anxiety. This result parallels with various studies which conclude that principals fear and are suspicious of technology (Bozionelos, 2001; Law, 2002; Totolo, 2011). Moreover, there are various studies in the literature showing the positive (Beaver, 1991; Çelik & Kahyaoğlu, 2007; Gülbahar, 2007; Howard, 1986; Karataş & Sözcü, 2013; Telem, 2001) and negative (Karadağ, Sağlam, & Baloğlu, 2008; Richardson & McLeod, 2011; Yörük, 2013) perspectives of principals toward technology. Given the dimensions of structures obtained in this study, we can say that the principals here have a positive perspective on technology.

It can be stated that "non-ideal principals," who stand out in the structures related to fear and suspicion of technology, have a negative affective attitude toward technology. Günbayı and Cantürk (2012) point out that principals have a positive attitude toward adopting, use and follow-up technology, but they also fear technology. In this context, we can say that evaluating the positive or negative attitude of principals as a whole is an important variable for successfully integrating technology into schools. It is believed that principals with a negative attitude will not be effective in integrating technology into the school, while principals with a positive attitude will be more effective in integrating technology into learning-teaching processes (Chang, 2012; Kopcha, 2010; Pope, Hare, & Howard, 2002). The cognitive and psychomotor learning abilities of principals regarding technology is a significant variable (Bilimoria, 1999; Brooks, 1997), and their sensory qualities in adapting to technology has more impact on the popularization of technology within the school compared to that of other staff (Akbaba-Altun, 2002; Cooley & Reitz, 1997; Delacruz, 2004; Garcia & Abrego, 2014; Waxman, Boriack, Lee, & MacNeil, 2013).

In Turkey, students, teachers, parents and the society at large expect more from schools as time goes by. In parallel with technological developments, education and school administration processes are carried out on a technological basis. The literature emphasizes that principals need to believe in the necessity of technology in schools and get trained on the use of technology in order to display technology leadership behaviors (Seferoğlu, 2009; Sincar, 2013). Thus, principals need to understand the potential contribution of technology to learning-teaching and management processes in order to generate productivity and yield in terms of education and management in schools (Şişman Eren, 2010).

Principals are expected to be technological leaders in terms of introducing, developing and sustaining technology at schools, and they need to be equipped with cognitive, psychomotor and, particularly, sensory technological qualifications. We can say that schools with principals who are suspicious and fearing of technology will not be able to make much use of technological activities. The fact that a large part of the technology structures revealed in this study fall into the ideal principal qualifications dimension can be interpreted as a positive attitude of principals toward technology. In this context, more productive results can be achieved in the use of technology by considering the fact that principals have a positive attitude toward technology-oriented pre-service and in-service educational activities. In this regard, along with the use of technology in pre-service and in-service educational activities, long-term educational activities and meetings promoting the adoption, acceptance, and internalization of technology can prove effective in principals' integration with technology.

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