International Journal of Advanced Biotechnology and Research (IJBR)
ISSN 0976-2612, Online ISSN 2278–599X,
Vol-7, Issue-1, 2016, pp332-341
http://www.bipublication.com

**Review Article**

# The study of virtualization in cloud computing

**[1]Hosein Fatahei, [2]Alireza Bahari and [1]Nasrin Evazzadeh Mohammadiyan**

[1]Shiraz University, Faculty of Engineering,
Department of Computer Engineering, shiraz, Iran.
[2]Bahonar Shiraz University,
Faculty of Engineering, Department of Computer Engineering, Shiraz, Iran

[Received-27/02/2016, Accepted-08/03/2016, Published-25/03/2016]

## ABSTRACT

**Objective**: Cloud computing refers to applications and services that run in a distributed network and uses virtual resources. The purpose of the present article is to study the existing and potential features of the management and sharing knowledge systems based on cloud computing in libraries and information centers. Present study, in addition to the investigation of existing and potential library software in the cloud-computing models of "software as a service" and "platformas a service", also discusses ability of such models in the creation, dissemination and sharing of knowledge. Present study, besides investigating the software features that have proposed their utilities with these models, have also attempted to identify the usage and feedbacks of using these products in the world's top libraries and have proposed suggestions in relation to the purpose of the study.

**Methodology/Approach**: The present study to collect data has used a combination of documentary study and the content analysis of websites of libraries of one hundred top universities according to the webometric website.

**Findings**: The results showed that more than 46% of the world's top libraries use cloud based systems.

**Keywords**: knowledge sharing, cloud computing, library and information center, knowledge management

## INTRODUCTION AND PROBLEM DESCRIPTION

Information and communication technologies such as the Internet have become a vital part of human life and are expanding day by day. In line with it, the needs of community members such as information security, fast processing, dynamic and instantaneous access, mutual partnerships, the power of focusing on institutional projects instead of wasting time for keeping servers and most importantly saving in costs has become increasingly important.

The solution that today in the field of technology is proposed for such problems is known as cloud computing (Liaqat, 2011).

On the other hand, networks for enterprises provide access to knowledge, resources, market and technology. A collaborative network represent the nature of organization, infrastructure, business processes, resources and relationships that support a collaborative effort to achieve collective benefits, regardless of whether the benefit is in the program, service or product (Lai, Tam and Chan, 2012). Collaborative networks offer advantages including speed, complementary roles, developmental aspects, competitiveness, upgrading and optimization of resources and innovation. So many organizations and centers

tend to establish collaborative networks similar to their centers to benefit from the advantages mentioned. The formation and implementation of collaborative networks also includes problems, the most important of them has a technological nature mainly focused on issues such as integration and coordination of internal and external operations of organization (ibid.). Cloud computing is a technology that concerns mentioned problems and issues. The term cloud is derived from the idea that users and enterprises are able to access applications from anywhere in the world when needed. Cloud computing is an emerging platform for applications, which aims to share data, information, knowledge, computing and services among users (Ibid.). Organizations only for what they use in calculations, operations and network resources pay some money and neither are obliged to spend their financial resources to keep their datacenters up to date and nor are required to use employees who are familiar with all kinds of hardware and software. In the environment of a collaborative networks, cloud computing provides kind of service that facilitates the mutual activity of individuals in a knowledge network. Cloud computing technology is partially considered in the commercial fields and its economic and technological benefits are limited in use, but as the system is emerging, few studies are done on the use of these systems especially in libraries. The purpose of this study was to investigate areas in which librarians and library users can use of technology for carrying out activities related to production, sharing and management of the knowledge. Accordingly, the context and purpose of this paper is as follows:

1) the concept of cloud in general and in library activities in particular is briefly considered theoretically,
2) the role of cloud systems of knowledge in facilitating cooperative activities with an emphasis on library software is explained and points of interest on the role of libraryare drawn in the models“Software-as-a-service” (SaaS) and “Platform-as-a-Service” (PaaS) in the structure of collaborative network for library services,
3) given the research part of paper,attention and the use of the world's top universities of this technology is examined and studied,
4) in terms of discussion and conclusion and as a suggestion, the use of the model of “Knowledge as a service” in the formation of a knowledge network in the academic libraries of Iranis considered.

**Knowledge sharing in the network environment**

Chisholm(1998, cited in Lai, 2012) defines a network as an organizational system that is capable of bringing together individuals and organizations around the common issues and objectives. Network having a flexible structure take the form of a collaborative activity, where some people are connected and communicate with each other.

Knowledge management systems are systems those helping to integrate and coordinate the exchange of information across the networks. The knowledge is a combination of experience, knowledge, values and information relating to a particular context and a specialized perspective as a platform to assess and share new information and experiences (Davenport and Pruask, 1998 cited in Lai et al., 2012). Knowledge management refers to a set of methods, tools, techniques and values that organizations can develop, learn, distribute and measure for returning intellectual capital. In collaboration networks, knowledge should be placed on collaborative network. Knowledge Management in collaboration networks is a way to manage the flow of knowledge among the various members of the network (Lai, Tam and Chan, 2012). Knowledge networks are groups or teams that their effectiveness depends to the extent people know who has the needed knowledge and expertise, where is the knowledge and expertise, where and when the specialist knowledge are needed (Alavi and Tiwana, 2002).

Information and communication technology provide the knowledge management with the possibility of activities such as collaborative support, knowledge sharing, organizational learning and institutional memory (Hicks et al., 2002). There is a wide range of technologies facilitating activities of collaborative networks. The Internet is type of information and communication technology, which along with other technologies and services provides a digital environment for continued creation of new knowledge, its fast spreading and entering it into the organization's configuration (Liao, 2003). For collaborative networks, the main feature of knowledge management systems is the management activities relating to knowledge flow in different stages of the cooperation cycle among network members through the Internet network environment (Lai, Tam and Chan, 2012).

**Virtualization in cloud computing**

Cloud computing means development and the use of Internet-based computer technology. The technology is type of computer computing in a space in which IT-related capabilities as a service supplies to the user and allows the user to access to services that based on technology in Internet, without requiring specific information about this technology or the infrastructure. Cloud computing is structurally similar to a cloud mass, by which users can have access to applications from anywhere in the world (Sasinki, 2011).

Cloud Computing provides the opportunity for individuals that instead of saving images in a folder on the PC to store them on a web space and access to them through an Internet service.in this case, no space of the computer's hard drive occupies and there is no need to install applications. Of course, it is possible that in charge of using these services, users will be obliged to pay some money to the owner or provider of the software or service. In Internet-based services, users have not the ownership capability and only can use of the services. Presence of major companies such as Microsoft, Google, Amazon and others in the competitive arena of cloud computing shows the rapid development and dominance of this type of computing in the world of information technology (ibid.).

The reason for simile of cloud to Internet is that Internet such as a cloud hides its technical details to the users and there is a layer of abstraction between the user and the technical details. In addition, the cloud has the feature of being for public and everyone can use its benefits. The cloud computing is used to a larger group of people can use of technologies (Liaqat, 2011).

The technology operates like a big computing machine over Internet so that receives a large volume of data stored in multiple separate computers to do the necessary calculations on them (Wang, Zhao and Kong, 2012). America's National Institute of Standards and Technology defined cloud computing as follows:

Cloud computing is a model for public access in an easy way and according to the network's order, to a set of configurable computing resources such as networks, servers, storage space, applications and services so that they can be used with the minimal administrative effort or necessary interaction with the service provider quickly (Liaqat, 2011).

The most important benefits of cloud computing are:

1. the lack of dependency to the hardware in cloud computing. Cloud computing refers to applications and services that run in a distributed network and make use of virtual hardware and software resources (Sasinki, 2011),
2. One of the most important advantages of cloud computing is when doing operations requiring the group cooperation and collaboration on shared document. The ability to share and edit documents between several users simultaneously is one of the main advantages of web applications, which facilitates the collaboration on projects (Liaqat, 2011),
3. Cloud computing is a highly successful solution for parallel and batch processing as well as analytic tasks. If there is parallelism in software, users can use

cloud computing to reduce their computation time,

4. in the cloud resources are shared and if need will be categorized and communications are standards-based (Goldner and Birch, 2011),
5. Cloud computing completely separates characteristics of users from system developers. Applications run on a system that is hidden from the user's perspective; Data is stored in an unknown place; systems' management can be done from the outside and they can be accessed from anywhere (Liaqat, 2011),
6. Coalition of resources. Cloud computing is an abstraction that is based on the sharing and coalition of physical and software resources and their displays as virtual resources (Sasinki, 2011).

According to the capabilities mentioned, cloud computing based systems have other desirable features, including choosing the service based on demand; wide access to the network; ability of rapid expansion; a service calculating he cost of services the client has used; lower costs; ease of use; quality of service; IT management from the outside; easier maintenance and improved facilities (ibid.).

The services offered by cloud computing can be divided into three categories: "Software as a Service", "Platform as a service" and "infrastructure as a service" (Sultan, 2010). Cloud computing services can provide borderless, reliable and high quality technological support to the user. On the other hand, institutions can adopt services of cloud computing in three ways: public, private and hybrid clouds (Goscinski and Brock, 2010). In **Fig. 1,** you can see advantages of using cloud computing in a library:

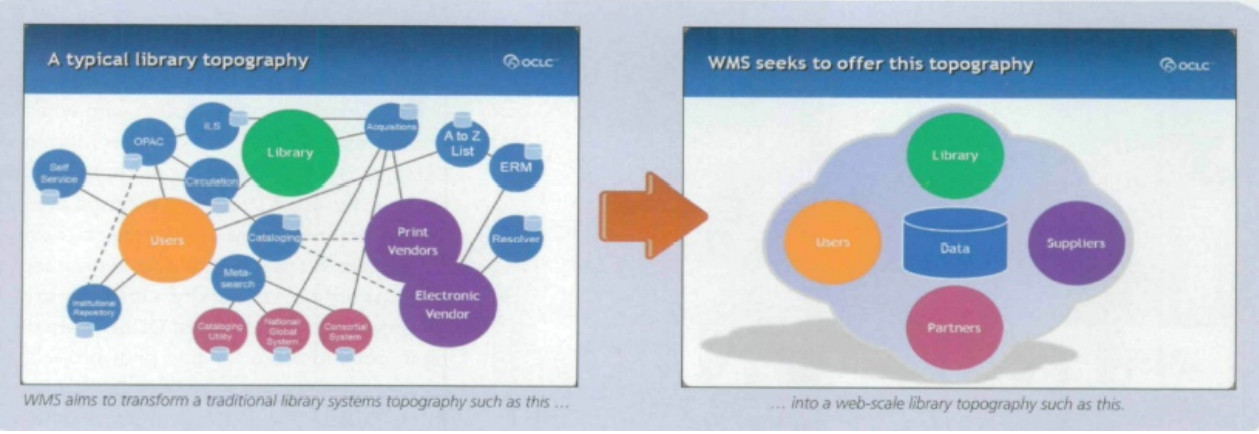



**Figure 1:** Topography of using a cloud-based library system (Dula et al., 2012)

**Investigating studies and practical examples**

Library inventory management for the library resources has changed and has converted to products of knowledge base. Integrated library system is a place for the original library data. This data includes data on purchases and costs, bibliographic records, information about the flow of resources, reports, searches, orders, resources of knowledge and the like. Using software as a service (SaaS), library brokers began to install their software on remote servers and provide the customers with the possibility that through web-based interfaces to have access on data. Among its examples, we can refer to World Share Management Services, which is provided byOCLC. In such an atmosphere, libraries are encouraged to share data and applications in a new platform. For example, in the system of Alma, which is product of the company of EX Libris, a Community Catalog is created that operates using a third source such as World Cat. The Community Catalog allows users to share bibliographic records and data of knowledge base in an open environment. Similarly, various applications and examples can be created. This way, librarians will have the opportunity to create records that subsequently can be used, downloaded and modified by other libraries(Wilson, 2012). Frequent updating and unlimited expansion of because they are done in the cloud have no impact on users daily use. The aim here is that the staff and librarians concentrate more on decision-making, innovation and their mental maps to create and learn the knowledge and whereby to spend low time and energy on issues such as data entry and technical affairs. The most important areas

that the SaaS and PaaS can move the operation of libraries towards the creation and sharing of knowledge in summary are as follows:

**Select**ion: Information that helps the user to decide on the purchase, e.g. bibliographic records for all the materials, inventory of each library and electronic materials of available knowledge base, the usage statistics, selection forms, pilot uses, evaluation, cancellation and other information. This information can be modified in different terms of storage and be shared for other decision-makings, attract comments the like.

**Order and collecting**: Traditional activities of ordering resources, including budget management, server management, orders, billing and downloads is categorized in terms of examples that can be used by users of the network as a knowledge base. Similarly, new models such as user-based models, interlibrary loaning based and other models can be designed, ran and shared.

**Description**: it includes the collection and cataloging by using all methods, including local and collaborative approaches in various standards, including a variety of brands, Dublin Core, and so on. For example, the global account management service of OCLC is presented to allow for access to the global information. OCLC database, called World Cat, is the largest global online library database. This product is a set of services related to cooperative library management and it aims to share the core library services such as the circulation of library resources, providing, organizing and detection of information on the network or cloud. By doing so, libraries will be able to use of hardware and services that were being used in traditional library systems separately in a shared way through the cloud. With using this system, there is no need to call bibliographic information in the library's system. Bibliographic record is maintained only in OCLC (Wilson, 2012).

**Management**: this will allow librarians to examine and follow up their existing resources and to inject them to search and discovery tools such unit indexes for searching (Wilson, 2012). Electronic resource management systems (ERMS) are locations for placing data such as licensing, administrative information, statistics and the like. This information is extremely at the risk of being left used, because these systems cannot link the data to other systems and thus to result in the creation of ideas (knowledge) and decision-making. The problem of management from multiple points and management of obsolete data can be resolved to some extent by their integration in a unified position. Thus, library management software has moved towards the concept of cloud.

**Access**: one of the most important issues in libraries is accessibility. A new term called Open URL presented in some new contents of librarianship, which can be considered related to cloud computing in some way. Open URL is a standard platform for transfer of resources bibliographic technologies between the informing services. For example, its pilot version in integration with DOI & Cross Ref projects as well as in integration with solutions presented in these projects has led to the creation of relationships that are mentioned below:

1. Linking a summary record to the full text of record on the publisher website,
2. Linkage from the record of books in library's OPAC to its text, description and criticize on the Internet,
3. Linkage from references of a Journal's article to record of that article in various databases of article's abstracts or indexes,
4. Linkage from a Journal's article to Journal in library's OPAC and displaying Journal's content in the library,
5. Linkage from a Journal's title to its impact factor Information in Journal Citation Reports database in ISI,
6. Linkage from keywords as or subject headings to a related article in Internet search engine (Breeding, 2009)

SfxSummon (Serial solutions) and EBSCO Discovery are products based on URL. These products not only are capable of linkage of one document to one or more databases, but also

provide the possibility of search on the Web, linking loan requests among libraries and linkage to other library catalogs, linkage to document delivery services, and linkage to specific pages on the Web.

Libraries using integrated software and its installation on the cloud provide the possibility of creating linkage between data and knowledge creation and sharing in the field of library activities. Such intelligence space allows the user to have better, faster and more efficient access.

**Resource sharing and knowledge creation**:Cloudcomputing using a shared infrastructurecan link a huge collection of systems for providing various services to each other. According to this structure, the scattered knowledge can be integrated. Accordingly, the library resources can be shared at any time and at any place and the user can have access,read and edit the computer systems and stored resources according to their needsand ultimately create new knowledge. Then they can store them as knowledge in the library, which this service in the library under the name of "Platform as a service", in short PaaS, is created in the cloud (Wang, Zhao and Kong, 2012). Its range can encompass several local, regional or country libraries. The system's user can by creating records to place its knowledge in the system and this way to share new knowledge.

**Economic model of cloud computing**

Although cloud computing is created because of the convergence of a number of recent technologies in the provision of softwareand hardware services, but one of the main and driving factors in cloud computinghas been the economic discussion in the use of IT services. In cloud computing, IT services can be supplied to users as in a general industry, e.g. water, electricity, gas and telephone, and some money can be request for them. In other words, users according to their consumption of the hardware and software services pay some costs. From the perspective of the consumer, cloud computing is a model for reducing the cost to convert investment costs to the operating costs. Consequently, service provider has presented different pricing models for services so as the customer can choose an option that is best compatible with his circumstance. It should be mentioned that the economic issues in the various layers of cloud are somewhat different from each other and here we aim to analyzeeconomically the services of infrastructures. Therefore, in the following, first, the economic considerations by the consumer of cloud computing infrastructure service are presented and the considerations of server provider are investigated.

**Economic considerations from the perspective of service providers**

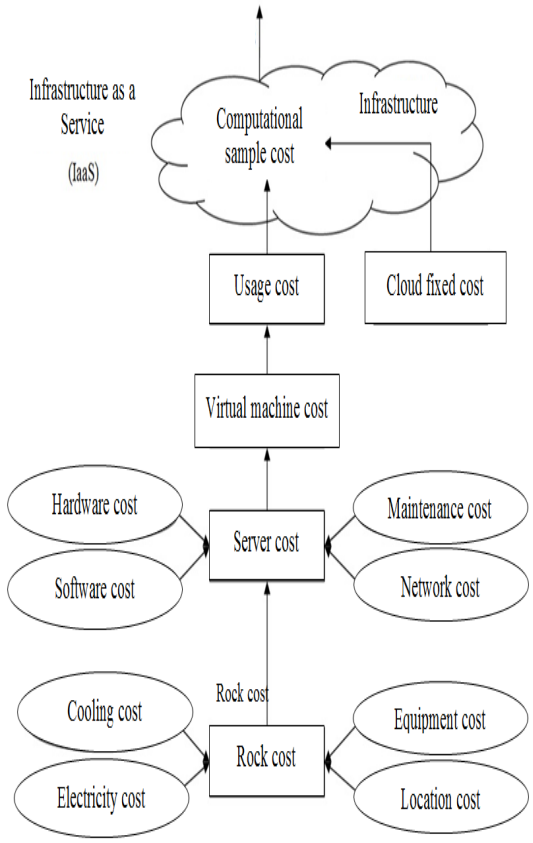
One of the main parameters in the use of cloud computing services is the way the price of the service is determined based on the use so as both the service provider and the consumer have economical choices. This task with respect to itscomputational complexityis very difficult. The cost of a data centerdepends on many factors, which the most important ones are shown in the following table.

| Cost | Examples |
|---|---|
| Hardware | Processor, network, disc, side equipment, rooter, personal or portable PC, local servers, etc. |
| Software | Operating system, scheduling tools, applications, database, monitoring tools, analytical packages, etc. |
| Human resource | Wage and slavery, overtime work, consult, etc. |
| Location | Renting work office, securing needed places, cost of electricity, telephone and bandwidth, etc. |

An analysis carried out in terms of physical structure and equipment for creating data center showed that more than 70% of costs directly or indirectly relate to the servers and any optimization in this sector can have a huge impact on reducing costs and rising incomes. One of the optimization done on the servers is the use of virtualization, by which we increase the level of using of the resources. Of course, the use of this technology imposes large coststo the software in the data center.

Now, given the large number of parameters, the question is how,for example, we can calculate

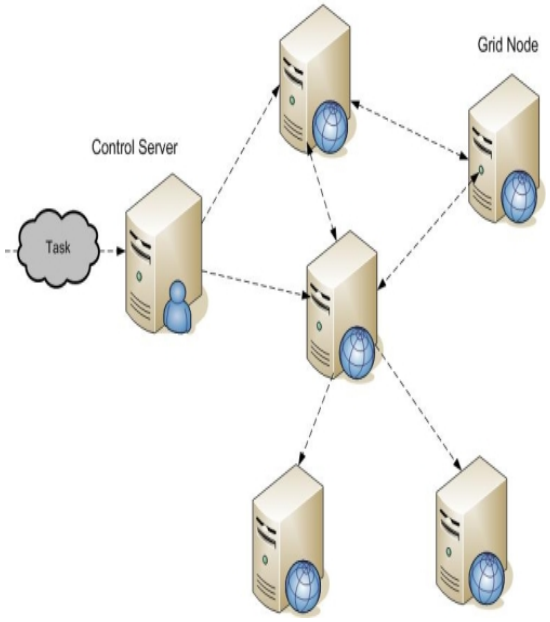
the cost of one hour use of a virtual machine with dual-core processor and one GB of RAM?In the figure below, it is shown that estimating the cost depends on various parameters including server cost, software cost, support and maintenance cost, network costs, the cost of power used, coolingand many other factors. Even parameters such as the number of virtual machines located on a server and their compressions, which causesharing of a percentage of resources between virtual machines, is also effective in determining the cost of services.




**The difference between cloud computing and grid computing**

Grid computing is confused with cloud computing, albeit they are quite different concepts. In grid computing, resources of multiple computers in a network are used simultaneously to work on a certain problem. It is used mostly when the scientific or technical issues are intended.

The famous example in this case is the search for extraterrestrial intelligence(SETI) in @Home Project. In this project, people around the world allow SETI that in the idle times to share their computers to search for signs of intelligencewithin thousands of hours of recorded radio data.




Another good application in the grid context is by World Association of Open grid-infrastructure of Berkeley in network computing (BOINC). In this case, you can select each more or less amount of unused power in process of your CPU to the help for advancing folding tests of protein in an effort to produce enriched rice to feed the world's hungry population. I am sure that did not knowyou couldfeed the poor by your computer.

Grid computing needs kind of softwarethat is capable of dividing a program and then sending its divided parts to thousands of other computers. This can be carried out on an organization's computers or in a public participation. Sun Company offers grid engine software that allows company's engineers to integrate the computer cycles up to more than 80 workstations simultaneously.

Grid computing is used for several reasons. First, it is a cost-effective way for using a certain amount of the resources of computer resources. Second, it is a good option for solving problems needing huge amounts of computing power. Third, resources of multiple computers can be shared cooperatively between

each other, without the control a computer by the other one.

So, what is the relationship between the grid computing and cloud computing?They have no relationship directly, because they operate in different ways. In Grid computing, a massive project divides among multiple computers to make use of their resources, but cloud computing work exactly opposite. Cloud computing allows several smaller applications to run simultaneously.

**Findings**

As mentioned earlier, quick processing as well as dynamic and immediate access to information are among the essential requirements of library users. To this end, some software developers and providers of library services use of the cloud computing technology.

This software is based onOpen URL. Cloud computing technology is passing its beginning of childhood stages, especially in relation to technologies and services relating to libraries. Thus, most libraries and software platforms, which have tended to cloud based models, have started their services with bibliographic data and the production and sharing of knowledge by focusing on these data with giving greater emphasis on technical services, indexing, ratings, abstracting and so on. Open URL provide a standard platform for transmission of bibliographic technologies of resources between international information services.

Examples of some of these Open URL based products, which have been used in libraries, include service software of OCLC, Sfx, Summon (Serial solutions) and EBSCO Discovery. In this article, in order to determine the amount of using of these types of services in the libraries of university, first, a list including hundred top universities of the world was extracted from the Webometric website and then website of the libraries was examined in terms using of above mentioned software systems.

The results are shown in the following Figures.

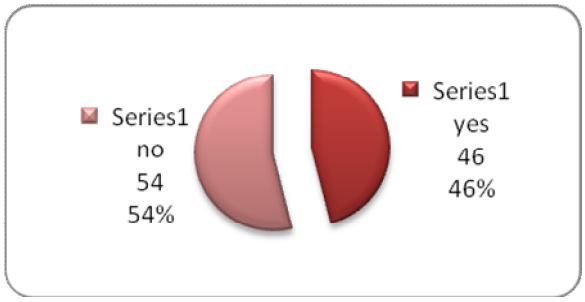



**Figure 1:** The amount of using cloud computing based systems in libraries of top universities of the world

As shown in Figure 1, about half of libraries of the world's top university use this type of library systems. The interesting point is that from 10 top universities of the world, nine universities use one of these cloud-basedsystems. Figure 2 shows the usage amount of each of these systems.

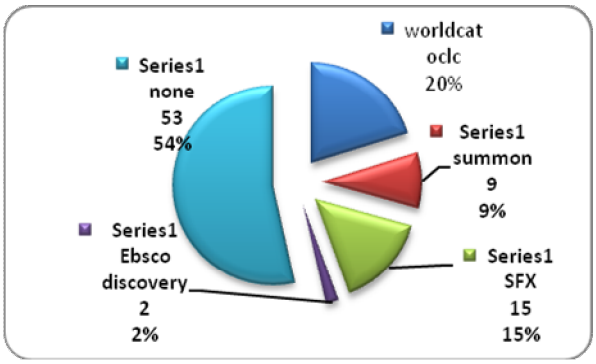



**Figure2:** the usage amount of each of the cloud-based systems

Information inFigure2 shows that OCLC is more used than any other software. The noteworthy point in relation to these applications is their compatibility with non-English language so that the cloud-based designed websites for universities can be used in Spanish, French, Japanese and Arabic.

## DISCUSSION, CONCLUSIONS AND SUGGESTIONS

Cloud computing provides facilities for libraries by which IT costs decreases and capacities, abilities and reliability increases and many of the traditional activities of libraries present with a better quality, whereas a significant portion of the information relating to the library processes and activities are left undocumented or isolated and they have lost

the opportunity to become a knowledge. Management strategies and knowledge sharing should be applied to ensure the successful transfer of knowledge and special emphasis should be given to the knowledge creation. Librarians and users can invite other users that by their sympathy and consult to draw a mind map and share their knowledge or to complete it in a collaborative way. The idea is to create a common form of computing for data processing, knowledge creation, its sharing and further development, which help to development knowledge sharing. It needs new structures be created for libraries, by which we can better use knowledge resources.

Resources organization, creation and sharing are important issues in libraries, especially in research and academic libraries. Librarians and library users need cooperative in new ways with each other to face with new challenges and to solve old problems. On the one hand, authorities of producing library software should move towards providing technological fields for consultation and the use of intellectual resources and skills as well as to help the knowledge production and their intersection. On the other hand, they should solve problems relating to knowledge diffraction and dispersion of knowledge bases. Various systems in addition to having technical and economic difficulties are also disjoined, which makes the management, transfer, sharing and reproduction of knowledge difficult. Libraries and information centers should move towards the direction that not only come out of their traditional rigid body, but also should look for solutions, strategies and appropriate facilities for moving towards such goals and concurrently attempt to reduce to the financial, human resources and technical costs. Knowledge-based networks are the best solution to create a new space to train and use the intellectual capital and to prevent wasting of human, intellectual and economic resources. Although cloud technology and its services are considered as new technology and little sign of them is present in the library, but they are promises for libraries to achieve the above objectives. Cloud computing as a shared infrastructure could link a huge collection of systems to provide various services. According to this structure, scattered knowledge can be integrated. In addition, the library resources can be shared at any time and at any place and the user can have access to computer systems and stored resources to read and edit them. Then, they can store them as the increase and interest in knowledge in the library and create the library in the cloud (Wang, Zhao and Kong, 2012). The technology facilitates the move of librarians and users of libraries towards creating collaborative and cooperative networks of knowledge production. It is quite clear that the required fields to create such an environment creates with the help of other technologies such as library software and changes in their nature and goals, giving attention to technologies such as cloud computing and, of course, changing attitudes and revision in goals and library tasks. To keep out of traditional roles and for greater efficiency, libraries should become knowledge-based organizations and to improve library services knowledge through creating knowledge in a collaborative network. Iran's libraries have not yet moved to this area. The results of this research can be used as a proposed platform for designing library software and creating knowledge-based environments and technological capabilities of cloud computing and its models services and can be employed in this context.

**REFERENCES**

1. Sasinki, Barry (2011), Full reference for cloud computing, translated by Navid Farokhi, Babel: Computer Science.
2. Liaqat, Neda (2011), Cloud computing, green technology, Tehran: Qoqnoos.
3. Alavi, M., & Tiwana, A. (2002). Knowledge Integration in Virtual Teams: The Potential Role of KMS. *Journal of American Society for Information Science and Technology, 53*(12), 1029-1037.
4. Breeding, M. (2009). The advance of computing from ground to the cloud. *The*

*systems librarian*, 29 (10): 22-25.
5. Cho, J. (2011). Study on a SaaS-based Library Management System for the Korean Library Network. *The Electronic Library, 29*(3), 379-393.
6. Dula, M., Jacobsen, L. & Ross, B. (2012). Implementing a new cloud computing library management services. *Computers in libraries*, 32 (1):6-11.
7. Goldner, M., & Birch, K. (2011). *Resource Sharing in Cloud Computing Age*. Paper presented at the IFLA 12th Interblending& Document Supply Conference held in Chicago, IL.
8. Goscinski, A., & Brock, M. (2010). Toward Dynamic and Attribute Based Publication, Discovery and Selection for Cloud Computing. *Future Generation Computer Systems, 26*(7), 947-970.
9. Hicks, B. J., Gulley, S. J., Allen, R. D., & Mullineux, G. (2002). A Framework for the Requirements of Capturing, Storing and Refusing Information and Knowledge in Engineering Design. *International Journal of Information Management, 22*(4), 263-280.
10. Lai, I. K. W., Tam, S. K. T., & Chan, M. F. S. (2012). Knowledge Cloud System for Network Collaboration: A Case Study in Medical Service Industry in China. *Expert Systems with Applications, 39*, 12205-12212.
11. Liao, S. (2003). Knowledge Management Technologies and Applications-Literature Review from 1995 to 2002. *Expert Systems with Applications, 25*(2), 155-164.
12. Sultan, N. (2010). Cloud Computing for Education: A New dawn? *International Journal of Information Management, 31*(3), 272-278.
13. Wang, H., Zhao, D., & Kong, J. (2012). *Library Knowledge Sharing Based on Cloud Computing*. Paper presented at the 2nd Conference on Software Technology and Engineering (ICSTE).
14. Wilson, K. (2012). Introducing the Next Generation of Library Management Systems. *Serials Review*, 1-14. doi: 10.1016/j.serrev.2012.04.003 Available at: http://www.sciencedirect.com/science/article/pii/S0098791312000366