Contents lists available at GrowingScience

Management Science Letters

homepage: www.GrowingScience.com/msl

A study on barriers of using information technology on learning and teaching in elementary schools

Sara Tountab Haghighi[a*] and **Mahboobeh Eskandari[b]**

[a]*Department of Management, Islamic Azad University, South Tehran Branch, Tehran, Iran*
[b]*Educational Programming Department, Islamic Azad University, Central Tehran Branch, Tehran Iran*

A R T I C L E I N F O	A B S T R A C T
	In this paper, we present an empirical study to determine the effects of different barriers on using information technology for learning and teaching in elementary school students. We plan to find the most important factors preventing elementary school children on implementing different information technology facilities for their educational programs. The study selects a population of 720 women teachers who work for elementary schools and chooses a sample of 220 people for this study. A questionnaire consists of various important factors are distributed among these people and the results are analyzed using some statistical tests. The study indicates that education program itself is to blame as the most important barrier for using information technology.

1. Introduction

Information technology plays an important role on today's learning programs and there are literally different information technology methods to improve teaching or learning skills in various organizations such as using media facilities, computers, etc. Giavrimis et al. (2011) investigated why teachers take part in information and communication technology (ICT) programs and discussed their objectives. Awang et al. (2011) discussed knowledge management in Malaysian school education. Yang and Huang (2008) performed a study of high school English teachers' behavior, concerns and beliefs in integrating information technology into English instruction. Al-Senaidi et al. (2009) studied barriers for adopting technology for teaching and learning in Oman. One of the most important issues is to understand how effective is training programs. There are different studies for measuring the effects of training based on different studies. Ducharme and Feldman (1992) compared different staff training strategies to promote generalized teaching skills. McDonnell (1997) studied the effects of training care staff to manage challenging behavior for three-day course studies. Rice et al. (1985) studied crisis prevention and intervention training for psychiatric hospital staff. Richman et al. (1988) investigated the effects of self-monitoring and supervisor feedback on staff performance for a

* Correspondent author. Tel. + 989121082897
E-mail addresses: sara_th52@yahoo.com (S. Tountab Haghighi)

residential setting. McDonnell et al. (2008) studied the effects of a 3-day training program in the management of aggressive behavior in services for staff with autism spectrum disorders were investigated using a quasi-experimental design. An experimental people received training for a 10-month period and a contrast group, which had received no training. The study indicated that staff training increased career confidence, but there were no training effects of measures of staff coping, support or perceived control of challenging behaviors. The study also indicated that staff training could increase staff confidence in managing aggression in people with autism spectrum disorders. Arthur (1994) presented a comprehensive survey on different customer-service training for academic libraries. Galloway and Ho (1996) presented a model of service quality for measuring the efficiency of service training. Daly et al. (2008) examined the effect of improvisation training, as used in schools of acting, in preparing front-stage service employees performed their roles when interacting with customers as cabin crew in a regional Irish airlines. In this paper, we study the barriers of using information technology in elementary school children. The proposed study of this paper selects a sample of 220 people and distributes questionnaire among them. The model uses Likert scale from one to five for a questionnaire consists of thirty questions and the results are analyzed using parametric statistical tests. The organization of this paper first presents the proposed model and it explains the details of the implementation of the proposed model for the case study in section 2 and 3, respectively. Finally, concluding remarks are presented in the last section to summarize the contribution of the paper.

2. Methodology

The main question in this study is to find out the key important factors preventing us to use information technology (IT) in elementary schools. This main question is divided into four sub questions, which are as follows,

1. Does educational barrier have any impact on IT implementation?

2. Does infrastructure barrier have any impact on IT implementation?

3. Does human resource barrier have any impact on IT implementation?

4. Does IT knowledge and familiarity with IT have any impact on IT implementation?

The focus of this study is on female elementary school children who study in elementary schools in capital city of Iran, Tehran. The statistical population of this study is the number of educational teachers who work for elementary schoolchildren in Tehran/Iran. In order to find out the number of sample size we have used the following statistical sampling technique,

$$n = \frac{N \times z_{\alpha/2}^2 \times p \times q}{\varepsilon^2 \times (N-1) + z_{\alpha/2}^2 \times p \times q}, \tag{1}$$

where N is the population size, $p = 1 - q$ represents the yes/no categories, $z_{\alpha/2}$ is CDF of normal distribution and finally ε is the error term. Since we have $p = 0.5, z_{\alpha/2} = 1.96$ and N=720, the number of sample size is calculated as n=220. The questionnaire was designed based on 34 questions in four main categories, which are summarized in Table 1 as follows,

Table 1
The structure of the questionnaire

Item	Title	Questions
1	Infrastructural barriers	8, 10, 33, 34
2	Educational barriers	12, 13, 17, 19, 21, 22, 23, 26, 31, 32
3	Human resource barriers	3, 9, 11, 14, 15, 16, 24, 27, 28
4	Educational equipment barriers	4, 5, 6, 8, 20, 25, 29, 30

Note that we have used Likert (1932) scale for all questions and the statistical tests we use is based on non-parametric method using t-student and one way ANOVA test. Table 2 describes the statistical observations on the level of familiarities with educational software packages.

Table 2
Statistical observation for the familiarities on educational software packages

Mode	Median	Mean	Range	Variance	Standard deviation	Standard Error	Skewness	Kurtosis
2	2	2.14	3	0.59	0.76	0.05	0.34	-0.13

As we can observe from Table 2, there are little differences among mode, median and mean of the observations. On the other hand, the numbers for Skewness and Kurtosis statistics are less than one and we can conclude that the sample size follows normal distribution and we can use mean as the main factor for our analysis. The results of our study for the impact of infrastructure on IT are shown in Table 3.

Table 3
Statistical observation for infrastructure barriers

Mode	Median	Mean	Range	Variance	Standard deviation	Standard Error	Skewness	Kurtosis
14	16	15.37	15	9.92	3.14	0.24	-0.81	0.92

Similarly, we can conclude that the statistical observations are normally distributed since there are not much differences among mean, median and mode and the Skewness and Kurtosis ratios are both less than one. Table 4 presents the details of our statistical observations for educational barriers.

Table 4
Statistical observations for educational barriers

Mode	Median	Mean	Range	Variance	Standard deviation	Standard Error	Skewness	Kurtosis
30	31	30.89	30	28.24	5.31	0.4	-0.12	0.26

Once again, the statistics show that mean, median and mode are relatively close to each other and the Skewness and Kurtosis are also less than one, which indicate that the distribution of the sample size could be considered normal and we may use mean of the data for our judgments. Finally, the details of human resource characteristics are also described in Table 5.

Table 5
Statistical observation for human resource attributes

Mode	Median	Mean	Range	Variance	Standard deviation	Standard Error	Skewness	Kurtosis
26	27	26.86	45	22.01	4.69	0.35	0.85	0.56

There is no doubt that we do not get different numbers for mode, median and mean and the Skewness and Kurtosis numbers are also less than one so we can conclude that our sample size is normally distributed and we may use mean as the main factor for our judgment. Finally, the statistical observations for the necessary equipments are summarized in Table 6.

Table 6
Statistical observation for the necessary equipments

Mode	Median	Mean	Range	Variance	Standard deviation	Standard Error	Skewness	Kurtosis
22	23	22.79	23	15.96	3.99	0.30	-0.70	0.89

As we can observe from Table 6, the numbers indicate that we may assume that Gaussian distribution holds for the numbers and the mean of the observation can be used for the analysis.

3. The results

In this section, we explain the details of our survey on all 34 questions of our study. Table 7 demonstrates the results of our study for the questions associated with infrastructure issues on using IT in elementary schools.

420

Table 7

The impact of infrstructure on IT implementation for elementery schoolchildren

#	Question	Mean	Standard devation	t-student	P-value
7	The impact of low buget on using IT	3.02	1.03	0.39	-
10	The impact of the implementation barrier on using IT	3.15	0.82	2.63	0.01
18	The impact of brain drain on using IT	2.89	0.95	-1.66	-
33	The impact of space limitation on using IT	3.25	0.82	4.40	0.01
34	The impact of not appropriatly implementing IT facilities	3.13	0.80	2.32	0.05
	Reflection	3.07	0.62	1.52	-

As we can see from Table 7, when $\alpha = 0.01$ there is a meaningful difference between experimental and judgmental means for questions 10, 33 and 34, which means that any shortage on infrastructure plays important role on implementation of IT for elementary schoolchildren. Table 8 shows the results of our survey for the questions on the impact of educational problems on IT implementation for schoolchildren.

Table 8

The impact of educational issues on IT implementation for elementery schoolchildren

#	Question	Mean	Standard devation	t-student	P-value
12	The impact of low buget on using IT	2.99	0.80	-0.86	-
13	The impact of the implementation barrier on using IT	2.99	0.77	0.01	-
17	The impact of brain drain on using IT	3.24	0.72	4.83	0.01
19	The impact of space limitation on using IT	2.97	0.78	-0.44	-
21	The impact of not appropriatly implementing IT facilities	3.10	0.73	2	0.05
22	The impact of changing the role of teacher from instructor to a learner by using IT	3.11	0.78	2.05	0.05
23	The impact of using IT on increasing teachers' awarness	3.25	0.72	5.10	0.01
26	The impact of using IT on changing teaching methods	3.16	0.36	3.14	0.01
31	The impact of using IT on long term learning	3.05	0.80	0.96	-
32	The impact of using IT on increasing students' carefulness	3.10	0.79	1.92	0.05
	Reflection	3.08	0.53	2.25	0.05

As we can observe from Table 8, brain drain is believed as one of the most important causes on having no IT in some of our elementary school children. The people who participated in our survey strongly believe that using IT in schoolchildren could increase their awareness. They also believe that using IT could help them change their teaching styles and improve their skills. The use of IT in schoolchildren could also help students do their assignments more carefully but they are under the impression that the consequence of improper implementation of IT facilities could be harmful. The people who participated in our survey did not believe that any limitation on budget or infrastructure could be a major barrier for IT implementation. In summary, educational issues could be considered as major barrier of using IT for schoolchildren. The next question is to learn the impact of human resources capabilities on using IT for schoolchildren.

As we can observe from Table 9, the impact of a good teachers' computer background could significantly impact the implementation of IT on schoolchildren. The other relative question, question 11, also supports the idea that when the instructor has good computer knowledge, she could expedite the use of IT for schoolchildren. The teachers' awareness could also increase the chance of using IT. Any implementation of IT could increase students' motivation. There is a relatively weak evidence to believe that when there is no computer facilities teachers are less reluctant to use IT facilities. In summary, there is not a strong evidence to blame human resource as the main barrier of using IT for schoolchildren programs.

Table 9
The impact of human resources capabilities on IT implementation for elementery schoolchildren

#	Question	Mean	Standard devation	t-student	P-value
3	The impact of a good teachers' computer background	2.42	0.79	-10.65	0.01
9	The impact of not having good learning computer facillities as a barrier for implementation of IT	3.13	0.82	2.34	0.05
11	The impact of not having good instructors of computer facillities as a barrier for implementation of IT	3.27	0.78	5.08	0.01
14	The lack of teachers' computer skills as a barrier for using IT	2.88	0.88	-1.81	-
15	The lack of a motivation as a barrier for using IT	3.20	2.13	1.42	-
16	The impact of the instructors' awareness on using IT to solve educational problems	3.28	0.72	5.60	0.01
24	The impact of using IT on increasing students' motivation	3.19	0.74	3.76	0.01
27	The impact of using IT on increasing the quality of teaching	3.01	0.75	0.18	-
28	The impact of the existing culture on using IT	2.36	0.98	0.52	-0.37
	Summary	2.98	0.52	-0.37	-

The impact of educational equipment on using IT for schoolchildren is shown in Table 10.

Table 10
The impact of educational equipments on IT implementation for elementery schoolchildren

#	Question	Mean	Standard devation	t-student	P-value
4	The impact of courses compatibility to teach with IT	2.21	0.82	-13.63	0.01
5	The impact of using IT to improve team work	2.68	0.88	-5.18	0.01
6	The familiarity with distance learning	2.09	0.92	-13.91	0.01
8	The lack of the necessary software packages on IT	3.11	0.91	1.80	-
20	The impact of using IT on changing the learning from traditional to advanced methods of group working	3.15	0.74	2.89	0.01
25	The impact of learning classes on IT	3.30	0.73	5.94	0.01
29	The impact of learning software packages on IT	3.05	0.74	1.02	-
30	The impact of motivation on using IT	3.11	0.77	2.09	0.05
	Summary	2.84	0.49	-3.93	0.01

As we can see, when the courses are integrated with IT, teachers could use IT much easier and students' familiarities could facilitate the use of IT on elementary schoolchildren. The implementation of IT could increase students' teamwork and if there are some available courses to teach students, students could learn more. In summary, the availability of sufficient equipments could help increase the use of IT for elementary schoolchildren.

The other key question is whether teachers' educational background could have any significant impact on using IT in elementary schoolchildren. Table 11 summarizes the results of our survey where students are divided into two groups of social sciences and engineering and basic sciences.

Table 11
The impact of educational background on using IT

Sub group	Educational background	Mean	Std-dev	t-student	df	P-Value
Infrastructure issues	Social sciences	15.57	3.29	0.33	156	-
	Engineering & basic science	15.41	2.81			
Educational issues	Social sciences	30.94	5.35	-0.48	163	-
	Engineering & basic science	31.34	4.95			
Human resources	Social sciences	26.67	4.25	-0.96	164	-
	Engineering & basic science	27.37	5.02			
The necessary equipments	Social sciences	22.91	4.02	0.21	161	-
	Engineering & basic science	22.78	3.68			

As we see from the t-student values, there is no evidence to believe that teachers' educational background has any impact on using IT for elementary schoolchildren. We have also investigated the impact of gender on using IT for schoolchildren and the results are summarized in Table 12

Table 12

The impact of gender on using IT

Sub group	Martial status	Mean	Std-dev	t-student	df	P-Value
Infrastructure issues	Single	16.04	2.30	1.09	159	-
	Married	15.26	3.27			
Educational issues	Single	31.84	3.96	0.97	167	-
	Married	30.78	5.44			
Human resources	Single	27.60	3.20	0.81	169	-
	Married	26.80	4.96			
The necessary equipments	Single	23.90	3.61	0.61	162	-
	Married	22.74	4.08			

The results of Table 12 indicate that there is no relationship between the gender and using IT since all t-students are meaningful. The other study is to investigate whether the familiarity of teacher with information technology could impact the use of IT in elementary schoolchildren. Table 13 presents details of our investigation.

Table 13

The impact of gender on using IT

Sub group	IT familiarity	Mean	Std-dev	t-student	P-Value
Infrastructure issues	Familiar	15.40	2.87	0.01	-
	Unfamiliar	15.40	4.56		
Educational issues	Familiar	31.21	4.76	1.78	-
	Unfamiliar	29.33	6.31		
Human resources	Familiar	27.15	4.49	1.28	-
	Unfamiliar	25.96	4.73		
The necessary equipments	Familiar	23.10	3.78	2.05	0.05
	Unfamiliar	21.46	4.14		

The results of Table 13 explains that familiarity with IT equipments does not necessarily impact using IT for elementary schoolchildren although it seems that the people who are familiar with IT equipments believe a well equipped school could positively impact the use of IT. The other aspects of this survey is to study the impact of age on using IT, which are summarized in Table 14.

Table 14

The impact of age on using IT

Sub group	Age perspective	Mean	Std-dev	F-value	P-value
Infrastructure issues	20-30	15.82	2.45	1.08	-
	31-40	15.45	3.28		
	>40	14.85	3.28		
Educational issues	20-30	31.90	3.92	0.65	-
	31-40	30.65	5.69		
	>40	30.73	5.73		
Human resources	20-30	27.96	3.59	0.91	-
	31-40	26.77	5.23		
	>40	26.54	4.35		
The necessary equipments	20-30	23.80	3.90	1.11	-
	31-40	22.74	4.01		
	>40	22.44	4.13		

The results of Table 14 indicate that age does not play any meaningful role on the use of IT in elementary schoolchildren. Another study is to investigate the impact of teachers' educational background on using IT skills and Table 15 summarizes the details of our survey.

Table 15
The impact of age on using IT

Sub group	Educational background (years)	Mean	Std-dev	F-value	P-value
Infrastructure issues	12	14.96	3.16		
	14	15.18	3.67	0.80	-
	>16	15.74	3.57		
Educational issues	12	29.88	5.68		
	14	31.90	6.10	0.70	-
	>16	31.29	4.10		
Human resources	12	25.91	3.76		
	14	26.57	5.93	0.76	-
	>16	27.28	3.50		
The necessary equipments	12	20.89	4.34		
	14	22.54	4.25	4.53	0.01
	>16	23.73	3.39		

The overall survey results clearly show that there is no relationship between the educational background and the use of IT although people with higher level of education background believe a well equipped school provides good infrastructure to use IT. The last test is to see whether job experience has any influence on the use of IT in elementary schoolchildren and the details of our survey is summarized in Table 16.

Table 16
The impact of job experience on using IT

Sub group	Job experience (years)	Mean	Std-dev	F-value	P-value
Infrastructure issues	1-10	15.63	2.69		
	11-15	16.06	3.52	1.80	-
	16-20	15.31	3.18		
	>20	14.53	2.97		
Educational issues	1-10	31.51	3.67		
	11-15	31.80	5.62	1.16	-
	16-20	30.00	6.27		
	>20	30.31	5.19		
Human resources	1-10	32.24	2.24		
	11-15	27.97	5.98	1.79	-
	16-20	25.75	4.78		
	>20	26.52	4.07		
The necessary equipments	1-10	23.34	3.72		
	11-15	23.14	3.76	0.68	-
	16-20	22.12	4.81		
	>20	22.65	3.86		

Again, we see job experience has no impact on the use of IT for elementary schoolchildren.

4. Conclusions

In this paper, we have presented an empirical study to determine the effects of different barriers on using information technology for learning and teaching in elementary school students. The survey of this paper considered various parameters influencing the implementation of IT in elementary schoolchildren such as teachers' educational background, age, job experience, etc. In our study, we have chosen four major questions and distributed 34 questions based on these four basic items among 220 female instructors out of 720 people. The results have indicated that many basic instructors' characteristics such as educational background, age, job experience have no impact on using IT. The

study also showed that education program itself was the most important barrier for using information technology.

Acknowledgment

References

Al-Senaidi, S., Lin, L., & Poirot, J. (2009). Barriers to adopting technology for teaching and learning in Oman. *Computers & Education*, 53(3), 575-590.

Arthur, G. (1994). Customer-service training in academic libraries. *The Journal of Academic Librarianship*, 20(4), 219-222.

Awang, M., Ismail, R., Flett, P., & Curry, A. (2011). Knowledge management in Malaysian school education: Do the smart schools do it better?. *Quality Assurance in Education*, 19(3), 263-282.

Daly, A., Grove, S. J., Dorsch, M. J., & Fisk, R. P. (2009). The impact of improvisation training on service employees in a European airline: a case study type: Case study. *European Journal of Marketing*, 43(3-4), 459-471.

Ducharme, J. M., & Feldman, M. A. (1992). Comparison of staff training strategies to promote generalized teaching skills. Journal of Applied Behavior Analysis, 25, 165-179.

Galloway, L., & Ho, S. (1996). A model of service quality for training. *Training for Quality,* 4(1), 19-26.

Giavrimis, P., Giossi, S., & Papastamatis, A. (2011). Teachers' attitudes towards training in ICT: a critical approach. *Quality Assurance in Education*, 19(3), 283-296.

Likert, R. (1932). A Technique for the Measurement of Attitudes. *Archives of Psychology*, 140, 1–55.

McDonnell, A., Sturmey, P., Oliver, C. Cunningham, J., Hayes, S., Galvin, M., Walshe, C., & Cunningham, C. (2008). The effects of staff training on staff confidence and challenging behavior in services for people with autism spectrum disorders. *Research in Autism Spectrum Disorders*, 2(2), 311-319.

McDonnell, A. (1997). Training care staff to manage challenging behaviour: An evaluation of a three-day course. *British Journal of Developmental Disabilities*, 43, 156–161.

Reid, D. H., Rotholz, D. H., Parsons, M. B., Braswell, B. A., Green, C.W., & Schell, R. M. (2003). Training human service supervisors in aspects of PBS. *Journal of Positive Behavior Intervention*, 5, 35–46.

Rice, M. E., Helzel, M. F., Varney, D. W., & Quinsey, V. L. (1985). Crisis prevention and intervention training for psychiatric hospital staff. *American Journal of Community Psychology*, 13, 289–304.

Richman, G. S., Riordan, M. R., Reiss, M. L., Pyles, D. A. M., & Bailey, J. S. (1988). The effects of self-monitoring and supervisor feedback on staff performance in a residential setting. Journal of Applied Behavior Analysis, 21, 401-409.

Yang, S.C., & Huang, Y.F. (2008). A study of high school English teachers' behavior, concerns and beliefs in integrating information technology into English instruction. *Computers in Human Behavior*, 24(3), 1085-1103.