FACTORS AFFECTING THE TRANSFORMATIONAL LEADERSHIP ROLE OF PRINCIPALS IN IMPLEMENTING ICT IN SCHOOLS

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ABSTRACT
Leadership is an important factor in the effective implementation of technology in schools. This study examines the transformational leadership role of principals to determine whether transformational leadership role of principals in ICT implementation in schools is influenced by the computer competence, level of computer use, and professional development activities of principals. This paper, based on responses from 320 principals in Iran, reports that computer use and professional development activities (on the dimension of ICT and leadership) influence the transformational leadership role of principals in implementing ICT in schools. In addition, the study results show that computer competence has a positive relationship with the level of computer use by secondary school principals and it indirectly influences the transformational leadership role of principals in implementing ICT in schools. It is suggested that ongoing professional development opportunities on dimension of leadership and technology should be provided for principals to increase their levels of proficiency in computer use which will help future research understand the importance of the use of technology in education and to learn to model the transformational leadership components of charisma (idealized influence), inspirational motivation, intellectual stimulation and individualized consideration in their schools.
Keywords: Information and communication technology (ICT), technology leadership, transformational leadership, computer use, school principal, computer competence, professional development, structural equation modeling

INTRODUCTION

Information and communication technologies (ICTs) play an important role in enhancing education quality (Betz, 2000; Tong & Trinidad, 2005). These technologies will be integrated and implemented effectively in schools if school leaders, particularly the principals, support them; learn and use them in their instructional and administrative tasks; support their teachers in the process of change; and provide sufficient development opportunities for themselves and their staff (Afshari et al., 2010). In fact, school principals as change facilitators carry the responsibility of initiating and implementing school change through the use of ICT and can facilitate complex decisions to integrate it into learning, teaching, and school administration (Schiller, 2003). Anderson and Dexter (2005) conducted a study to examine principals' technology-related leadership characteristics in 800 schools in the USA and found that "although technology infrastructure is important, technology leadership is even more necessary for effective utilization of technology in schools" (p. 49). Moreover, other researchers like Schiller (2003) and Dawon and Rakes (2003) support that leadership is an important issue in effective technology use in schools. Therefore, it is quite important to examine principals' leadership ways of implementing educational technologies in schools.

According to Betz (2000), transformational leadership behaviors of principals play an essential role in the implementation of large-scale innovation in education. "This form of leadership is necessary to drive principals to the higher levels of concern and motivation needed for educational improvement" (Crawford, 2005, p. 8). According to Schepers, Wetzels, & de Ruyter (2005), transformational leadership is one of the best styles of leadership that can significantly determine the extent to which technology becomes integrated in school. As transformational leaders, principals play a critical role in the successful implementation of school initiatives and they act as role models to those whom they lead (Dawon & Rakes, 2003). Therefore, it is important to identify the factors that impact the transformational leadership role of principals in implementing ICT in schools.

"As leaders of school development, including integrated use of ICT, principals need to have a personal proficiency in computer use" (Schiller, 2003, p. 172). They should realize the importance of the new technologies in education and improve their knowledge and skills in the use of computer and other technologies.

However, although technology leadership responsibilities may have been assigned formally to principals, most of them do not have background or suitable training to feel confident in dealing with technology (Stuart et al., 2009). Previous research suggests that ICT competence and using computer are important factors that influence role of principals in implementing ICT in schools (Stuart et al., 2009). However, despite the importance of computer utilization in education and the role of the principals in supporting technology integration, there has been little research on the use of ICT by principals, their computer competencies, and their transformational leadership role in implementing ICT in schools. The current study addresses this pressing need and seeks to identify the relationships between school principals' computer competencies, levels of computer use, professional development activities, and transformational leadership role in implementing ICT in schools.

In the next section, the literature on the transformational leadership role of principals in implanting ICT in schools; principals' computer competencies; and computer use will be reviewed. Next, the research model, hypotheses, methodology, and survey will be illustrated. Then, findings, discussion, limitations, conclusions, and implications for school administrators are presented.

Transformational leadership and ICT

With the development of information technology and innovation, schools need more transformational leaders. "Transformational leadership occurs when one or more persons engage with others in such a way that leaders and followers raise one another to higher levels of motivation and morality" (Geijsel et al., 2003, p.230). According to Geijsel et al. (2003), transformational leadership has four specific dimensions:

(1) Idealized influence. This dimension entails putting followers' needs first, being role models for followers, doing the right thing, demonstrating high moral standards, and avoiding the use of power unnecessarily or for personal gain.
(2) Inspirational motivation. This factor describes the ways by which leaders motivate and inspire those around them, including practices aimed at creating attractive visions of future states, boosting follower goals, and inspiring enthusiasm and optimism.
(3) Intellectual stimulation. This process is aimed at developing followers' capacities to higher levels and the practices of this process stimulate effort to become more innovative and creative.
(4) Individualized consideration. This dimension implies paying close attention to the needs and interests of the organization's members.

This type of leadership has been indicated as one of the most significant factors influencing and promoting the integration of educational technology in schools (Yee, 2000). Schepers et al. (2005) carried out a study on leadership styles in terms of acceptance of technology and found that there is a significant relationship between transformational leadership and perceived usefulness of the technology. This shows that "encouraging new ways of thinking and enabling subordinates to analyze problems from many different viewpoints will indirectly yield a better individual technology acceptance level within the organization" (Schepers et al., 2005, p. 505). Yee (2000) suggested that principals as transformational leaders must be prepared to serve as the role model and hands-on user of technology. They should use ICT and understand the potential of ICT use in the teaching and learning process. "If principals do not use technology on a consistent basis, then they should not expect the faculty to use technology regularly. Modeling the use of technology provides an effective method for exposing teachers to new strategies and demonstrating to the staff that it is acceptable to take risks and make mistakes, without the fear of retribution" (Afshari et al., 2010, p. 11).

According to Bass and Riggio (2006), transformational leadership can be learned" (p.27). Principals can learn the techniques through training and obtain the qualities they need to become transformational leaders. Dvir, Eden, Avolio, & Shamir (2002) conducted an experimental research to review the efficiency of leadership training in two organizations. Their findings indicated significant difference between two cases in transformational leadership resulting from the training. Therefore, leadership training should be a priority in management training and development in organizations.

Computer competence, ICT use and ICT implementation

"In the information and technology age, school principals must possess computing capabilities" (Felton, 2006, p.14). They should use technology and understand how it can be used effectively in learning, teaching, and school administration. In Australia, Schiller (2003) conducted a quantitative study on 369 principals to assess the level of their use of computers and their perceived competencies in using various elements of ICT. The study showed that 93.5 percent of principals utilized computers at school and home. The study also revealed that the main use of computers was in word processing, sending and receiving e-mails, and accessing the worldwide web whereas construction of spreadsheets, databases, and presentations was much less common. In light of these

findings, this study highlighted that principals need to be provided with ongoing professional development opportunities to boost their levels of proficiency in computer use (Schiller, 2003).

Stuart et al. (2009) explored the association between ICT competence of school leaders and the intention to master the ICT. Their findings indicated that the principals who perceived themselves as technology leaders have high levels of ICT competence and that they use ICT frequently in their administrative and instructional tasks. In fact, competence in operating a computer and in utilizing software helps school principals to be effective technology leaders (Stuart et al., 2009). Therefore, principals as technology leaders should be fluent in the basics of word processing, spreadsheets, and presentation software (Attaran & VanLaar, 2001). They should also know how to use the Internet to communicate with their staff and the broad community (Attaran & VanLaar, 2001). It is important that principals understand and learn how to utilize new technologies in education. If leaders use technology and realize the advantages of its use in education, then technology use in school is more likely.

Anderson and Dexter (2005) suggested that professional development opportunities should be provided for principals to promote their levels of ICT use and to increase their productivities. In fact, effective training programs help the principals to know and utilize computers for accessing and finding information and new knowledge. Furthermore, it helps them to develop processes for effective decision making and problem solving which eventually result in better accountability. The computer technology proved to be able to markedly improve the role of principals in the educational process. Therefore, it is very important for principals to know how to use new and existing technologies.

THE STUDY

The Theory of Planned Behavior (TPB) provides a theoretical basis for this investigation. This theory, which was suggested by Ajzen (1991), is an extension of the theory of reasoned action and is one of the most predictive persuasion theories. It has been applied successfully to studies of the relations among attitudes, beliefs, behavioral intentions, and behaviors (Schmidt, 2011). Moreover, many studies related to ICT have used the TPB as a framework (e.g., Stuart et al. (2009) and Albirini (2006)). The TPB is deemed to be a practical theoretical framework for the current study because of its success in explaining and predicting a variety of human behaviors besides that empirical data support its effectiveness (Sallimah & Albion, 2004).

In light of the above discussion about computer competence, ICT use, the transformational leadership role of principals in implementing ICT in schools and the TPB, hypotheses have been developed to guide the present study which posits that the transformational leadership role of principals in implementing ICT in schools is linked to the principals' perceptions of their computer competencies (Stuart et al., 2009; Bassellier, Benbasat, & Reich, 2003), levels of computer use (Scheper et al., 2005), and professional development activities on the dimension of ICT and leadership (Schiller, 2003; Stuart et al, 2009; Yee, 2000). According to Stuart et al. (2009), principals who have high levels of ICT competence are successful in implementing ICT and integrating it in schools. In fact, without knowledge of the computer technology and possession of the necessary skills to utilize it, principals may have high levels of uncertainty that will influence their opinions and beliefs about the innovation (Rogers (2003) cited in Afshari et al. (2010)). Furthermore, Schepers et al. (2005) stated that transformational leaders who have enough competence in operating a computer and utilizing software use technology more in their administrative and instructional tasks than the leaders who do not have enough competence. These leaders play a critical role in the successful implementation of school initiatives and act as role models.

Leaders need to model the use of technology to show how it can positively impact the school environment. In order to improve principals' levels of proficiency in computer use, professional development programs should be provided for them. Such training helps principals to learn how to use computers efficiently to access and find information and new knowledge (Felton, 2006). As well, leaders should adopt transformational leadership skills and develop those skills through training. Leaders who train on dimensions of leadership and technology are much more successful in implementing the ICT and integrating it into learning and teaching.

Based on these findings, the following hypotheses were established:

Hypothesis 1: Professional development in terms of leadership and technology will positively influence the transformational leadership role of principals in implementing ICT in schools.

Hypothesis 2: The ICT-related professional development will positively influence the principals' levels of computer competence.

Hypothesis 3: Principals' computer competencies will positively influence the transformational leadership role of principals in implementing ICT in schools.

Hypothesis 4: Principals' levels of computer competence will positively influence the extent of computer use by secondary school principals.

Hypothesis 5: High levels of computer use by secondary school principals will positively influence the transformational leadership role of principals in implementing ICT in schools.

METHODOLOGY

Research Design

A structural equation modeling (SEM) approach was used in this study to develop a model that shows the relationships among four variables: transformational leadership, computer competence, computer use, and professional development. Also, a quantitative method was utilized to collect data on the population of secondary school principals in Tehran, Iran. According to Tehran's Department of Education, there are 1,312 secondary schools in this area.

Data Collection

To carry out this study, first, approval was acquired from the Ministry of Education. In addition, a meeting was arranged with the research department of Tehran's Ministry of Education to discuss the proposed study. In this meeting, a questionnaire and a letter of introduction were submitted to the superintendent in the research department for review. The researcher then got permission to attend the principals' meeting in each educational area of the Ministry of Education. Totally, three hundred and fifty packages, each comprising a cover letter; the questionnaire; and a stamped addressed return envelope, were randomly distributed among secondary school principals during these sessions. At the beginning of the data collection session, trained enumerators met with the principals to introduce the study and explain its purpose and potential usefulness to the participants. Those who wished to participate were assured about confidentiality of their responses. Further, the enumerators provided those participants with briefing on how to fill the questionnaire. The enumerators checked the questionnaire for completeness immediately upon return. School principals who could not completely fill their questionnaires were given three weeks to return the completed questionnaires by mail. Totally, three hundred and fifty questionnaire copies were distributed among secondary school principals and 320 completed forms were returned, corresponding to a response rate of 91.4%.

Instruments

A questionnaire was used to obtain the required data for this study. The questionnaire was divided into two parts. Part A measured the transformational leadership role of principals in implementing ICT in schools. Factors that were related to this role were measured in part B (computer competence, ICT use, and professional development). Principals' perceptions of their transformational leadership styles were measured by the Multifactor Leadership Questionnaire 5x (MLQ5x) which was developed by Bass and Avolio (2000). The MLQ5x measures three dimensions of leadership (the transformational, transactional, and laissez-faire leadership dimensions). The transactional and laissez-faire leadership dimensions were not examined in this study. Laissez faire leadership is distinguished with complete abdication or avoidance of leadership (Rubin, Munz, & Bommer, 2006). In fact, laissez-faire leadership is extremely passive where leaders avoid decision-making and supervisory responsibilities (Bass & Riggio, 2006). Regarding the transactional leadership, Pounder (2003) stated that the transactional leaders are remarkably less exciting in effective leadership than the transformational leaders. In line with this, Scheperset al. (2005) reported that transactional leadership is not an effective style in implementing technology in schools. A transformational leadership approach is much likely to be more effective in handling barriers to change than a transactional leadership approach that focuses on technical problem solving to the neglect of people and organizational issues (Beatty & Lee, 1992). In this study, the principals' transformational leadership styles were assessed by 20 items measured on a five-point Likert scale from 0 (not at all) to 4 (frequently, if not always).

On the other side, the level of computer use is operationally defined in this study as the self-reported use of computers and their software for administrative and instructional purposes. According to this questionnaire, four domains of computer use, namely, Internet use; hardware and software use; instructional use; and administrative use were measured. The level of computer use was quantified by the total score on 22 items using a five-point Likert scale. Each item was rated by respondents from 1 (Never use) to 5 (Use daily). The responses to all 22 items were analyzed using frequency distribution analysis to determine the extent to which principals use the computer for instructional and administrative purposes.

The Computer Competence Scale was used to measure the beliefs of secondary school principals about their computer knowledge and skills. This scale was developed by Flowers and Algozzine in 2000 (Flowers and Algozzine, 2000). Computer competence was determined by the total score on 25 items on a four-point scale, ranging from no competence (1), through little (2) and moderate competence (3), to much competence (4). The

mean score of the responses was calculated to determine each respondent's perceived level of computer competence. Principals' perceptions of their past professional development activities regarding ICT and leadership were assessed by two items. On the other hand, this study took into consideration the possibility of effects and differences associated with six other factors: gender, age, administrative experience, type of school, type of formal computer course, and education and hence these six items were included in the instrument.

Two indispensable characteristics of measurement that must be considered in establishing the appropriateness and usefulness of an instrument are reliability and validity. Although these instruments were valid, face and content validities of these instruments were evaluated by a panel of experts. Besides this, the convergent and discriminant validities of these instruments were assessed by using the Analysis of Moment Structures software (AMOS). Moreover, the internal consistencies of these instruments were assessed using the Software Package for Social Sciences (SPSS) v.18. The Cronbach's alpha coefficients for these scales were 0.96, 0.81, and 0.92 for the computer competence, transformational leadership style, and level of computer use, respectively.

Data analysis and results

AMOS 18.0 was used to analyze the collected data. The usual steps for doing SEM were followed. Before the data were analyzed they were screened for missing values and outliers. The frequency of every variable was explored. All errors found were corrected . However, a preliminary analysis of the amount of missing data indicated that 58 surveys contained missing values. The mean substitution imputation method was used to avoid reduction in the sample size and loss of statistical power.

Descriptive Summary of Principals' Characteristics

The findings indicated that 51.6% (n = 165) of the respondents were males and 48.4% (n = 155) were females. In terms of age, more than half of the respondents (50.3%; n = 161) were within the 45-54 age range. The participants' responses on their administrative experiences showed that 44.7% (n = 143) of them had 21 or more years of experience, 23.1% (n = 74) of them had 16 to 20 years of experience, 21.6% (n = 69) had 11 to 15 years of experience, and only 10.6% (n = 34) had 6 to 10 years of experience. More than half of the respondents (53.1%; n = 170) were working in private schools while 46.9% (n = 150) were working in public schools. In terms of education, 60.3% (n = 193) of the respondents held bachelor's degrees and 37.2% (n = 119) had masters' degrees. Only 2.5% (n = 8) had doctoral degrees. On the other hand, 76.3% (n = 244) of the participants reported that they had computer training and about 68.8% (n = 220) stated that they attended training courses related to leadership and to technology leadership. In terms of the type of training, more than half (52.8%) of the principals participating in the study reported that they received their training through in-service training.

Descriptive statistics of the items in the measure

The descriptive statistics for each instrument item are shown in Table 1. The mean score of computer training and leadership training are 1.24 and 1.31, respectively. This shows that the majority of principals had received training related to computer applications and leadership. Regarding the computer competence scale, the mean score of the participants' responses on Word processing (3.54) was the highest among the eight subscales, indicating much competence in this skill.

Table 1: Descriptive statistics of the items in the measure

Variable	Item	Mean	Standard Deviation	Skewness	Kurtosis
Professional Development	Computer training	1.24	0.426	1.23	-0.48
	Leadership training	1.31	0.464	0.81	-1.35
Computer Competence	Set up, maintenance, and troubleshooting of equipment	2.89	0.825	-0.38	-0.7
	Word processing	3.54	0.59	-1.16	0.268
	Spreadsheets & Database	2.39	0.845	0.07	-0.74
	Networking	3.07	0.802	-0.76	-0.03
	Telecommunication	3.12	0.85	-0.67	-0.36
	Media communication	2.66	0.841	-0.28	-0.51
	Internet use	3.568	0.84	-0.5	-0.13
	Hardware and software use	3.302	0.716	-0.12	-0.44

Computer Use	Instructional use	3.404	0.95	-0.5	-0.42
	Administrative use	3.466	0.877	-0.53	-0.25
Transformational Leadership	Idealized influence (attributed)	2.99	0.67	-0.38	-0.27
	Idealized influence (behavior)	2.88	0.71	-0.4	-0.44
	Intellectual stimulation	2.69	0.8	-0.41	-0.43
	Inspirational motivation	2.74	0.76	-0.42	-0.43
	Individualized considerations	2.58	0.69	-0.41	-0.43

On the contrary, the spreadsheets and database domain had the lowest mean score (2.39), indicating little competence in these skills. In addition, principals taking part in the study stated that they have moderate competence in using telecommunication (M = 3.12); networking (M = 3.07); and media communication (M = 2.66). Furthermore, all mean scores for computer use are above the midpoint of 3.00, with a range of 3.30–3.57. The standard deviations range from 0.71 to 0.88. Overall, the principals' perceptions of their levels of computer use are moderate with an overall mean score of 3.44 (SD = 0.82).

As can be seen in Table 1, all of the five dimensions of transformational leadership had much similar mean ratings (2.69–2.99). The standard deviations associated with the five transformational leadership dimensions are somewhat similar, ranging from 0.67-0.80. This indicates low variation in the perceptions of respondents. Regarding normality of the data, Kline (2005) stated that the magnitudes of the skewness and kurtosis indices should not exceed 3 and 10, respectively. Findings of this study indicated that both the skewness and kurtosis indices have acceptable ranges. Therefore, the data in this study are considered as normal for the purposes of SEM.

Test of the measurement model

To assess the reliability and validity of the measures, a confirmatory factor analysis was carried out. The results of the measurement model are presented in Table 2.

Table 2: Results for the measurement model

Latent Variable	Manifest Variable	Factor Loading (>0.50)*	CR (t-Value)	SRW	R^2	AVE (≥0.5)	Construct Reliability (CR)
Professional Development	Leadership Training	0.7		0.7	0.546	0.515	0.95
	Computer Training	0.74	13.653	0.74	0.556		
Computer Competence	Computer Competence1	0.76	16.919***	0.76	0.575	0.676	0.91
	Computer Competence2	0.78	17.595***	0.776	0.602		
	Computer Competence3	0.66	13.846***	0.665	0.442		
	Computer Competence4	0.92	24.453***	0.92	0.846		
	Computer Competence5	0.90	23.165***	0.897	0.804		
	Computer Competence6	0.88		0.877	0.768		
Computer Use	Computer Use1	0.83		0.83	0.687	0.77	0.81
	Computer Use2	0.89	20.22***	0.892	0.796		
	Computer Use3	0.87	19.467***	0.871	0.759		
	Computer Use4	0.91	20.925***	0.911	0.83		
Transformational Leadership	Transformational Leadership1	0.78		0.78	0.609	0.6	0.88
	Transformational Leadership2	0.75	13.838***	0.751	0.564		
	Transformational Leadership3	0.71	12.93***	0.708	0.502		
	Transformational	0.85	15.947***	0.851	0.724		

	Leadership4				
	Transformational Leadership5	0.76	14.022***	0.760	0.583

SRW: Standardized Regression Weight.
Average variance extracted= AVE= $(\Sigma\lambda^2)$ /n
Construct reliability = CR= $(\Sigma\lambda)^2 / (\Sigma\lambda)^2 + (\Sigma\delta)$

All factor loadings are above 0.70, ranging from 0.70 to 0.92. In addition, factor analysis showed that four factors are extractable and that these factors explain 78% of the total variance in the data. All the standardized regression weights are above 0.70, except for computer competence (spreadsheet and database subscale). However, the weight of this item was above 0.66 and the associated t values were significant ($P < 0.001$). The values of the coefficient of determination (R^2) of all items ranged from 0.442 to 0.846, indicating that 44.2% to 84.6% of the variations in these items were explained by their predictors. The convergent validity values of these instruments were calculated as well. The convergent validity refers to a set of variables that are presumed to measure a construct (Kline, 2005). It can be tested using the average variance extracted (AVE) and the factor loading. According to Hair et al. (2006), average variance extracted and factor loading values greater than, or equal to, 0.5 indicate a high convergent validity. The AVE ranged from 0.515 to 0.77. Moreover, construct reliability was measured. As shown in Table 2, the construct reliabilities ranged from 0.81 to 0.95, thus exceeding the minimum acceptable level of 0.7 (Chin, 1998). It is concluded therefore that the measures have adequate reliabilities and convergent validities.

All and above, this study assessed the discriminant validity. Discriminant validity refers to the extent to which a construct is truly distinct from other constructs (Hair et al., 2006). In order to test for discriminant validity, we compared AVE for two factors against R^2 between the two factors. Discriminant validity is acceptable if the AVE for each construct is greater than its shared variance with any other construct (Farrell, 2010). According to Table 3, the AVE was greater than R^2 between the two factors which indicate that all variables meet the requirements of discriminant validity.

Table 3: Square of correlation between constructs

	Professional Development	**Computer Competence**	**Computer Use**	**Transformational Leadership**
Professional Development	1			
Computer Competence	0.504	1		
Computer Use	0.409	0.562	1	
Transformational Leadership	0.467	0.448	0.423	1

As suggested by Hair et al. (2006), a variety of indices such as the $\chi 2$ statistic, comparative fit index (CFI), Tucker-Lewis index (TLI), Goodness-of-Fit index (GFI), and the root mean-squared error of approximation (RMSEA) were used in this study to obtain a comprehensive evaluation of model fit. The foregoing fit indices represent three categories of model fit indices: absolute, parsimonious, and incremental fit indices (Teo & Noyes, 2009). The levels of acceptable fit and the obtained values for the aforementioned fit indices for the proposed model are summarized in Table 4. Based on these criteria, we conclude that the measurement model has a good fit to the data.

Table4: Fit indices for the measurement model

Model fit indices	Values	Recommended guidelines	References
$\chi 2$	339.47	Non-significant	Klem (2000), Kline (2005), McDonald and Ho (2002)
CFI	0.939	≥0.9	Klem (2000), McDonald and Ho (2002)
TLI	0.925	≥0.9	Klem (2000), McDonald and Ho (2002)
GFI	0.946	≥0.9	Klem (2000), McDonald and Ho (2002)
NFI	0.916	≥0.9	Klem (2000), McDonald and Ho (2002)
RMSEA	0.071	<0.08	McDonald and Ho (2002)

Test of the Structural Model

Several indices were employed to test the structural model. Findings indicated a good model fit ($\chi 2$= 341.545, P< 0.001, GFI=0.91, AGFI=0.96, CFI=0.939, NFI=0.916, TLI=0.925, and RMSEA=0.078). The results of the hypothesis test and the path coefficients of the proposed research model are shown in Figure 1. The findings indicated that four out of the five hypotheses were supported by the data. All the hypotheses, except for H_3, were significant indicating that there is the significant relationship between professional development activities (on dimensions of leadership and technology) and transformational leadership role of principals in implementing ICT in schools; ICT-related professional development (computer training) and the principals' computer competence; principals' computer competence and their level of computer use; and the level of computer use by secondary school principals and their transformational leadership role in implementing ICT in schools.

Three endogenous variables were tested in the research model. The transformational leadership role of principals in implementing ICT in schools was predicted by professional development with respect to the dimensions of leadership and technology; computer competence and level of computer use. The prediction model has an R^2 of 0.78, implying that 78% of variance in the transformational leadership role of principals in implementing ICT in schools was explained by professional development activities of principals, principals' computer competence, and principal's level of computer use. Individually, the ICT-related professional development (computer training) explained 45% of the variance in computer competence. On the other hand, 57% of the variance in the level of computer use by secondary school principals was explained by their computer competence (Table 5).

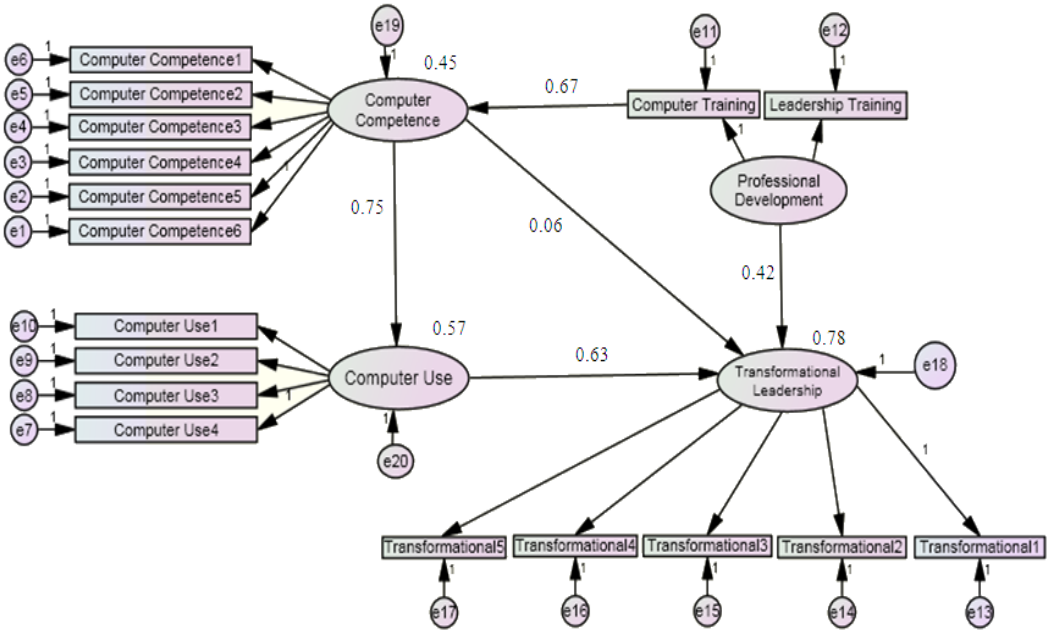

Figure 1: Structural model

Table5: Results of hypothesis testing

Hypotheses	Path	Path coefficient	t-value	Result
H_1	Professional Development & Transformational Leadership	0.42	4.6	supported
H_2	ICT-related Professional Development & Computer Competence	0.67	14.04	supported
H_3	Computer Competence & Transformational Leadership	0.06	0.789	Not supported
H_4	Computer Competence & Computer Use	0.75	15.011	supported
H_5	Computer Use & Transformational Leadership	0.63	8.324	supported

Total, direct, and indirect effects

In this study, the direct and indirect effects, and the standardized total effects were assessed to determine the extent to which each exogenous variable has an effect on the endogenous variables. The direct effect is the effect of an independent variable (exogenous) on a dependent variable (endogenous) whereas the indirect effect expresses the effect of an independent variable on a dependent variable through mediating variable(s). The total effect for a variable represents the sum of the direct and indirect effects (Schreiber et al., 2006).

Table 6: Direct, indirect, and total effects of the research model

Endogenous variables	Exogenous variables	Standardized estimates		
		Direct	Indirect	Total
Computer Competence (R^2=0.45)	Computer Training	0.671	0.000	0.671
Computer Use (R^2=0.75)	Computer Competence	0.755	0.000	0.755
Transformational Leadership (R^2=0.78)	Computer Competence	0.063	0.47	0.536
	Computer Use	0.627	0.000	0.627
	Professional Development	0.422	0.17	0.589

According to Cohen (1988), the d values of 0.2, 0.5, and 0.8 represent small, medium, and large effect sizes, respectively. Table 6 shows the direct, indirect, and total effects of the research model. The results indicate that professional development (in terms of the dimensions of leadership and technology) has a medium effect on the transformational leadership role of principals in implementing ICT in schools (d = 0.589). Additionally, the ICT-related professional development (computer training) has a medium effect on computer competence (d = 0.671). Furthermore, computer competence has a large effect on the level of computer use by secondary school principals (d = 0.755) and a medium effect on the transformational leadership role of principals in implementing ICT in schools (d = 0.536). This is followed by the level of computer use by secondary school principals which has a medium effect on the transformational leadership role of principals in implementing ICT in schools (d = 0.627).

Model Comparison

The research model was tested with and without the effect of computer competence on the transformational leadership role of principals in implementing ICT in schools. According to Table 8, the CFI and RAMSEA indicate a better-fitting model once the direct effect of computer competence on the transformational leadership role is not taken into consideration. In addition, each of $\Delta\chi 2$ and ΔCFI were used as indices to difference in fit. However, use of $\Delta\chi 2$ has been criticized due to its sensitivity to sample size (Brannick, 1995; Cheung & Rensvold, 2002; Kelloway (1995) cited in Lievens & Anseel (2004)). The ΔCFI does not have these problems (Cheung & Rensvold, 2002). Cheung and Rensvold (2002) suggested that a ΔCFI value greater than 0.01 shows a significant drop in fit. Findings of this study show a significant drop in fit between Model 1 and Model 2 (ΔCFI = 0.012). Therefore, it can be concluded that model 1 has a significantly better fit to the research data than model 2.

Table 7: Model Comparison

Model	$\chi 2$	df	CFI	RMSEA	$\Delta\chi 2$	Δdf	ΔCFI
1) Research model without the direct effect of computer competence on the transformational leadership	342.2	100	0.927	0.075	0.61	1	0.012
2) Research model with the direct effect of computer competence on the transformational leadership	341.5	99	0.939	0.078			

DISCUSSION

This study explored the relationships between variables related to the transformational leadership role of principals in implementing ICT in schools. All hypotheses, except the third one, were supported. This study indicated that computer competence was not a significant predictor of the transformational leadership role of principals in implementing ICT in schools. This result implies that school principals who have knowledge and skill only about some aspect of ICT may not have intention to inspire and encourage teachers to become committed to using technology in their learning and teaching process. Moreover, they may not have intention to be involved in ICT projects and management of the school's ICT. This result is consistent with that of Stuart et al.'s (2009) study.

In addition, findings of this study indicate that there is a significant relationship between principals' computer competence and their levels of computer use. This result is in compliance with the findings of Schiller (2003) and Stuart et al. (2009). In fact, principals who are competent in a computer application will be able to identify when it is advantageous to use the application in their instructional and administrative tasks. When principals have this expertise, there is a relative advantage in using computers. Additionally, because of their expertise, principals may feel that computer use is compatible with their existing values about instruction. Once the principal's level of computer use is above the intermediate level, the perceived complexity of using computers diminishes. This may explain the tendency to use computers according to Rogers' theory.

Furthermore, the study results showed that ICT-related professional development activities (computer training) are positively related to the principal's computer competence. In fact, school principals who had participated in professional development activities reported higher computer competence than those who had not. This may be explained by that these principals felt more confident in applying these skills and were intending to head beyond knowing to doing (Stuart et al., 2009). Furthermore, outcomes of this the study reveal that the sample principals have moderate competence in using computers (M = 2.94). They have less competence in database, spreadsheet, and presentation/multimedia software; the Internet; and information seeking than other technology competencies. Each of these applications had less than 50% of the respondents at the proficient level or above. It seems that ICT-related professional development or formal courses can help principals to develop their competencies in using computers and software. Without these capabilities, principals can do little to improve their efficiencies. Hence, it is suggested that school managers provide formal computer courses that feature the latest hardware and software to improve computer proficiency among school principals. This training can help principals to effectively use technology in their work.

Another key finding is that the level of computer use by principals has a significant relationship with their transformational leadership role in implementing ICT in schools. From the effect sizes, computer use had the largest effect on the transformational leadership. Moreover, the study results indicated that the principals who utilize technology in their administrative and instructional tasks act as strong role models for the effective use of technology in support of learning and teaching. Such leaders can transmit a vision or sense of mission for comprehensive integration of technology. They can foster an environment and culture conducive to realization of that vision and can create enthusiasm in followers for applying technology in their teaching.

According to Bass and Riggio (2006), principals as transformational leaders should pay attention to the personal needs of their staff and be active listeners. Study results showed that principals used computers to communicate with staff and members of the wider school community. In fact, effective principals are good communicators. Technology allows principals to communicate highly efficiently and effectively with their staff. In this way, a personal and friendly relationship between principals and all members of a school community will be created. These relationships convey a sense of caring and appreciation (McEwan, 2003). Harris (2004) sees caring as a way of showing respect for teachers and students and believes that this process involves challenging people to grow personally and professionally. Thus, principals should get engaged in these behaviors to keep their relationships positive and growing (Whitaker, 2003). According to Bamberger and Meshoulam (2000), the training and development of transformational leaders is the most viable route for organizations to pursue. Findings of this study spotlight that professional development (in relation to the dimensions of leadership and technology) is positively related to the transformational leadership role of principals in implementing ICT in schools. Hence, the current study confirms the importance of professional development in enhancing principal's transformational leadership behaviours in implementing ICT in schools. This finding is consistent with those of Dvir et al. (2002) and Kelloway and Barling's (2000).

In other respect, this study highlights that a representative sample of Iranian secondary school principals fairly often provided some elements of transformational leadership. Bass and Avolio (2003) suggested that ideal ratings for the transformational variables should be greater than three. This benchmark shows that principals who

have a mean score greater than three are very powerful in achieving the best outcomes. However, the principals surveyed in this research did not meet this benchmark.

Based on literature review, the level of transformational leadership in developed countries is higher than that in developing ones. Actually, in developed countries such as the USA, educational master degrees are mandatory. School principals must pass the Principals' Qualification Program (PQP) before being appointed as principals (Bush & Jackson, 2002). Unfortunately, in most developing countries like Iran training is not a requirement for appointment of principals and there is an assumption that good teachers can become effective managers and leaders without any need for specific preparation. This may be a reason why the principals surveyed by this research did not meet the optimal level for transformational leaders.

LIMITATIONS

This study had several limitations which may influence generalizability of the results. The current inquiry was part of a cross-sectional research to explore factors affecting the transformational leadership role of principals in implementing ICT in schools. The data used in this study were obtained from secondary school principals in the province of Tehran in Iran and may not be generalizeable to principals in other types of institutions and other countries. Another limitation is that participants in this study completed a self-reported instrument. Thereupon, it was quite possible that principals overrated or underrated their levels of proficiency. These ratings may not be reflective of the true proficiency levels of the principals.

CONCLUSION

This study raised some issues about the implementation of ICT in schools. Findings of this study indicate that factors such as computer use, professional development activities (with respect to the dimension of ICT and leadership) influence the leadership role of principals in implementing ICT in schools. Interestingly, computer competence had no significant direct relationship with the transformational leadership role of principals in implementing ICT in schools. This study compared the performances of the research model with and without inclusion of the direct effect of computer competence on the transformational leadership role of principals in implementing ICT in schools and found that the model excluding direct effect of computer competence on transformational leadership had a significantly better fit to the research data than the model including this effect. All and above, the study outcomes underline that the level of computer competence indirectly influences the transformational leadership role of principals ($d = 0.47$). Furthermore, this study showed that principal's level of computer competence has a positive correlation with his/her level of computer use. Principals with higher skills and knowledge exhibited higher levels of computer use. Actually, without the knowledge of computer technology, principals may have a high level of uncertainty that influences their opinions and beliefs about the innovation. Therefore, Iranian principals with limited knowledge and background in computer-based information systems cannot use the computer efficiently and they encourage their schools to ride the wave of technology.

We believe that this study can be useful for decision makers and providers of professional development programs to devise training programs for principals that will quarantine that principals a) understand the importance of transformational leadership behaviors in implementing ICT in schools; b) use technology to communicate efficiently with staff, parents, and the community; (c) use technology directly to collect and analyze data and other information that can improve decision-making and other management functions; (d) understand how current and available technologies can be integrated effectively into all aspects of the learning and teaching process; and (e) use technology appropriately in leading and communicating about school programs and activities .

As well, Iranian principals should be active learners in this fast-moving arena. They should never stop learning and honing their skills. Rather, they must maintain personal plans for self-improvement and continuous learning (Bennis, 1990). The principals should develop their styles of leadership and be familiar with current research and best practices. Furthermore, they should use new technologies and model their use to improve the environment in which educators function. If Iranian principals want to take the initiative and implement school change through use of the ICT, they must be eager to model the transformational components of charisma (idealized influence), inspirational motivation, intellectual stimulation, and individualized consideration in their schools. As charismatic leaders, these principals must talk about values and beliefs, emphasize the sense of mission, and promote the good of the group (Bass & Riggio, 2006). As part of inspirational motivation, a principal must create a vision and encourage others to assimilate this vision by providing them with the feeling of being part of something bigger than themselves. Principals should provide intellectual stimulation by challenging teachers to reconsider, and rethink about, assumptions about their work (Leithwood, 1994). Finally, school principals should personalize interactions with staff and concern themselves with the individual's need for achievement. According to Bass and Riggio (2006), transformational leadership can be taught. Therefore, decision makers

may redesign programs, such as leadership studies, in order to teach the components of transformational leadership to future administrators.

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