Principals' Level of Computer Use and Some Contributing Factors

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Abstract—This study identified the extent to which Iranian secondary school principals use computers and explored the relationship between three variables related to ICT use. These factors included high level of computer access, positive attitudes towards ICT, and positive cultural perceptions of ICT, all contributed significantly to the computer use by principals. Findings from this study indicated that principals spent a few times a week working on their computers. It seems that knowledge of the role of ICT in the work life of the school principals and the acquisition of appropriate skills to use this knowledge needs to be understood by the principals. Hence, considerable ongoing professional development opportunities should be provided for principals to fulfill their role as technology leaders.

Keywords— ICT, Computer use, Secondary school principals

I. INTRODUCTION

Leadership is very important in developing effective, innovative schools and in facilitating quality teaching and learning [1]. Reference [2] reported on the analysis of data from the 1998 Teaching, Learning, and Computing survey of more than 800 schools in the USA and concluded that "although technology infrastructure is important, for educational technology to become an integral part of a school, technology leadership is even more necessary" (p. 74). In fact, school leaders, particularly the principal, have a major responsibility for initiating and implementing school change through use of information and communication technology (ICT) and facilitate complex decisions about integration of ICT into learning and teaching [3]. Principals need to be cognizant of the benefits of the new technologies. Many researchers have shared these benefits such as the works of [4]-[9]. Hence, the principals need to have proficiency in their use, and be able to promote a school culture which encourages

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exploration of new techniques in teaching, learning and management [3].

In the information age and the age of technology, school principals must possess computing capabilities [10]. They must be users of technology and role models to those that they lead [11][12]. In fact, it is difficult to imagine a leader who does not use technology trying to convince teachers that it is important [13]. According to [14], principals are continuously influenced by the demands of their jobs. They must have access to information and new knowledge to make informed decisions and to solve problems. Frequent and immediate access to computers to get data (e.g. student files and grades, arrange class schedules, track discipline problems, and evaluate teachers) give principals the ability to evaluate options before making decisions. In fact, levels of access to ICT are significant in determining levels of use of ICT by principals [15]. Therefore, principals who had regular access to computers use them more in their administrative and instructional tasks.

According to [16], people's attitudes toward a new technology are a key element in its diffusion. Reference [17] conducted a case study on pre-school principals' practices in the use of ICT and reported that principals' attitudes toward technology is a variable that determines the extent to which computers are used in school. Besides, he added that principals who have positive attitudes toward technology are very helpful and supportive in introducing these new technologies into the school. For example, they encourage their colleagues to have ICT training, equip the school with sufficient computers and ensure the staff has access to relevant technology. Hence, if principals understand the value of ICT and its benefits, they are able to implement innovations in school. Furthermore, [18] stated that changing individuals' behavior is possible once their attitudes have been identified. Reference [19] suggests that attitudes are made up of three components: affect, cognition, and behavior. The affective element refers to the individual's emotional feelings or liking of a person or an object. The cognitive element refers to the person's knowledge about a person or an object. The behavioral element refers to the person's overt behavior towards a person or an object. Reference [18] asserted that "even though we cannot predict the behavior of single individuals, we should be able to predict that people (in general) will change their behavior if we can change their attitudes…" (p. 52). Therefore, attitudes of participants revolved in an educational innovation are important factors in determining to what degree and with what speed change will be effected [20].

In addition, [16] stated that a cultural perception is a very general idea of social system norms. Also, it refers to the cultural suitability of computers [21]. In line with this idea, [22] conducted a study on the relationship between users' cultural profiles and technology adoption in the context of the mobile Internet. Their findings of large-scale on-line surveys in Korea, Hong Kong, and Taiwan indicate that cultural factors have a significant influence on users' adoption perceptions of mobile Internet services. So, cultural differences are a contributing factor in the adoption of technology, particularly in third world countries. Reference [16] noted that few studies have considered the influence of cultural perceptions on the adoption of technological innovations. According to [3], the success or failure of the technology integration process rests solely on the shoulders of school leaders. Therefore, studying principals' cultural perceptions is particularly important in developing countries where ICT is not usually part of the culture. ICT may not be received well by developing-country principals under various cultural influences, due to its novel presence in society at large and in schools in particular, [23].

II. PROBLEM STATEMENT

Given the importance of principals' use of computer in administrative and instructional tasks and the relationship of the level of computer use by principals to the above variables, the purpose of this study was, therefore, to identify the extent to which secondary school principals use computers in Tehran, Iran and then to explore the relationship between level of computer use by principals and factors that are thought to be influencing it, including perceived computer access; principals' attitude toward computers, and cultural perceptions. The determination of which factors are related to computer use by principals will bring benefits to decision makers in establishing programs and incentives that would promote computer use. Rogers' Diffusion of Innovations theory was used as a theoretical framework for this study. This theory is one of the main theories that explain the process of adoption of new technologies. Rogers uses the terms innovation and technology interchangeably so the diffusion of innovation framework seems particularly suited for the study of the diffusion of ICT [16].

A. Research Questions

More specifically, the study investigated the following questions:
1. What is the level of computer use by secondary school principals in Tehran?
2. What are the principals' perceptions of their level of access to computers?
3. What are the principals' attitudes toward computers?
4. What are the principals' perceptions of cultural relevance of computers to Iranian society and schools?
5. What is the relationship between the level of computer use by secondary school principals in Tehran and their perceptions of each of the above variables?

III. METHODOLOGY

This was a descriptive study of an exploratory nature. The target population in this study was Iranian secondary school principals in the province of Tehran during the 2007-2008 school years. The total number of secondary school principals in the then Directory of the Department of Education in Tehran was 1312. A stratified random sample of 320 subjects was selected to participate in the study. In this study, stratified sampling was used because the population to be sampled was not homogeneous but, in essence, consisted of several subpopulations [24]. When sub-populations vary noticeably, it is advantageous to sample each subpopulation (stratum) independently.

A set of questionnaire was used to obtain the required data for the study. The questionnaire was divided into two parts. Part A measured the perceived level of computer use by principals. Factors that were related to it were measured in part B. Although theses instruments were valid, face and content validity of these instruments were established again by the panel of experts. To ensure that Iranian secondary school principals had a complete comprehension of the instrument used in the study, the survey was translated from English into Persian using the double back translation method to ensure the accuracy of the Persian version. Furthermore, Cronbach's alpha was used to measure internal consistency and calculated via the SPSS 15 statistical package. Cronbach's alpha is the most common form of internal consistency reliability coefficient. The Cronbach's alpha coefficients for these scales were: computer use= .91, computer access=.86, computer attitude=.92 and cultural perceptions =.61. Descriptive statistics were used to summarize and describe the properties of the mass of data collected from the respondents [25]. Correlation analysis was used to identify the relationships between variables or to use these relationships to make predictions. By convention, an α level of 0.05 was established a priori for determining statistical significance.

IV. FINDINGS AND DISCUSSION

A. Computer Use by Principals

As Table 1 illustrates, principals' overall computer use was moderate with an overall mean score of 3.32 and a standard deviation of 0.76. In other words, this result shows that principals spend a few times a week working on their computers. It seems that knowledge of the role of ICT in the work life of the school principal and the acquisition of appropriate skills to use this knowledge needs to be understood by principals [3]. The respondents' level of computer use were evident within the Internet use (mean=3.49), hardware and software use (mean=3.27), instructional use (mean=3.36), and administrative use (mean=3.23) domains. As for the Internet use subscale, the majority of the respondents stated that they used Internet 2 or 3 times a week at school (47.8%) and at home (35.6%). Also, the most frequent use of Internet was for sending and receiving email (46.9% "2 or 3 times a week"). It is clear that email was the most accepted application among principals

who were surveyed. In fact, there may be several reasons for this - email is efficient, widely available, and effective. Email is an application that can be used very quickly without a lot of instruction. Furthermore, email is widely available (most individuals have email at home, at work, and even on their cell phones). Finally, email is very effective. With a few clicks of a mouse, principals can communicate with their entire faculty, student body, or school community. Thus, it is not surprising that email is accepted and used far more by the sample population of this study.

Table 1: Mean and Standard Deviation of Principals' Level of Computer Use (n=320)

Scale	Mean	S.D.
Internet use	3.49	0.79
Hardware and software use	3.27	0.66
Instructional use	3.36	0.93
Administrative use	3.23	0.90
Overall Computer Use	3.32	0.76

Also, more than a third of the respondents reported that they used a web browser few times a week to explore professional resources (33.8%) and educational resources (34.7%). Indeed, the Internet can be an avenue for researching information and data. This information is very important for principals to find adequate and intelligent solutions for on-the-job problems. Principals should communicate with a wide variety of audiences on matters such as current educational research, policy issues, and curriculum assessments. Hence, the Internet helps principals to find information regarding their profession and educational subjects in order to develop processes for effective decision-making and problem solving [14].Therefore, training should be provided for principals to introduce them to all possible Internet resources with underlying techniques of strategic browsing to improve Internet literacy of principals.

Regarding the hardware and software use subscale, most of the respondents (49.7%) stated that they used daily word processing for their professional work while a few principals stated that they used computer daily to construct databases (3.1%), spreadsheet (2.5%), and presentations (such as PowerPoint) (1.9%). The findings of this study confirmed Schiller's study that most of the principals were competent in using basic word processing and a few of them were proficient in constructing spreadsheets, databases and presentation software. As for the instructional use domain, the majority of participants indicated that they used computers two or three times a week to record observation; monitor student achievement for specific objectives and grades; create master schedules; record discipline referrals; write up classroom observations; monitor achievement test data; locate curriculum resources; develop or write curriculum; and create graphs and charts. Moreover, findings indicated that within the area of administrative uses, communicate with staff and members of the wider school; initiate and sustain collaborative activities with colleagues within and outside their school were the areas of greatest use, while financial matters; maintenance of administrative records about students; using a program to analyze information for solving problems; and using technology to participate new kinds of professional development were the areas of least use. Also, an examination of data showed that the mean score of the administrative use

subscale was lower than other subscales, and computer use for instructional purposes was generally ahead of administrative uses. Therefore, the assumption that the introduction of computers into schools for administrative purposes would spread to their use for instructional purposes was not supported by the data

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B Computer Access

Computer access has often been one of the most important obstacles to technology adoption and integration in both developing and developed countries ([15]; [26]). Hence, sufficient technology infrastructure should be available in order to use technology successfully [27].

In this study, participants were asked to rate their level of access to computers. The access questions covered: (a) the location of computers used by principals (home, office, and school), and (b) the frequency of access (never, once a month, once a week, two to three times a week, and daily). Computer access of principals was represented by a mean score on a 5-point scale ranging from 1 (Never) to 5 (Daily).

According to Table 2, the mean score of the overall Computer Access Scale was 3.55 ($SD = 1.05$), which implies that, on average; Iranian principals had access to a computer almost two or three times a week. Finding of this study showed that only 30.9% of principals had access to computers daily. In fact, frequent and immediate access to computer to get data is important for principals. They can get these data to develop processes for effective decision-making and problem solving which result in better accountability (Felton, 2006). Moreover, principals reported high levels of computer access in more personalized spaces such as in their offices (M=4.12) and at their homes (M=3.53). These results imply that principals had access to a computer almost two or three times a week. Hence, access to computer does not seem to be a problem for secondary school principals. Furthermore, the high level of computer access for administrators can be a positive sign. It shows that the importance of computers as management and instructional tool has been understood by decision makers.

Table 2: Percentages, Mean and Standard Deviation of Computer Access (n=320)

Scale	Percent (%)					Mean	S.D.
	Never use	Once a month	Once a week	2 or 3 times a week	Daily		
Home	6.9	9.7	28.8	32.8	21.9	3.53	**1.13**
Office	3.4	7.2	10.3	32.2	46.9	4.12	**1.07**
School (Computer lab or Library)	18.8	16.6	25.9	24.7	14.1	2.99	**1.31**
Overall Access Level	**10.0**	**13.4**	**19.1**	**26.6**	**30.9**	**3.55**	**1.05**

C, Attitudes Toward ICT in Education

The Attitude scale contained 23 Likert-type items that asked respondents to describe their attitudes towards ICT. The scale was divided into three subscales: (a) affective domain, (b) cognitive domain, and (c) behavioral domain.

As can be seen from the Table 3, principals' attitudes towards ICT were positive, with an overall mean of 4.05 and a standard deviation of 0.44. Also, findings indicated that the affective domain had the highest mean score of 4.11 (SD = 0.53) among the three subscales of attitude scale. This implies that principals have positive emotional feeling of computer in education. So, the majority of respondents reported that they liked, enjoyed, and felt comfortable using ICT in general and

in education. This was followed by the cognitive attitudes (M=4.05, SD=0.45). This result implies that principals have realized the impact of technology on their life and society in general. Thus, most of the respondents considered computer as a viable educational tool, worth the time and effort spent on it, and a fast and efficient means of getting information. In addition, participants recorded the lowest mean score in behavioral attitudes (M= 3.97, SD=0.59). The behavioral subscale of the Computer Attitude Scale showed that Iranian principals had the intention to buy computers, to learn about them, and to use them in the near future.

Table 3: Percentages, Mean and Standard Deviation of Principals' Computer Attitude (n=320)

Scale	Percent (%)			Mean	S.D.
	Negative	Neutral	Positive		
Affect	0.0	24.1	75.9	4.11	0.53
Cognition	0.0	20.3	79.7	4.05	0.45
Behaviour	0.0	29.1	70.9	3.97	0.59
Overall Attitude	**0.0**	**21.3**	**78.8**	**4.05**	**0.44**

D. Cultural Perceptions

According to Table 4, respondents' responses to the 16 items on the Cultural Perceptions scale were positive (mean = 4.00, SD = 0.53). In other words, principals had positive perceptions of the value, relevance, and impact of ICT on Iranian society and schools. So, they did not feel ICT as a threat for Iranian culture. Moreover, findings of this study indicated that the majority of respondents believed that computers make a difference in their schools or lives and also students need to know how to use computers for their future jobs. Besides, most of the principals stated that students prefer learning from computers to learning from teachers; working with computers does not diminish people's relationships and

does not encourage unethical practices. Hence, they stated that computers should be a priority in education. In addition, most of the respondents pointed out that using the computers would not hinder Iranian generations from learning their traditions, and computers do not dehumanize society. However, the fact that principals saw ICT as culturally appropriate for Iranian schools and society did not prevent them to indicate that there are other social issues that need to be addressed before implementing computers in education, and that computers are proliferating too fast.

Table 4: Percentages, Mean and Standard Deviation of Principals' Cultural Perceptions (n=320)

Scale	Percent (%)			Mean	S.D.
	Negative	Neutral	Positive		
Cultural Perceptions	**0.0**	**26.3**	**73.8**	**4.00**	**0.53**

E, Relationship Between Level of Computer Use by Principals and Selected Independent Variables

The association between computer use and independent variables were explored by using the correlation analysis. Correlation analysis was used to describe the strength and direction of the linear relationship between two variables. To run correlation analysis, preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity, and homoscedasticity. The correlation matrix shows a number of significant relationships between level of computer use by principals and the independent variables (Table 5).

Table 5: Summary of the Correlation Matrix of Independent Variables and Computer Use

Variable	Pearson Correlation	Sig. (2-tailed)
Computer Use	1	
Access	0.78**	0.000
Attitude	0.47**	0.000
Cultural Perception	0.44**	0.000

**: $p<.01$; *: $p<.05$

Computer Access and Level of Computer Use

The relationship between computer access and the level of computer use was investigated using Pearson product-moment correlation coefficient. There was a strong and positive correlation between the two variables (r =0.78, n=320, p<0.05), indicating that as principals' access to computer increases, principals' level of computer use improve as well. In other words, this result suggests that principals who had access to computers and the Internet were more likely to use them than those who did not have adequate access to equipment and network connections. Therefore, access to hardware and software is an influential factor related to computer use [28]. Also, coefficient of determination analysis revealed that 60% of variance in the level of computer use can be explained by computer access. This variable could have unique contribution in predicting level of computer use by principals.

In addition, the relationship between having access to computer in a majority of secondary school principals and their level of ICT use supports previous studies [3], [14], [26], [29]-[31]. Also, the study's result is consistent with [15] proposition that levels of access to ICT are significant in determining levels of use of ICT. Furthermore, this result supports Rogers' theory through the concept of trialability in that principals who have access to computers can try new management method with the computers.

Attitudes toward Computer and Level of Computer Use

Correlation analysis revealed that attitudes towards ICT have a moderate and positive association with the level of computer use (r =0.47, n=320, p<0.05). It implies that principals, who have positive attitudes towards ICT in education, use technology more in their administrative and instructional tasks. This finding confirms Rogers' theory through the attributes of relative advantage and compatibility. When principals understand relative advantages of computer use in their instructional and administrative tasks their attitudes become positive towards computer as a tool. Those attitudes would also be compatible with their existing values and so adoption of computer use may occur more readily.

Furthermore, this symbiotic relationship between attitudes toward ICT and computer use has been widely reported in the literature, e.g., [17], [32]. Also, literature confirmed this finding that attitude I s an important factor for using or avoiding computer-based technology [15], [29], [32]-[34].

According to [35], principal's positive attitudes toward technology impact on the effective use of computers in the school. If principals have positive attitudes toward technology, they can use it to enhance their role in the educational process. The use of computer applications and tools may help streamline record keeping and administrative tasks. Frequent computer use can reduce workloads and free up time to allow principals to perform other instructional and administrative tasks [36]. Furthermore, [37] stated that attitudes are difficult to change as people are generally more comfortable with what they have learned or knew due to stereotyping, fear of taking risks, intolerance to ambiguity, and possibly the need to maintain tradition. In this study, the negative attitude toward ICT was not prevalent. This means that principals have fewer problems in introducing computers in schools. Nonetheless, it is suggested that formal trainings should be provided for principals to improve attitudes toward computer adoptions. Districts should plan computer programs to train principals. Training should be ongoing so principals can continue to learn how to use hardware and software applications within the context of their administrative and instructional responsibilities [3].

Cultural Perceptions and Level of Computer Use

The relationship between cultural perception and the level of computer use was investigated using Pearson product-moment correlation coefficient. There was a moderate and positive correlation between the two variables (r =0.44, n=320, p<0.05), indicating that as principals' cultural perceptions of computers increase, level of computer use will improve as well. It seems that principals who have positive cultural perceptions of ICT can use technology and model technology use for their staff. In this way, they make their vision tangible. In fact, it is difficult for a principal that has not understood the value and impact of computer use in

his/her school and society and want to convince teachers to use computer in their teaching and learning process. The result of this section is in line with many other research studies about the impact of culture on the adoption and the implementation of technology [23], [38], [39]. Moreover, the study's result is consistent with Rogers' premise regarding the role of social norms in the diffusion of innovations, and also with Thomas's "Cultural Suitability" hypothesis, which posits that the acceptance of a new technology depends to a large extent on its compatibility with the existing culture. Specifically, principals in this study acknowledged the importance of ICT for their educational system and society. It reflects the influence of their cultural norms on their perception of ICT. Therefore, cultural perception is considered as one of the important factors influencing ICT adoption [23] [38] [39].

V. CONCLUSIONS

This study identified the extent to which Iranian secondary school principals used computers and explored the relationship between three variables related to ICT use. These factors included high level of computer access, positive attitudes towards ICT, and positive cultural perceptions of ICT, all contributed significantly to the computer use by principals.

Findings from this study indicated that principals spent a few times a week working on their computers. Principals had a mistaken view of computer use, using computers as a replacement for the old manual or electric typewriters. Computers were rarely used for tasks such as generating reports, the collection of information for management decisions, and saving, and retrieving data. In fact, in the age of technology and information, Iranian principals should become competent in using computers. They should have the ability to effectively use computers and other technologies. The effective use of the computer in management, communication, and decision-making can help increase their accountability. Therefore, from the results it can be inferred that Iranian principals must be prepared to embrace technology and integrate technology into the school. According to [40], to increase principals' use of computer technologies for instructional and administrative purposes, the following themes need to be addressed which are support, training, change in administrative methods and strategies, improvement of school infrastructure, management workload, and attitudes toward computer use. Therefore, principals must receive substantial amounts of training and support in using these (computer-related) technologies.

In addition, using up-to-date hardware and software resources is a key feature to diffusion of technology [40]. The results of this study indicated that to create a significant impact on level of computer use, high level of computer access is needed. Technology should be visible enough to be used seamlessly whether in the principals' office, the classroom, a media center, or any location in which access to information and productivity tools is necessary. Moreover, funds need to be made available to purchase hardware and software. School districts are expecting principals to model

the use of technology in their schools. For principals to do this, they must have access to updated hardware and software. School budgets must include funds for training and for hardware and software upgrades.

Also, the study's results indicated that principals had positive attitudes towards computer use in education and their attitudes towards ICT had a significant relationship with the level of computer use. Principals' positive attitudes exhibit their initiation into the innovation-decision process [16]. Reference [16] stated that an innovation-decision process include five steps which are knowledge, persuasion, decision, implementation, and confirmation. It seems that Iranian principals have already gone through the Knowledge and Persuasion stages and are probably proceeding to the Decision phase. As many theorists have indicated, attitudes can often foretell future decision-making behavior [19]. Thus, it can be concluded that Iranian principals who have positive attitudes toward ICT in education, use computer in their administrative and instructional tasks once computers become more available to them. At this stage, principals' expertise in computer use and the social support from others (colleagues, peers, etc.) might affect their attitudes toward computer use.

Above all, attention to cultural beliefs and their impact on ICT adoption are very important in developing countries [39] because socio-cultural factors may put ICT transfer at risk. In fact, duplicating strategies from other developed countries without any consideration about cultural adaptations of technologies might be less effective and successful. Information technologies are the product of developed countries, and to make that technology appropriate for developing countries, there should be an effort to build a capacity to recognize the importance of implementing IT according to national development needs [41]. In this way, implementation of a new technology will not be finished with installation of the machinery and explanation of how to use it. The new technology should be accepted by the receiving society. Findings from this study indicated that principals have positive cultural perceptions of ICT in society and school. Also, principals' cultural perceptions of ICT can influence their level of computer use. Hence, it can be inferred that principals who have positive perceptions of the value and impact of ICT as it relates to the cultural norms in Iranian society and schools can use technology and foster an environment and culture conducive for integration of technology in schools. In fact, this cultural perception relates the leaders' success to their individual's ability to articulate and influence norms and values. Hence, understanding the cultural values is as important as understanding the technological benefits. Principals who are responsible for adopting and implementing technology in school must be aware of its societal and organizational cultural impacts.

It is expected that the data obtained from the study will open new lines of inquiry about the crucial roles of school leaders in the adoption of ICT. Schools are in the change of re-culturing to accept teaching with information and communication technologies [42]. It seems that ICT utilization in education seeks fundamental reform and change in traditional instructional programs. Principals are educational leaders who shape and communicate visions of teaching and

learning within their schools, and by their action or inaction influence school activity [42]. An evaluation of the extent to which secondary school principals use computers and exploration the relationship between factors related to ICT use will contribute to decisions about future developmental needs because more will be known about their preparedness for change. Therefore, this study will be useful for policy makers, providers of professional development programs for principals, professional associations of principals and for systems level decision makers to reflect on and devise support mechanisms and strategies to assist principals develop them in their work and at their schools.

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