We live in cloud computing world, without using it in our libraries

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Abstract

Purpose – The purpose of this study was to investigate the views of librarians in Iran academic libraries about the extent of their familiarity, application and knowledge of the cloud computing in libraries.

Design/methodology/approach – This was a survey research. The statistical population of research consisted of librarians working in five universities in northeastern Iran. The sample (83 librarian) selected by using random sampling method.

Findings – The findings showed that in 2019 librarians familiar with cloud computing was low, but their use of cloud computing services was moderate. Also the findings showed that the item of providing enough computers in the library had the lowest effect on promoting the use of cloud computing and the items. Cloud computing training for librarians and users and broadband Internet were best strategies offered by librarians to promote the use of cloud computing.

Originality/value – Cloud computing has received less attention from librarians and researchers. However, based on the results of the present study, the broader use of cloud computing in libraries requires specialized and trained staff. Librarians need to broaden their knowledge in this technology.

Keywords Cloud computing, Cloud service, Academic libraries, Librarian, Iran

Paper type Research paper

1. Introduction

Cloud computing is one of the new technologies that have emerged in the recent years and adopted by many organizations. According to Han (2015), cloud computing is one of the greatest achievements in the field of technology. Cloud computing allows sharing applications among users; therefore, it can facilitate the sharing process of data, information, knowledge and services. As such, there is no need for organizations to be acquainted with all types of new hardware and software, spending a chunk of their financial resources on hiring new employees and keeping databases up to date. Hence, they should pay the costs of calculations, operations and resources (Knorr and Gruman, 2008). Accordingly, cost reduction, shared services and equipment, accelerated services, less need for support, and so on are considered as the benefits of cloud computing, which has urged organizations to consider this technology as an alternative.

Libraries and information centers are seen as the organizations that can hugely benefit from this technology. Currently, a large portion of the operations and services provided by libraries are based on information technologies such as information networks and the Internet. Cloud computing can also be used to provide enhanced services in university libraries. Cloud computing has the potential to remarkably enhance library staff's productivity and can radically reengineer and regenerate library operations that support the rendering of effective information services (Salam and Ali, 2020).

According to Scale (2009), cloud computing can be used in different sections of libraries, including the development of digital libraries and wikis, collaborative websites development, collaborative web documents and search engines. Goldner (2010) posits that reduced

information management costs as well as increased availability and visibility of resources and information are the main advantage that cloud computing can provide in libraries.

Certainly, future libraries will have no choice but to adopt cloud computing and prepare for its application and potential challenges (Han, 2015). Breeding (2011) believes that existing technologies have generally impacted the form and type of services offered at libraries, and there is a close relationship between the provided services and the status of libraries and modern technologies. Accordingly, cloud computing technology undoubtedly urges libraries to adopt this technology. Currently, approximately half of the libraries of the top universities in the world utilize cloud computing, and of the top ten universities, nine universities employ cloud-based library systems (Wang *et al.*, 2010). This suggests that academic libraries have adopted cloud computing regarding its potential benefits (Mate, 2016).

Nevertheless, many academic libraries lack adequate capabilities to achieve their expected outcomes. These potentials are not only constrained to computer hardware and software capabilities but also to human resources issues. In fact, in the library and information profession, the librarians' command of new technologies is of utmost importance (Mitchell, 2010; Liu and Cai, 2013). The library and information profession is heavily dependent on information technology (IT) so that most of the activities performed in libraries or services provided to users are IT-based. Nowadays, if librarians are not sufficiently acquainted with IT, they will fail to maintain their performance in a modern library because their abilities are not suited for library activities (Omrani, 2013). Therefore, librarians should be adequately informed about new technologies and their applications which enable them to provide appropriate services to users. Otherwise, clients should refer to alternative organizations and channels to meet their information needs. These days, libraries, and more specifically academic libraries, face intense competition from other providers of business information services and networked technologies such as the Internet and the World Wide Web. Therefore, the survival of libraries is a function of their capacity to adequately and effectively understand the emergent needs of users and respond to these needs (Manjunatha and Shivalingaiah, 2004). If academic libraries seek to consolidate their position, they should welcome changes and keep pace with developments while revisiting their goals and functions to maintain their competitive edge against powerful rivals such as computer science, information technology and knowledge management (Shahbazi and Fahimnia, 2013). Therefore, libraries and librarians need to place a premium on new technologies such as cloud computing, which may enable them to survive alongside other competitors. It is because this technology facilitates the progress of librarians and libraries toward the construction of collaborative and cooperative networks of knowledge production.

It is clear that such a goal is achieved only by adopting other technologies (e.g. library software), changing their nature and purposes, understanding the importance of technologies such as cloud computing, changing attitudes and modifying the job description of libraries. To depart from traditional roles and attain greater productivity, libraries should be transformed into knowledge-based organizations. Moreover, by creating knowledge in a participatory network, library services can be improved (Rasoulzadeh, 2013).

Generally speaking, it can be contended that the use of cloud computing in libraries is inevitable owing to its considerable benefits. This means that libraries and information centers should strive to not only go beyond their traditional and inflexible framework but also look for solutions, strategies and appropriate facilities to achieve such a goal and cut back on the costs of the maintenance, staff, technology, etc. Knowledge-based networks are the best solution to construct an environment for training and optimal use of intellectual capital, which can also prohibit the squandering of human, intellectual and economic resources. Although cloud technology and services represent new and emergent technology and have not established a strong foothold in libraries, they portray a promising future for libraries (Wang *et al.*, 2010). In the meantime, the key to a successful implementation of cloud-based

designs is librarians because they need to exploit this technology as a way of providing services and appreciating its importance in this process. Accordingly, the purpose of this study is to investigate the views of the librarians in Iranian academic libraries about the extent of their familiarity, application and knowledge of cloud computing technology in their libraries. To achieve the research purpose, the following two questions will be examined in this research.

(1) What is the level of familiarity of cloud computing among librarians?

(2) What is the level of using cloud computing technology by librarians? (This question consists of three sub-questions):

- What is the status of librarians' use of cloud computing technology?

- What do librarians think about the need to use cloud computing in the library?

- What are the solutions to promote the use of cloud computing in the library?

2. Literature review

A review of the research in the field of cloud computing in libraries and information centers suggests that this issue has received scant attention. There have been studies which focused on the conceptual and architecture of cloud computing (Chen and Deng, 2009; Sharma *et al.*, 2017), the types of cloud computing, its diverse architectures, requirements and infrastructure. Moreover, research (Irwansyah, 2017; Panetta, 2017; Makori, 2016; Akeriwa *et al.*, 2015; Oyeleye *et al.*, 2014) have chiefly focused on theoretical topics, such as the definition, types, benefits, risks and challenges of cloud computing. The point underscored in these articles is that librarians need to be informed about this technology and its various aspects. Some other studies have attempted to take a closer look at cloud computing technology and accordingly, have theoretically examined the determinants of cloud computing adoption (Nassif, 2019; Ooi *et al.*, 2018; Bachleda and Ouaaziz, 2017; Galvin and Sun, 2012). Also, few articles have quantitatively and qualitatively investigated cloud computing in libraries and information centers.

Mahalakshmi and Surnam (2012) conducted a study to raise the awareness of librarians and library staff about cloud computing and its applications in libraries. The findings revealed that many respondents are conversant with cloud computing and the applications of this technology in libraries. Using a similar approach, Yuvaraj (2013) examined the utilization of cloud computing by librarians in 29 Indian academic libraries. The findings demonstrated that respondents were particularly interested in using cloud computing in the library and its various capabilities and tools to improve library services.

In another study that surveyed the views of library staff on cloud computing in the UAE, El Khatib and Catalan Opulencia (2015) explored the impact of cloud computing on libraries. Using a sample of 30 libraries, they reported that 83.3% of library staff are familiar with cloud computing, and 55.6% of the respondents had an experience of using cloud computing.

Regarding barriers to cloud computing in digital libraries, Norozi and Haddad Oskoee (2018) identified obstacles to implementing cloud computing from the standpoint of the officials in the digital library portal of Iran. Using a researcher-made questionnaire, they surveyed the views of 30 managers Findings suggested that legal (3.7), economic (2.7), managerial (1.82) and security (1.78) barriers have the greatest impact on the implementation of cloud computing in portals, respectively.

Two new studies have been conducted in the developing country of Nigeria that examines the subject of cloud computing in academic libraries. In the first study, Tella *et al.* (2020) have examined determinants of cloud computing adoption for web-based services in academic

libraries in Nigeria. The results of this research have demonstrated that the nine determinants facilitating conditions, perceived benefits, user-friendliness, perceived ease of use, perceived security, ease of maintenance, perceived flexibility, perceived reliability and increased performance are good predictors of cloud computing adoption. They are all positively correlated with the adoption of cloud computing for web-based services in academic libraries. In another study, Zubairu *et al.* (2021) focused on awareness and adoption of cloud computing in Nigerian libraries. They studied the extent of cloud computing awareness among library personnel and ascertain what they use it for. Fifty-three library personnel were randomly selected from four private university libraries. Research findings showed that most library personnel are aware of cloud computing and they use it mostly for personal than professional purposes. The most libraries provide mailing services and social networking cloud-based services.

A review of relevant research suggests that due to the emergent nature of cloud computing, there is a paucity of research in this field, more especially about libraries and information centers. The bulk of studies in this field are theoretical, addressing concepts, advantages and challenges facing librarians and libraries in the adoption of cloud computing. Hence, there have been a few studies reporting practical work in this field showing the nascent nature of this field. In general, most research has stressed that cloud computing technology can have a significant impact on the future of libraries, and its adoption will bring many benefits to libraries. Accordingly, librarians need to expand their knowledge and skills in the field of cloud computing and take a step to promote the adoption of this technology. A look at more recent research shows that cloud computing is a common and trivial subject in developed countries; however, it still poses challenges for libraries in developing countries. Overall, given the importance of this issue and the existing research gap, the present study can be helpful to librarians and experts in this field and promote their knowledge.

3. Methodology
3.1 Research design
In this method, survey research has been adopted. Survey research is used to collect data related to the present time to explore the behaviors and motivations of individuals or groups. Based on information and survey data, it establishes connections between different variables (Hafeznia, 2020). A survey is commonly used in information system evaluation research to collect self-reported data from study participants. A survey usually focuses on factual information about individuals, or it might aim to collect the opinions of the survey-takers (Tella *et al.*, 2020).

3.2 The population of the study
The scope of the study covers the university libraries in the northeastern of Iran. The statistical population of the research consisted of the librarians who work in five universities. According to official statistics, there are 105 librarians employed in these universities.

3.3 Sample and sampling procedure
The selection of the sample was based on qualifications. Therefore, all the qualified librarians in each of the five universities were selected to participate in the study. Using Cochran's formula, a sample size of $n = 83$ people was calculated for the research. The sample was selected using the random sampling method. After sending the questionnaires, 82 questionnaires were collected, serving as the basis for answering research questions.

3.4 Measuring instrument

There are various data collection tools. A method commonly used by researchers in descriptive, analytical or interventional research is the questionnaire (Sarmad *et al.*, 2020). The questionnaire used in this study comprised three main parts: the first gathered demographic information of the respondents including the name of university and library, gender, the field of study, level of education, work experience and job description. The second part examined librarians' familiarity with cloud computing (12 items). The third part was concerned with the use of cloud computing, which encompassed: (1) utilization of cloud computing services, (2) reasons for using/not using cloud computing in the library and (3) strategies to promote the use of cloud computing (31 items). A five-point Likert format ranging from very much to very low was adopted for the instrument.

3.5 Validity and reliability

When measuring the validity of an instrument, it is important to know whether the instrument measures what the researcher seeks to measure (Dayani, 2008). To evaluate the validity of the researcher-made questionnaires, apart from the initial authentication of the supervisors and advisors, it was presented to six professors at the Department of Knowledge and Information Science of Ferdowsi University to corroborate its validity. The reliability of each instrument depends on its consistency, homogeneity and internal coordination (Dayani, 2008). Reliability includes two evaluations: instrument consistency and internal consistency. There are several methods for measuring the reliability and internal consistency of an instrument, including Cronbach's alpha coefficient (Momeni and Qayyumi, 2011). Since Cronbach's alpha coefficient is usually a sound indicator for measuring the reliability of an instrument and the internal consistency of items, the reliability of the questionnaire used in this research was measured by Cronbach's alpha test. The findings are presented in Table 1.

The findings of the table above show that in all the studied variables the alpha level was greater than 0.7, and therefore, the questionnaire has desirable internal consistency.

3.6 Testing hypotheses regarding the normal distribution of variables

Before determining the type of test, especially in comparative and correlational tests, it is essential to ensure that variables are normally distributed. In the case of normal distribution, parametric tests are recommended; otherwise, nonparametric tests should be used (Vaughan, 2001). There are a variety of tests to evaluate the normal distribution of data, including Kolmogorov–Smirnov, Shapiro–Wilk and normal probability plot. In this study, we used the Kolmogorov–Smirnov test, the findings of which are presented in Table 2.

According to the findings of the table above, the variable of familiarity with cloud computing was normal at a significant level of more than 0.05, and the variable of using cloud

Variable	Criteria	Alpha coefficient
Familiarity with cloud computing	Familiarity cloud computing	0.93
Use of cloud computing	Utilization of cloud computing services	0.85
	Reasons for using/not using cloud computing in the library	0.75
	Strategies to promote the use of cloud computing	0.93
Total		0.84

Table 1.
Cronbach's alpha
coefficient of the
research questionnaire

computing services was abnormal at a significant level of 0.05. The normal and abnormal variables were tested using parametric and nonparametric tests.

4. Results

4.1 Demographic findings

Before answering the main research question, descriptive findings related to the demographic information of respondents are presented to gain deeper insights into the characteristics of the respondents. Accordingly, 64 librarians (78%) were women. Also, 78 (95%) had a university degree (bachelor's and master's degrees). Regarding the field of study, more than 92% ($n = 74$) had a degree in information science and knowledge management. Most librarians (61%) had less than 15 years of work experience. In general, the demographic findings suggest that the study population consists of educated and young librarians specialized in information science.

4.2 Research findings

4.2.1 Librarians' familiarity with cloud computing. To assess the familiarity of librarians with cloud computing, 12 items were identified, the results of which are presented in Table 3.

Table 2.
Results of Kolmogorov–Smirnov test regarding the normal distribution of research variables

Row	Variable	Significance level of test p-value
1	Familiarity with cloud computing	0.2
2	The extent of using cloud computing services	0.007

| | | | | | Mean CI at 95% level | |
| | | | | | Lower limit | Upper limit |
Row	Item	Mean	SD			
1	Reading materials (books, articles, etc.) about cloud computing	2.41	1.06		2.18	2.65
2	Familiarity with the applications of cloud computing in the library	2.57	0.96		2.36	2.79
3	Knowing the benefits of using cloud computing in the library	2.7	0.97		2.48	2.91
4	Being acquitted with different models and methods of cloud computing	2.33	1.08		2.33	2.57
5	Knowing the drawbacks of cloud computing	2.2	1.1		1.95	2.44
6	Understanding the requirements of using cloud computing at the library	2.54	1.17		2.28	2.8
7	Possessing kills required to work with cloud computing technology	2.51	1.15		2.26	2.77
8	Familiarity with cloud-based social networks (e.g. Flickr, Instagram and Facebook)	3.1	1.02		2.87	3.32
9	Familiarity with e-mail as a cloud computing provider in the library	3.39	1.13		3.14	3.64
10	Familiarity with associations as a provider of cloud computing services in the library	2.34	1.24		2.07	2.62
11	Knowing how to use Google Drive, Drop box, Slide share, Egnyte for file sharing in the cloud	2.71	1.31		2.42	3
12	Knowing how to use websites such as Google, Zotero, Delicious and QR stuff	2.83	1.15		2.58	3.08
13	Total	2.63	0.87		2.44	2.82

Table 3.
Descriptive statistics of librarians' familiarity with cloud computing

According to the findings of Table 3, since the upper limit of this variable is less than 3 (slightly higher than 56%), the respondents have rated their familiarity with cloud computing as below average.

4.2.2 Librarians' use of cloud computing. To investigate the degree of using cloud computing technology by librarians, three variables were identified. Therefore, this research question includes three secondary items, each of which is dedicated to one of these criteria.

4.2.2.1 Extent of use. To answer this question, 12 items were identified, which were assessed by librarians on a five-point Likert scale (very low to very high). Table 4 shows some descriptive statistics about the use of this technology.

As shown in Table 4, the mean CI (3) is at the average level. Hence, the librarians' use of cloud computing services in the surveyed libraries was moderate (at the level of 60%).

4.2.2.2 The necessity/unnecessity for cloud computing. To answer this question, eight items were developed and provided to librarians to be scored on a five-point Likert scale. Table 5 provides some descriptive statistics of this variable.

According to Table 5, "Efficacy and utility of using cloud computing programs for the library" and "Facilitating the library operations using cloud computing programs" with an upper limit of 4.06 are among the main reasons cited by librarians regarding the necessity of using cloud computing. In contrast, the "Security in storing online data in cloud environments" gained the lowest upper limit (2.93).

To determine the priority of these needs, we used the Friedman test to find out whether there was any difference between these needs. The test results are listed in Table 6.

According to Table 6, since the significance level for "Reasons that highlight the need for cloud computing" is less than 0.05, the equal priority of items is rejected. According to Table 5, the item "Efficacy and utility of using cloud computing programs for the library" with a mean rank of 5.86

Row	Item	Mean	SD	Mean CI of 95% Lower limit	Upper limit
1	Status of using cloud computing in the library	2.67	1.16	2.38	2.96
2	The extent of using devices such as computers, laptops, mobile phones, etc.	3.16	1.15	2.88	3.42
3	Using cloud-based services (postal services, associations, social networks and cloud-based information collection)	2.7	1.2	2.43	2.97
4	Using cloud computing to perform tasks such as e-mail service, online applications, payment for the storage of online computer files, backup of an online site, etc.	2.78	1.19	2.52	3.05
5	Using cloud computing to collaborate with libraries and information centers in research projects	2.41	1.26	2.11	2.67
6	Using features and services of cloud archiving in the library	2.52	1.33	2.22	2.83
7	Using information services via e-mail (e-mail, Gmail, Yahoo and Hotmail)	3.48	1.1	3.24	3.74
8	Using online chat services in the library	2.71	1.59	2.39	3.09
9	Using open drive, Drop box, sugar sync to store data and information	2.16	1.54	1.84	2.53
10	Using online search services such as lib.ir, Simorgh network, Nosa, etc.	3.22	1.45	2.94	3.58
11	Using cloud computing for business purposes such as storing photos, videos and online files	2.89	1.36	2.6	3.2
12	Using cloud computing for professional purposes such as collaborating with library users, providing reference services and collaborating with other librarians	2.78	1.28	2.5	3.07
Total		2.78	0.92	2.59	3

Table 4.
Descriptive statistics of librarians' use of cloud computing services

Row	Item	Mean	SD	Mean CI of 95% Lower limit	Upper limit	Mean rank
1	Security in storing online data in cloud environments	2.73	0.89	2.53	2.93	2.91
2	Keeping a backup of online files by service providers	3.02	0.93	2.82	3.23	3.59
3	Ensuring the possibility of retrieving information from the cloud	3.01	0.73	2.85	3.17	3.43
4	Greater trust of library in cloud computing technology compared to internal information technology systems	3.07	0.8	2.9	3.25	3.65
5	Increasing the productivity of the library using cloud computing	3.67	0.75	3.5	3.83	5.15
6	Efficacy and utility of using cloud computing programs for the library	3.93	0.62	3.79	4.06	5.86
7	Facilitating the library operations using cloud computing programs	3.9	0.71	3.74	4.06	5.79
8	Reducing overall costs and avoiding the costs of purchasing various software and hardware-based cloud computing	3.85	0.77	3.68	4.02	5.61
Total		3.39	0.4	3.3	3.48	

Table 5.
Librarians' views on the necessity of using cloud computing at the library

Variable	X^2 statistics	Df	Significance level of test p-value	Test results
Reasons that highlight the need for cloud computing	193.83	7	0.000	Significant

Table 6.
Friedman test results to prioritize librarians' views about the necessity/unnecessity of using cloud computing

was ranked first and the item "Security in storing online data in cloud environments" with the lowest mean rank (2.91) gained the last ranked.

4.2.2.3 Solutions to promote the use of cloud computing. To answer this question, 11 items were developed, which were scored by librarians on a five-point Likert scale. Some descriptive statistics are shown in Table 7.

According to Table 7, the items "Cloud computing training for librarians and users" with an upper limit of 4.53 and "broadband Internet" with an upper limit of 4.48 were the best strategies offered by respondents to promote the use of cloud computing. Also, the item "Providing enough computers in the library" with an upper limit of 4.16 had the lowest effect on promoting the use of cloud computing. To determine the priority of these strategies, we used the Friedman test to find out whether there was any difference between these strategies. The test results are listed in Table 8.

According to Table 8, the significance level for the criterion of "Promoting the use of cloud computing" is less than 0.05; therefore, the equal priority of items is rejected. As shown in Table 7, the item "Teaching cloud computing to librarians and users" had the highest mean rank (6.96) and was ranked the first rank. In contrast, the item "Providing enough computers in the library" and "Librarians' ability to manage and maintain digital information" had the lowest mean rank (5.36) and gained the last rank.

Row	Item	Mean	SD	Average CI at 95% level		Mean rank
				Lower limit	Upper limit	
1	Broadening the knowledge and information of librarians about cloud computing	4.1	0.73	3.94	4.26	5.66
2	Librarian's ability in management and maintenance of digital information	4.02	0.72	3.86	4.18	5.36
3	Developing the skills of librarians in providing electronic services to clients and collecting and organizing digital resources	4.22	0.62	4.08	4.36	6.12
4	Ability of librarians to access, analyze and use digital information	4.17	0.62	4.03	4.31	5.9
5	Skills of librarians to use the Internet, search and retrieve resources	4.16	0.67	4.01	4.31	5.8
6	Using CRM (customer relationship management)	4.13	0.71	3.98	4.3	5.77
7	Broadband internet	4.32	0.73	4.16	4.48	6.71
8	Providing enough computers in the library	3.96	0.9	3.76	4.16	5.36
9	Cloud computing training for librarians and users	4.38	0.64	4.24	4.53	6.96
10	Eradicating administrative restrictions	4.16	0.76	3.99	4.33	5.8
11	Adequate budget and support of human resources	4.31	0.64	4.17	4.45	6.57
Total		4.17	0.7	4.2	4.33	

Table 7.
Librarians' views on the importance of strategies to promote the use of cloud computing

Variable	X^2 statistics	df	Significance level of test p-value	Test results
Strategies to promote the use of cloud computing	43.57	10	0.000	Significant

Table 8.
Results of the Friedman test to prioritize the views of library librarians about how to promote the use of cloud computing

5. Discussion of findings

The goal of this study was to investigate the familiarity of librarians with cloud computing and their use of cloud computing in libraries, which comprised three sub-questions. The findings of Table 3 illustrated that the librarians' familiarity with cloud computing was below average.

A review of the literature suggested the paucity of research that has directly addressed this issue. However, the results revealed that Iranian librarians have poor knowledge of cloud computing. This finding can be attributed to the fact that cloud computing technology has received the growing attention of organizations in recent years and the public. Moreover, current librarians have not received any training for this technology during their studies at the university. Besides, the librarians have been negligent in self-learning for a variety of excuses such as busy schedules or lack of interest. The score of the related item lends credit to this conclusion. Another reason is that libraries have failed to offer proper training to their librarians in this area. The results of this research also suggest that librarians are aware of the importance and benefits of cloud computing in the library environment, and such information can pave the way for their effective participation in training courses. In this regard, the findings of Valhamdi and Mazaheri (2017) demonstrated that the variable of "understanding the efficacy and utility of cloud computing" has the greatest impact on the decision to use cloud computing.

The results (Table 4) also revealed that from the standpoint of respondents, the use of cloud computing was at a moderate level. According to the respondents, among the items of "Cloud computing use" variable, "Using electronic services (e-mail, Gmail, Yahoo and Hotmail)" required the highest and "use of open drive, dropbox", "sugar sync for data and information storage" required the least use of cloud computing. As mentioned earlier, the bulk of studies suggest that e-mail is frequently used by librarians. Zarei Shandiz *et al.* (2017) attributed it to the widespread use of this tool in society. Therefore, it can be argued that the limited use of tools such as Open drive, Dropbox and Sugar sync is driven by the fact that these tools have not been properly introduced to society.

Findings related to the necessity/unnecessity of using cloud computing (Tables 5 and 6) also demonstrated that among the reasons above, "Efficacy and utility of using cloud computing" and "Facilitating library operations" are the main rationales for the use of cloud computing by librarians. In line with these results, Valhamdi and Mazaheri (2017) reported that the variable of understanding the efficacy and utility of cloud computing has the greatest impact on the decision to use this technology. In other words, the variable of the decision to use cloud computing is primarily influenced by the variables of understanding its utility, followed by the convenience of cloud computing and attitude toward it. Moreover, Doshmanziari (2016) reported that among the factors affecting the use of cloud computing in universities, utility and facilitation were the third crucial factors. Considering the utility of cloud computing, it seems that the benefits of this technology are the main reason for its wide adoption. Librarians also underlined the importance of this factor in their preference for adopting this technology at the library.

Although Subashini and Kavitha (2011) cite security as one of the key factors curbing the growth of business cloud computing, the findings showed that in the view of respondents, security in storing data was the least important reason that justified the use of cloud computing. In keeping with this finding, Doshmanziari (2016) reported that among five major factors affecting the use of cloud computing, security was ranked fifth in terms of importance. However, Yaghubi *et al.* (2016) stated that among 16 sub-factors affecting the use of cloud computing in the healthcare industry, security and confidentiality were ranked first. It seems that considering the status of the library and people's trust in this organization, data security gains the lowest priority in highlighting the necessity of using cloud computing.

It appears that librarians are adequately aware of the advantages of using cloud computing technology in libraries. This may be originated in their understanding of the benefits offered by other technologies and their experiences of using such technologies. In recent years, technologies have facilitated and expanded library services, and hence promoted customer satisfaction. Another reason may be that librarians are accustomed to using cloud computing services in their personal lives and understand the benefits of this technology. It should be noted that being cognizant of the merits of cloud computing technology can pave the way for the provision of suitable educational services so that managers can hold courses and workshops in this field for librarians. More importantly, this preparedness can facilitate the adoption of this technology by libraries.

The latest research findings on strategies of promoting cloud computing (Tables 7 and 8) also manifested that to respondents, "Teaching cloud computing to librarians and users" was the most important strategy to promote cloud computing. In keeping with this result, Larijani and Salarpoor (2010) reported that among the factors promoting information technology in libraries, the respondents identified "Teaching the methods of using information technology" (94.7%) as the most influential factor. Hariri and Yari Firoozabadi (2009) also found that to managers, the main barrier to utilizing information technology is the lack of training. As regards the feasibility of implementing cloud computing in terms of human resources, managers believed that learning how to use cloud computing through formal and informal training was the third important factor.

However, to librarians, cloud computing training was a key factor in promoting the use of cloud computing. Therefore, it seems that managers have a slightly different view than librarians. Besides, as noted earlier, even though managers support cloud computing, their negligence in recruiting necessary staff, hardware and software facilities, and budget allocation suggest otherwise. It appears that managers just pay lip service to the importance of new technologies, and in practice, they are not prepared to take any measures that imply their appreciation of this technology. Thus, to improve the situation and promote the adoption of new technologies in the libraries, managers are recommended to look at the situation from the angle of librarians and place a premium on teaching new technology to librarians.

On the other hand, greater attention should be dedicated to the quantitative and qualitative development of hardware and software facilities in libraries. Increasing the bandwidth of the Internet or supplying more computers can bolster the necessary infrastructure for cloud computing in libraries, as pointed out by librarians. Legal and administrative restrictions must also be dismantled because cloud computing could not be implemented in libraries unless a legal and administrative mechanism is already in place. Norozi and Haddad Oskoee (2018) also found that legal barriers are the main challenges facing digital libraries in implementing cloud computing, which must be overcome. Another important issue noted by librarians, and reported in the literature, is concerned with budget. Cloud computing requires an initial investment, and libraries need to have enough financial resources to purchase the equipment and infrastructure. In sum, eliminating administrative barriers is the first step followed by providing adequate funding and training for librarians as well as upgrading hardware and software can promote the use of cloud computing in libraries.

6. Conclusion

Findings suggest that despite the potential benefits of cloud computing to reduce costs, time and parallel work in libraries, librarians are not sufficiently cognizant of this technology and its applications. The results demonstrated that from the perspective of library staff, the feasibility of implementing this technology was at the medium level. The broader use of this technology in libraries requires specialized and trained staff. Librarians need to broaden their knowledge in the field of cloud computing, and administrators should provide in-service training for librarians and pay more attention to human resources as the pillars of the library. Also, in the wake of the current situation and the prevalence of COVID-19 disease, it is recommended to allocate special attention to this technology because it is a web-based service that can remarkably diminish the need for in-person visits to libraries. Also, there is a need to investigate and eliminate all factors that could militate against cloud computing adoption in libraries, such as the Internet services and hardware requirements (e.g. routers, switches and various communication media) should be resolved before engaging in cloud computing adoption in the libraries.

In light of the findings of this study, it is suggested that libraries and information centers should work on the following subjects in order to shed light on different facets of cloud computing:

(1) Researching to explore users' opinions about the extent of their familiarity with cloud computing technology and compare the results with that of librarians in the present study;

(2) Designing a pilot study about one or more cloud computing services and surveying user satisfaction;

(3) Researching users' views about the extent of using cloud computing as well as their awareness of the benefits of this technology;

(4) Comparing university libraries in developing and developed countries in terms of using cloud computing.

Finally, as with any study, the present study had several limitations. Among other things, one of the main challenges in the present study was obtaining the necessary permissions to distribute the questionnaire in different universities, which turned out to be a time-consuming process due to the bureaucracy of obtaining permits. Moreover, the dispersion of the study population made it difficult to access them for data collection. The poor cooperation of the respondents in filling out the electronic questionnaire also postponed data collection.

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