

Investigating the Barriers of Application of Cloud Computing in the Smart Schools of Iran

Fardin Amirian

Master Student of IT Management, Farabi Institute of Higher Education, Karaj, Iran

Email: amirian.mit92@gmail.com

Sanaz Nikghadam Hojjati

Ph.D. Candidate of Information Technology Management, Department of Management and Economics, Science and Research Branch, Islamic Azad University, Tehran, Iran

Email: s.nikghadam@srbiau.ac.com

Fatemeh Soleimani Roozbahani

Ph.D. Candidate of Information Technology Management, Department of Management and Economics, Science and Research Branch, Islamic Azad University, Tehran, Iran

Email: Fa.Solaymani@gmail.com

ABSTRACT

Computing model is based on the computer networks such as internet. Internet presents a new sample for consuming and delivering the computing services. The developed societies caused the administrators have a specific glance to this area for promoting the quality of educational system. cloud computing appeared as one of the suitable strategies of minimizing the costs and resources centralized management. This research wants to identify the barriers against the implementation of cloud computing in smart schools by extensive studying of "cloud computing". The present research is a descriptive-measurable research according to its purpose, application and the method of its implementation. We have used the method of questionnaire for gathering the data. A sample consisted of 70 questions gathered from a 85 persons society according to Morgan sampling table and then we used the single sample t- test for testing the hypothesizes and also we used the Freedman trial for grading the barriers. Results show that some barriers such as security, economical, management problems, infrastructural factors, cloud service conditions , literacy and awareness of employees of cloud computing affect the application of cloud computing in the smart schools. The results can be useful in utilization of innovative educational technologies.

Keywords- Cloud computing, smart schools, security, cloud service.

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I. INTRODUCTION

Education is one most essential need of the human societies and one of the axis of the sustainable development [1] and also one of the key factors and the symbol of advance and development and even survival of the modern organizations [2] that has a determining role in economical, social, etc development [3]. On the other hand, there is a direct and coordinated relationship between the society and the education. Educational system is the infrastructure sentence and the first base of formation of public culture and national beliefs according to this point [4]. Nowadays, students, teachers, facilities, educational facilities and other educational equipment vary, so the type of educations should be varied and equipped according to the modern and new technology [5]. The influence of information and communication technology in the field of education has provided the context of the new educational methods. One of these new methods is e-learning that had been succeeded in achieving the objectives that have no limitation in the time and space [6]. Paradigm of cloud computing caused a great change in the process, computer calculations, information gathering,

data transfer and e- marketing in information and communication technology[7]. When IBM and Google states that they cooperate each other in this field, this terminology became popular[8], and then It became an important terminology in the universe of information technology[9]. This terminology leads a new wave of information and communication technology to an era with a new style of life [10]. Cloud computing has been developed in widespread fields of information systems and technologies such as operating systems , application software and technology approaches of companies[11] and it was used in the cycle of various industries widely in the recent years[12] and It was approved in all of the social fields. E- Learning approaches that are based on this cloud presents a new field of learning in education in which speeches and laboratories are based on cloud and virtualization [13]. The cloud process has a widespread acceptability because of some characteristics such as customization, portability, access that is based on demand and separation. Additionally, it attracts the users because of reducing the costs of preparing the services mean while improving the outsourcing. The companies that use the cloud computing don't need to invest for new infrastructures

and training the users, in this way, the cloud computing will become a popular method for introducing this technology to the secondary educational environments and other organizations [14]. The industrial leaders estimate that the benefits of the cloud computing companies will reach to 160\$ billion and they define the cloud computing as an innovative developed delivery model of Information Technology that makes presenting the goods and products, services and solutions possible in internet in the real time[15]. "Cloud Computing" is a new phenomenon that links the web 2.0¹ [16]. Google presented this phenomenon. This cloud will prepare the calculation ability, saving environment, software duties, information services, etc for users [17]. "Cloud Computing" is a parallel distributive system that contain a series of highly interconnected virtual computers. This cloud is a same computing model that is based on the agreement between the provider and the receiver of services. This system cans automatically dynamic sets the computer sources. "Cloud Computing " is an influential integration of network computing and distributive cluster computing .The cloud computing is available to the virtual users as the next generation of data center and is the dynamic allocation of the real time of calculative sources[18]. The cloud computing points to a large scale distributive calculative sample that according to the requests of the foreign customers, has a dynamic virtual pool; This dynamic virtual pool is scalable from the viewpoint of managed calculative power, services, platforms and saving on Internet [19]. "Cloud Computing " is a sample of virtual systems that shows the natural evaluation of the data centers; It applies the management of automatic systems, parallel workload and the virtual technologies [20]. It is the smart management approach that can improve the performance; It will decrease the management levels while stimulate the employees potentially, so the employees will be creative continuously and they learn to be adjusted and don't use the last and traditional difficult approaches[21]. Small companies, schools and social groups need high services from the part of virtual servers of "cloud computing "in order to decrease the information costs of the company [11]. "Cloud Computing" presents various types of the necessary software and hardware such as applications, save, process and virtual servers on web media (such as the cloud computing), so the educational system gets significant benefits because of scalability and not need an extensive investment [22]. It is specially very attractive for small and medium - sized educational institutes because sum of its costs is less than the cost of other methods [23]. Universities are always looking for updating the software and hardware of the information technology in order to attract the students and keep the

¹sites or Internet services that provide the possibility of information interchange between the users or let them prepare some information or manipulate them are considered as web2.0

track of their movement according to the rapid development of digital technologies, so they can use these technologies according to the cost that they can afford. Additionally, they can cost saving the human source and IT services by transitioning the responsibility of hardware and software infrastructures to the outside [24].

Specialists and ones who are active in the field of Information and communication technologies present various reasons for slow moving ahead toward the "cloud computing". Lack of the growth of the industry of traditional data center and high cost of Internet in Iran are the main factors of not development of "cloud computing" in this country from the view point of this group [25]. Acceptance of "cloud computing" is useful in university institutes and cloud computing is sometimes necessary in avoiding the challenges and barriers [26]. Although "cloud computing" has a glorious future, a lot of problems should be solved for implementing it. This technology and its characteristics are not known well in Iran [27]. So, it is essentially necessary to have program in this direction in Iran according to the more rapid movement of the developed societies for improving the quality of educational system by developing the application of Information and communication technology [28]. So, it is necessary to investigate the barriers of implementation of "cloud computing" in the smart schools for utilization of this technology.

II. LITERATURE REVIEW

First smart school was established in England in 1996 and then Malaysia considered the smart schools as one of its own essential programs in its own development program in the project of "twenty twenty". Central council of education of Japan suggest the government have a comprehensive program of enrichment of learning in schools in the light of Information and communication technology in 1996 and then it published the basic axis of modification of national curriculum in 1998. In this year, the government established the virtual agency under the auspicious of the prime minister. The purpose of this agency was investigating the coordination of various departments of the government for studying and execution of various projects of development of Information and communication technologies in education, government, management of manufacturing and service companies, etc [29].

This issue is considered in Australia and the general policies of ICT in education are as following. Results , occupational opportunities and the variations of life of students of public schools and universities mainly depends the skill and ability of users of Information and communication technology and knowing whether inclusion of ICT is useful in educational program and organizing teaching and learning. Allocation of sources is based on three occupational priorities(width of band, contents of the band, occupational achievements of the teachers)in an equilibrant manner and publication of

the results of researches of ICT are known as the proposed policies in this country[30]. Ercan(2010) showed in a research about educational institutes that the "cloud computing" decreases the hardware , software and protection costs and provide new tools and programs for developing the characteristics of IT[9].Kue et al (2012) showed in a research that combining of cloud computing and the last grade high school education is possible and they also determined the structure of content and experiences of education for combining with "cloud computing"[10]. Andreescu & Mircea (2011) presents a suitable cloud acceptance for universities by considering the advantages and disadvantages of the structure of "cloud computing" [31]. Jaigirdar et al(2010) introduced the architecture of the "cloud computing" for Bangladesh educational system ; it consist of for different services. This architecture will balance the relationship between the economic conditions and sources and also provide an environment with more security by use of unused sources [32]. Sultan (2010) showed that how large and small organizations will use the advantages of this technology in the ground of costs and utility [24]. Katzan(2010) showed that a software as (SaaS) service is a software that has only one host and is available by Internet and a cloud data base is based on an operating system that is executed in the cloud and provide an infrastructure for developing the software [23]. WEBWE (2011) showed that subjects of security, reliance and privacy are not solved even between the main providers of "cloud computing" despite of lots of "cloud computing" advantages [33]. Alabbadi (2011) presents the complete organizational "cloud computing" model (C3F) in his research; This model has classified the IT activities according to two criteria of importance and sensitivity of missions [34].

Abbaspoor and Hatamloo(1393) explained the relationship between the smart schools, cloud computing and its effect on education by studying the subject of smarting the schools in the platform of cloud computing [35]. Zeinali et al(1393) explained the architecture of electronic cloud computing by introducing the infrastructures of "cloud computing" in education and electronic education and presents the challenges of development of electronic education and the solutions of cloud computing[36] studied the advantages and challenges of the application of "cloud computing" in the educational system[37]. Zare et al (1393) discussed the power of these models in creating, dissemination and share knowledge while considering the existed and potential facilities of librarian software of cloud computing by studying the approaches of use and share of knowledge based on " cloud computing " in educational centers [38].

Golsanam loo & Seyed Abbasi(1393) investigated the importance of applying the cloud computing in providing a learning environment by studying the application of "cloud computing" in education[39]. Dehghan et al(1393) introduced the architecture and the main parts of a sufficient electronic educational system

for the efficient application of "cloud computing " in their research which was about investigating the electronic education challenges based on cloud service[40]. Jalali, Ibrahimkhani(1392) investigated the advantages and difficulties of "cloud computing" in education in their research which was about use of "" in education of schools and its benefits and challenges[41]. Taft (1393) defines the concepts of "cloud computing" and application of it by use of mobile and the relationship between these concepts in his research which was about use of "cloud computing" in education by mobile [42]. Adelian, Nowroozpoor(1393) emphasized the increasing of learning English by "cloud computing " in their research which was about use of "cloud computing" in educating English[43]. Nik nejad and Karbar(1392)designed and presented a sufficient architecture by concentrating on the advantages of use of "cloud computing" in comparison to the traditional method of electronic learning field in their research which was about presenting an architecture of electronic learning based on "cloud computing" [44]. Attar (1393) presented a conceptual model for test systems and educational institutes based on the concepts "cloud computing" and considered its advantages and challenges and problems in his research which was about presenting a new method in the system of test and educational institutes by use of cloud computing[45]. Amini zadeh and Amini Moghadam(1393) presented a concept model for test systems based on the concepts of "cloud computing "in their research which was about a conceptual model of the system of online test based on "cloud computing"[46]. Loh Moosavi et al. (1391) considered the use of "cloud computing" for scalability and sufficient use of sources and protection of different models of programming and also configuring and developing the application programs in the electronic learning environment in their research which was about presenting a frame work for sufficient use of sources and developing the application programs of electronic learning in the environment of "cloud computing" [47]. Movafegh Ghadiri and Rastegarpoor(1391) presented a sample that showed the advantages of portable smart education and "cloud computing" in their research which was about presenting a sample for use of "cloud computing" in the portable smart educational systems and also they showed that this application will increase the long life of battery of portable apparatus and the educational system will be more useful despite the existed challenges[48]. Mardani karani et al (1393) investigated the possibility of implementing the comprehension educational system of Golestan according the technology of "cloud computing", they also consider the challenges and necessities of Golestan educational system and the characteristics of "cloud computing" and the method of performance of possibility of implementing this educational application according to "cloud computing" to achieve their purpose[49]. In another research, Yaghoobi et al (1393)

considered and scaled the risk factors of "cloud computing" in public organizations by use of the view point of experts of Information technology [22]. Naseri nejad et al (1393) showed in their research that "cloud computing" will optimize the efficiency of educational system expert teachers [50].

III. THEORETICAL PRINCIPLES OF RESEARCH

III.I Cloud Computing

The ambiguous but also useful definition of the so-called word is that cloud computing is data, process or experiments that are in some part of the cloud which is called Internet [51]. Several definitions of "cloud computing" are presented. The research of Mac Kinzi (company of the universe management consultation) shows that there are 22 separate definitions of "cloud computing". However, Soltan & Soltan presented a complete and comprehension definition of it. According to the explanations of these writers, "cloud computing" is a method which presents a wide range of ICT services by use of ICT advancements such as virtualization and network calculations, virtual software and hardware, public and private networks (Internet) according to the needs and demands of the customer [22]. There are three types of cloud [52]:

a- public cloud: Public cloud allows the users access the cloud by Web browser. Users' pays off, when they use the service. It means pay off for each use.

b- Private cloud: Private cloud is governed in data center of an organization. Its main advantage is easiness of security management, maintenance and promotion and also more control of its development and use. Cloud computing can be compared with Internet.

c- Hybrid cloud: Hybrid cloud is a combination of the public cloud and private cloud. There is a private cloud which hybridized with one or more cloud services. It is a method that controls data and programs by more security and it allows the group access the information of Internet.

d- Community cloud: When a lot of organizations share needs, policies and one cloud structure, this cloud model is called community cloud. This cloud structure can be hosted by a third servicer or be in one of the inner group organizations.

Mardani karani et al. (1393) showed the characteristics, type of service and the distribution of the service of "cloud computing" in Fig (1) [49].

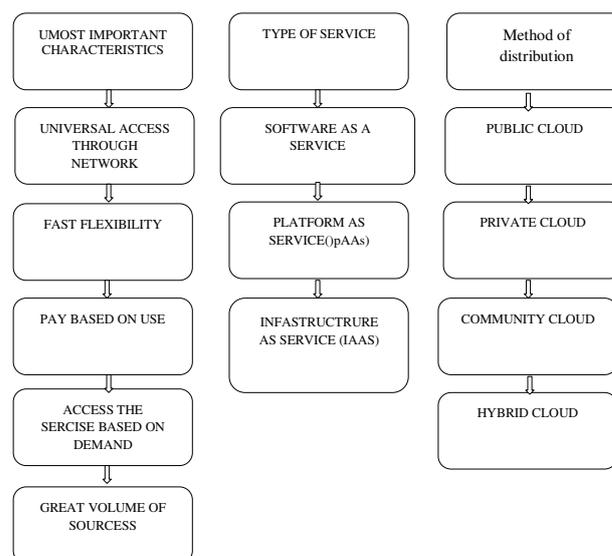


Fig.1: Method of distribution of the service of "cloud computing" [49]

III.II ADVANTAGES OF CLOUD COMPUTING[53]

A- Technical Advantages

- They can be used very much easily and without need of additional infrastructures in the circumstances of peak load.
- Saving data in the cloud, has considerable advantages in access based on client. The power of cloud processing is used for doing the works that the traditional utility programs can't do them.
- Allowance of use traditional servers and personal computers is more easily from the view point of infrastructures, maintenance and recovery and cost saving. It presents more scalability additionally so that it is sometimes possible to add the demanded calculative sources and occupational servers.

B- Advantages for Users

- One of the greatest advantages of it is that it will not force the user use of traditional computers for using an application program or buying a specific version of mobile, pad or other configured tools. It is anticipated that each tool that can be connected to Internet can execute the programs which are based on cloud.
- It needs less maintenance and repair regardless to the tool that is used. Users are not forced to concern the saving capacity, scalability or other subjects. Also, the user can access the last versions of application programs, without being forced of promoting any program.

C- Architectural Advantages

- "Cloud Computing" infrastructures will faster the acceptance of technology: When the companies priorities the technology, they understand that they need to search the new ideas and have new valuable sources. The cost is saving and also the company considers that success is not possible by only doing the activities better than before. They are forced to do new activities in order to get better results. They present the technology of "cloud computing". Need of the innovators for finding the developing sources will less the tests, so all of the users access their innovations? Users can concentrate the innovations instead of searching and managing the sources that lead innovations.
- "Cloud Computing" infrastructures lead to utility of hardware and software investments of IT: Use of beneficiary sources increases by use of "cloud computing" infrastructures. The common sources of great clouds will decrease the cost and the utility of sources increases by the time of needing the sources.
- Infrastructures of "cloud computing "can be used in regions with less space and electricity.

D- Advantages for Company

- "Cloud Computing" is useful for small and medium businesses specifically, that are being more beneficiary by use of efficient IT tools without more paying off for technical equipment and sources.
- Also, big businesses attract the "cloud computing" because of a lot of cost savings, remote control, and easiness of access and real- time collaboration capabilities.
- Other advantages of "cloud computing" are as following:
- Analysis and separation of business services from the infrastructures that are needed for its implementation (virtualization).
- Flexibility for selecting some sellers that presents the reliable and promotable business services and advanced environment.
- The flexible nature of the structure that will allocate or not allocate the sources for business services based on one demand rapidly.
- Allocation of flexible cost for transforming the investment exchange in to operating exchange according to the demand of customers.
- Reducing the cost of operating yield and more rapid development of the new business services.

"Cloud Computing" leads to more efficient use of IT hardware and software investments. It is done by breaking inherent barriers of separated systems and automation of management of systems of a group as a single entity.

The architecture of distributed electronic learning systems is as following: software parts such as client programs, a service provider of application programs and a data base server and necessary hardware parts (client computer, communication infrastructures and servers). Hardware of client can be a mobile or a desk computer. Client program can be a simple web browser or a special application program [54].

Ercan presented a model of "cloud computing" that matches the needs of administration staff, educational staff and the researches that are useful for university staff (figure 2) [9].

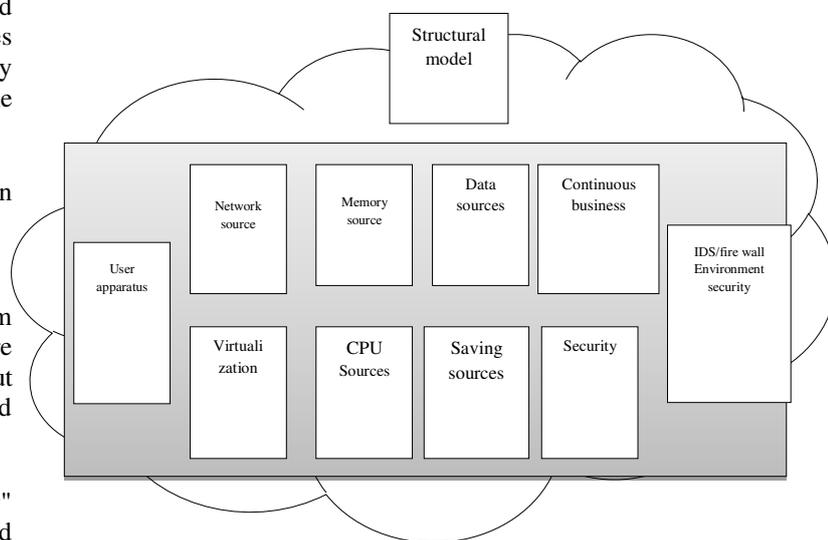


Fig. 2: A model of "cloud computing" that matches the needs of administration staff, educational staff and the researches those are useful for university staff.) [9]

IV. METHODOLOGY

The present study is a descriptive –survey study because of its purpose in the frame of application researches and its methodology. The method of questionnaire, librarian studies, observation and interviews are used for gathering the data. Indexes and the methods of descriptive analysis such as the method of descriptive analysis of demographic information are used in data statistics analysis and α -Cronbach coefficient is used for determining the stability of the studied variables. This method is used for evaluating the inner coordination of measuring tools, such as questionnaire or the tests that measures the different characteristics; their scope swings between zero to one[55]. So, this value was about 81% after distributing the questionnaire between a group of professors and experts according to the subject of the research. This

value is a suitable value based on the principles of the methodology of research.

T-test was used for determining the meaningfulness of the hypothesis and the test of un parametric freedman is used for comparing the scores of the studied factors. The statistics society of the present research is about 85 persons; They are the teachers of smart schools and ones who are responsible of information technology of Sharkord education. The simple accidental sampling is used for selection of sample based on Morgan sampling table; 70 ones were selected.

V. HYPOTHESES AND RESEARCH MODEL

H1: The security problems of cloud computing have a meaningful effect on not use of cloud computing in Iran schools.

H2: The security problems have a meaningful effect on not use of cloud computing in Iran schools.

H3: The rate of knowledge and literacy has a meaningful effect on not use of cloud computing in Iran schools.

H4: Service provider factors have a meaningful effect on not use of cloud computing in Iran schools.

H5: Management problems have a meaningful effect on not use of cloud computing in Iran schools.

H6: Infrastructural factors have a meaningful effect on not use of cloud computing in Iran schools.

The conceptual model of the present research is shown in figure (3).

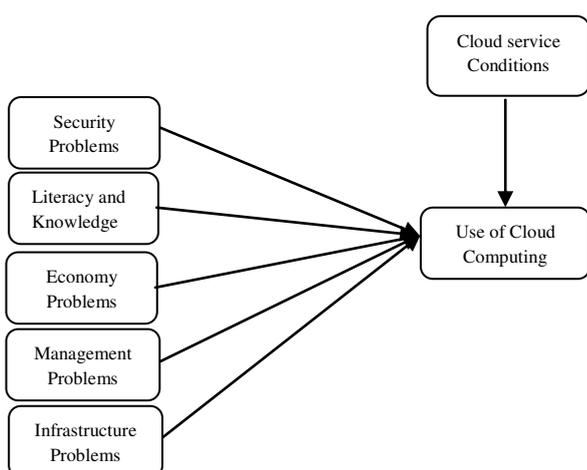


Fig 3: Research’s conceptual model

VI. RESEARCH FINDINGS

The descriptive characteristics of the variables of the present research such as the scores of the barriers of cloud computing are discussed in this section ; These barriers are security, economic problems, literacy and awareness, service providers, management problems and infrastructures from the view point of the employees of the smart schools and information technology.

Table1: Descriptive characteristics of the scores of the barriers of cloud computing from the view point of the employees of the smart schools and information technology.

Maximum	Minimum	Criteria Deviation	Mean	Obstacles
4.25	1.00	0.93	2.375	Security
5.00	1.00	1.18	3.05	Economic problems
5.00	1.00	1.07	3.29	Knowledge and literacy
4.67	1.00	0.93	2.53	Service providers
5.00	1.33	1.03	3.37	Management problems
4.80	1.20	0.82	2.75	Infrastructures

VII. TEST OF HYPOTHESES

In this section, at first we should determine whether we want to use the parametric tests or non-parametric tests for considering the hypothesizes of the research. We can use the test of Kolemogroph-Smirnof in the software of Spss. This test is one of the most important statistical tests which show the normal distribution of data. If p is less than 0.05 after the analysis of Spss in output of the test of Kolemogrooph-Smirnof, it means that the distribution is normal (test is not meaningful) and we should use the non-parametric test. Output of (sig) is more than 0.05 for all of the variables, so the distribution is normal and we should use parametric test. T-test is used for determining the meaningfulness of hypothesizes. Its results are shown in Table2.

Table2: results of the effects of security problems, economic problems, literacy and awareness, service provider’s factors, management problems and infrastructural factors in applying cloud computing in the smart schools

Meaningful	t-statistics	Freedom degree	Mean	Variable
0.000 ⁵	-5/23	59	2.375	Security problems
0.744	0.328	59	3.05	Economic problems
0.037 ⁵	2.131	59	3.29	Knowledge and literacy
0.000 ⁵	-3.89	59	2.53	Service providers
0.000 ⁵	2.748	59	3.367	Management problems
0.021 ⁵	-2.381	59	2.75	Infrastructural factors

The average score of it compared with the value of 3(average) for investigating the effects of security problems on application of cloud computing in schools and use of one – sample T-test according to the results of the first hypothesis. The meaningful value of 0.0 of T-test shows that the security problems affect the cloud computing. On the other hand, the mean value of this index (2.375) showed that employees of this field believes that security problems has less effect on cloud computing.

The average score of it compared with the value of 3(average) for investigating the effects of economic problems on application of cloud computing in schools and use of one – sample T-test according to the results of the second hypothesis. The meaningful value of 0.744 of T-test showed that this test is not meaningful; it means that economic problems have no effect on application of cloud computing in schools.

The average score of it compared with the value of 3(average) for investigating the effects of knowledge and literacy on application of cloud computing in schools and use of one – sample T-test according to the results of the third hypothesis. The meaningful level of T-test showed that the rate of knowledge and literacy affect the cloud computing. On the other hand, the mean value of this index(3.29) and the meaningful of 0.037 showed that employees of this field believes that the level of knowledge and literacy has a relatively high effect on cloud computing.

The average score of it compared with the value of 3(average) for investigating the effects of service providers factors on application of cloud computing in schools and use of one – sample T-test according to the results of the fourth hypothesis. The meaningful value of 0.0 of T-test showed that service provider’s factors affect the cloud computing in schools. On the other hand, the mean value of this index (2.53) showed that employees of this field believes that service providers factors has less effect on cloud computing.

The average score of it compared with the value of 3(average) for investigating the effects of management problems on application of cloud computing in schools and use of one – sample T-test according to the results of the fifth hypothesis. The meaningful value of 0.0 of T-test showed that management problems affect the cloud computing in schools. On the other hand, the mean value of this index (3.367) showed that employees of this field believes that the management problems has a high effect on cloud computing.

The average score of it compared with the value of 3(average) for investigating the effects of infrastructures factors on application of cloud computing in schools and use of one – sample T-test according to the results of the sixth hypothesis. The meaningful value of 0.0 of T-test showed that infrastructures factors affect the cloud computing in schools. On the other hand, the mean value of this index(2.75) showed that employees of this field believes that the infrastructures factors has a relatively less effect on cloud computing and the non- parametric

freedman test is used for comparing the grades of scores of the studied factors. The results are shown in Table3.

Table3: Investigating the average score of effect of the so-called factors as prohibitive factors on use of cloud computing

Meaningful level of P	Khi Do statistics	Freedom degree	Average ratings	Type of mark
0.000 ⁵	38.319	5	2.46	Security problems
			4.10	Literacy and knowledge
			2.97	Service providers factor
			4.08	Management factors
			3.59	Infrastructural factors

The results of non-parametric test of Freedman which are used for comparing the scores of the so-called factors showed that there is a meaningful difference between their scores ($p.0.000 < 0.05$). So, we can conclude that the rate of prohibition of these factors in use of cloud computing is different and each of these factors has a different effect. There is a meaningful difference between the effects of each barrier on use of cloud computing in the smart schools. It means that the rate of prohibition of each of these factors on use of cloud computing was different and each of them has a different effect , so that the results of non- parametric test of Freedman that is used for comparing the scores of the so-called factors shows that the rate of knowledge and literacy(mean score=4.10),management factors(mean score= 4.08), infrastructural factors(mean score=3.59), service provider factors(mean score=2.97), security problems(mean score=2.48) are the barriers of use of cloud computing in smart schools respectively.

VIII. CONCLUSION

Studying the effect of security problems on applying the cloud computing in schools showed that according the result of the first hypothesis , employees of this field believe that security problems have a less effect on use of cloud computing. These results are completely unidirectional with the results of Catteddu et al(2009) [56]. Also, Sadralsadati(2013) showed in his research that the security aspects related to privacy of data are the most great concern in using the cloud computing[57]. Studying the effect of economic problems on applying the cloud computing in schools showed that according the result of the second hypothesis, this test is not meaningful. It means that the economic problems have no effect on use of cloud computing in schools. These findings are unidirectional with findings of Perkash Bhise et al.(2013) and Ercan(2010). The results of their research show that economic problems are one of the advantages of utility of cloud computing [58; 9].

Studying the effect of knowledge and literacy on applying the cloud computing showed that according the result of the third hypothesis, employees of this field believe that the level of knowledge and literacy have a relatively high effect on use of cloud computing. These findings are unidirectional with the results of Hassani Karimabad et al(1394). Not awareness of how to use the modern information technology is a barrier of efficient use of information technology in developing the smart schools [59].

Studying the effect of service provider factors on applying the cloud computing showed that according the result of the fourth hypothesis, service provider factors have less effect on use of cloud computing. These findings are unidirectional with the results of findings of Mardani et al (1393). The dependence which may be between implementing the cloud computing and the provider of the cloud, is one of the defects of utility of cloud computing in educational institutes [49]. Pearson et al (2011) notified according to the citation of SadralSadati(2013) that the main components of cloud service providers, availability, responsibility, guarantee of responsibility toward compensation are possible, so he introduce various services of different service providers and selection of the suitable cloud services as an obstacle in front of cloud computing implementation [57].

Studying the effect of management problems on applying the cloud computing showed that according the result of the fifth hypothesis, the employees of this field believe that management problems have a high effect on use of cloud computing. These findings are completely unidirectional with the findings of Elamir et al(2013) [60].

Studying the effect of infrastructural factors on applying the cloud computing showed that according the result of the sixth hypothesis, the employees of this field believe that management problems have a relatively less effect on use of cloud computing. These findings are completely unidirectional with the findings of Hassani Karimabad et al(1394). [59]Hardware, software and equipment are known as the necessities of smart schools according to their findings[59].

There is a meaningful difference between the effect of each barrier on use of cloud computing in the smart schools. It means that the rate of prohibition of each factor was different in use of cloud computing and each of them has a different effect in this part. So that the results of non-parametric test of freedman which was about comparison of the scores of the studied factors showed that the level of knowledge and literacy, management factors, infrastructural factors, service provider factors and security problems are the barriers of use of cloud computing in the smart schools respectively.

This research does not generalized to other educational institutes because it is studied in only the smart schools and the results and yield of research based on the view point of managers, staff, and employed educators in such schools.

The following solutions are suggested according to the results of the current research for removing the studied obstacles in implementation of cloud computing in the smart schools:

- Presenting the in-service classes for promoting the digital literacy of employees and cultural teachers of educational field.
- Explaining standards and mandatory provisions of utility of security protocols of cloud service providers by competent authorities.
- Presenting a list of safe and reliable service providers by authorities of the field of information technology and ministry of interior.
- Suitable bed of telecommunications equipment and presenting a suitable Internet band width to all of the schools of the country.
- Justifying or briefing sessions and transparency of access levels and the rate of monitoring of the data in the cloud for headmasters of schools.

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Mr. Fardin Amirian has obtained B.S. degree in Agriculture from Tabriz University in 2000, and from 2014 he is pursuing Master degree in Information Technology Management in Farabi University.



Mrs. Sanaz Nikghadam Hojjati has obtained B.S. degree in Math from Islamic Azad University in 2005, and has obtained Master degree in Information Technology Management summa cum laude with a cumulative GPA of 19.94 [out of 20] amongst the graduates of this major who had been graduated in 2011 from Farabi University. Presently she is pursuing Ph.D. in Information Technology Management in SRBIA University. Her research fields are Information Business Intelligence, e-Banking, e- Commerce, Management of Information Technology Projects, Artificial Intelligence, Fuzzy Logic and Management Information Systems. She is appointed as a Lecturer in Azad University, Deptt. of Information Technology.



Miss. Fatemeh Soleimani Roozbahani has obtained B.S. degree in Nuclear Physics from Shahid Chamran University in 2009, and has obtained Master degree in Information Technology Management summa cum laude with a cumulative GPA of 19.76 [out of 20] amongst the graduates of this major who had been graduated in 2011 from Farabi University. Presently she is pursuing Ph.D. in Information Technology Management in SRBIA University. Her research fields are Information Business Intelligence, Systems Integration, Strategic Information Systems, e- Banking, e- commerce, Knowledge Management and Security in Computer Networks. She is appointed as a Lecturer in Azad University, Deptt. of Information Technology.