

# Cloud Computing for Libraries: A SWOT Analysis

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## Abstract

*This paper provides brief information on cloud computing and its application for libraries. Adoption of cloud computing is not an easy task for Indian libraries. This paper provides some basic idea to choose evaluate Cloud service for the library. The advantages, disadvantages and features needs to be seriously considered before putting data on the cloud. The paper also describes its merits and demerits on the principle of SWOT analysis.*

**Keywords:** Cloud Computing, Library-Cloud, Computer Applications, Library Software, SWOT Analysis

## 1. Introduction

Cloud computing is a technology that uses the web (Internet) and central remote servers to maintain data, software and application. Cloud computing allows users to use applications without installation in their local machine to access their personal and official files on any computer with internet access. This technology allows users to access much more efficient computing by centralizing storage, memory and processing. This is not a new technology; it's associated since inception of the web. In the libraries cloud computing is used to build a digital library and to automate housekeeping operations using third party services, software and hardware. Cloud computing refers to both applications delivered as a service over the internet and the systems software in the data centers that provide services. In simple words the datacenters, hardware and systems software is what we can call a cloud. A simple example of cloud computing is Yahoo mail, Gmail etc. One does not need any software or server to store them. These services are free to all users till some limit, any extra storage capacity and advanced services are available at cost.

## 2. What is Cloud Computing?

Cloud computing means cloud based networking environment. Cloud computing contains set of software and hardware resources which are available on the internet and its services are managed by third-party. These services provide access to advanced software applications and high configured servers. Service provider performs role of consultant. Cloud computing is a web based computing where shared resources, applications and information are provided to the set of computers and other devices on demand using web technology. Cloud computing is based on internet; generally the internet is commonly visualized as a cloud. Therefore, the process of cloud computing is being done through set of web enabled applications loaded on the server with proper access rights.

Various definitions and interpretations of 'Cloud' and 'Cloud Computing' exist.

"Internet based computing in which large group of remote servers are networked so as to allow sharing of data-processing tasks, centralized data storage and online access to computer services or resources." <sup>1</sup>



## 2.1 Segments of Cloud computing

**Following are different segments of cloud computing:**

**1) Application:** The application segment is the part of internet technology which is proved already as the constructive and helpful model. When many individual applications are accessed through the central server of cloud, the library (Institute) will demand severe cost. On the other hand, the applications of on-demand are not similar in the price scheme and delivering process to the users. In short an application is the first segment without which a concept of cloud computing cannot be survived.

**2) Storage:** The backbone of the main concept of Cloud Computing is called infrastructure or storage. All the vendors will permit the users to create their own cloud applications within the limited space. The popular S3 of Amazon is considered as a storage segment.

**3) Connectivity:** Most important part of the cloud is connectivity. Without high speed internet connectivity there will be no use of application and storage. Therefore, the high speed leased line internet connectivity is necessary to connect with the cloud.

All above three segments are inter-related with each other and out of three if, anyone is missing then a concept of cloud will remain unfulfilled.

## 2.2 Types of Cloud computing:

There are two types of cloud computing:

### 2.2.1 On the basis of service

- ❖ **Infrastructure:** Infrastructure is referred as resource clouds. Resource (Infrastructure) is

being provided by third party as service to the users to use them the way they want. ( e.g. Amazon S3)

- ❖ **Platform:** Basically, platform is a set of computational resources using which one can use the infrastructure. In other words a set of computer application developed and hosted on the cloud to access and manage the data. (e.g. Google App Engine, Windows Azure (Platform))

- ❖ **Services:** Services are the set of applications developed by the service provider to use cloud infrastructure and platform. (e.g. Google Docs)

### 2.2.2 On the basis of usage

- ❖ **Private:** Private clouds are available only to the members of the organization. The cloud will facilitate user to store and disseminate their data on respective cloud (e.g. Institutional cloud, ebay)

- ❖ **Public:** Any institute may use cloud service from third party which may available free or with cost can be considered as public cloud (e.g. Google apps, Windows Azure)

- ❖ **Hybrid:** As public cloud allow any organization to outsource their part of infrastructure to service provider, at the same time organization would lose the control over resources and data management. In this type of cloud a part of cloud will be given to public for use. (e.g. Google Apps)

- ❖ **Community:** Community clouds are specifically organized clouds and are limited for specific group (e.g. Institutional Gmail of Google Apps)

❖ **Special cloud:** Special clouds are extensions of normal cloud system to provide additional services. (e.g. Google App Engine)

### 2.3 Features of Cloud Computing:

Following are different features of cloud computing:

**1. Elasticity and Scalability:** Elasticity is one of the essential and core features of cloud systems. This is very important feature of this service that any modification and enhancement in the services are very easy and fast which make this service very scalable and resilient. One can easily add up required bandwidth, processing speed and data storage or number of license in very short time. One need not to plan any more for project costing, procurement, project implementation or project closer; but one need to place a purchase order to the service provider to get the service in due time.

**2. Multi-tenancy:** Multi tenancy is a highly essential issue in cloud systems, where the location of code and / or data is principally unknown and the same resource may be assigned to multiple users (potentially at the same time). This affects infrastructure resources as well as data / applications / services that are hosted on shared resources but need to be made available in multiple isolated instances.

**3. Energy consumption:** Energy consumption is relevant to reduce additional costs of energy consumption. In case of traditional system one has to keep all the servers on as the data loaded on the server for round the clock access. Cloud is a based on network environment and therefore, principally allow reducing the energy consumption.

**4. Reliability:** It's an amazing characteristic of cloud computing. Reliability is one needed characteristic of cloud computing that will increase when redundant websites are accessed. Reliability is improved by having multiple sites for the same service, such that if one faces an outage, the other can take over the load.

**5. Security:** Security is obviously essential in all systems dealing with potentially sensitive data and code. The cloud is managed and administered by the team of IT expert. Therefore, the data will be secure in terms of data loss and system crash.

**6. Consumption based billing.** The capability to build up cost according to the actual consumption of resources is a relevant feature of cloud systems. Pay per use strongly relates to quality of service support, where specific requirements to be met by the system and hence to be paid for can be specified. One of the great features of cloud is, if you don't use the resource and you pay nothing.

**7. Data Management:** Data management is an essential aspect in sense of storage, where data is flexibly distributed across multiple resources. Implicitly, data consistency needs to be maintained over a wide distribution of replicated data sources. At the same time, the system always needs to be aware of the data location at the time of replicating data across the data centers. Therefore, data management is a tremendous feature of cloud environment.

**8. Managing Cloud Activities:** One of the most considerable features of the cloud is a management and monitoring of cloud application. As cloud manager works within a distributed wide area network infrastructure; one can monitor it from all over the world. One of the biggest shifts from the

traditional data center is that all the data stored, managed and administered in a cloud.

**9. Self Service Model:** The one of the reason behind popularity of cloud based environment is self service model. In some cases users have the ability to upload files, build programs, deploy, schedule, manage, and generate reports. This service is available to the users based on demand.

### 3. Cloud Computing in the context of Libraries

Libraries are moving towards cloud and trying to provide network based services. Moving to cloud based services means, the library housekeeping operations, digital libraries etc are hosted on cloud based network. In the recent era many libraries are using Google web technology knowingly or unknowingly to provide services. Earlier, if a person wanted to create document or spreadsheet he was using Microsoft's Office package, nowadays many libraries are processing documents, using Google web technology (Google Docs) on day-to-day basis. Use of Google apps and other similar tools in the libraries shows a radical shift from traditional to advance technologies. Now libraries are providing good number of services to their users to access various resources and computer applications from a single platform. This is an advantage of the cloud computing.

The concept of cloud computing is not much accepted in Indian libraries. The reason behind that is the lack of good service provider in the field of library management using advanced technology. Many libraries are thinking to adopt cloud computing but they are facing some problems in relation to standardize software, administrative procedures, budget constraints, connectivity problem etc. Nowadays, some foreign companies are providing cloud based services.

### 3.1 Areas of Library where Cloud Computing can be Applied

In today's scenario libraries are adopting advanced technology in their day-to-day activity and the concept of cloud is one of them. In libraries there are main two areas which can be moved on the cloud.

- 1) Automation of Housekeeping operations
- 2) Digital Library

With a view to Indian libraries one need to examine all the criteria before choosing any cloud service. Because, when it is planned to use third party services one need to have thorough idea about the whole system. If one thinks that our all day-to-day activities can be moved then, first of all searching the standard company who has set of various software and hardware and experience in handling such services. There are many companies in the market which provide this kind of services. (e.g. Ex Libris, Duracloud, Polaris Library System)

### 3.2 Architecture of Cloud for Library

Architecture of cloud databases for libraries is a major view point of the selection of cloud services. One need to keep some criteria for evaluation of databases, application, hardware configuration etc., which are available for the cloud.

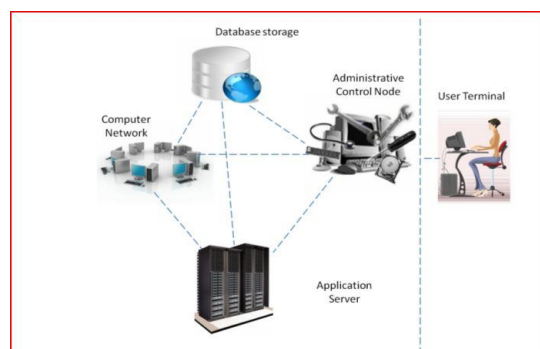


Figure 1

As shown in the above figure the application server and database server are different but it is not necessary that the both need to be independent. Both database and application can be loaded on the same server. First code will be generated on the application and then the database will be created on data storage server. After database creation an administrative control node will create records and save it on the server. On the other hand the saved data will be available on computer network and finally user can access the data stored in the server in various form.

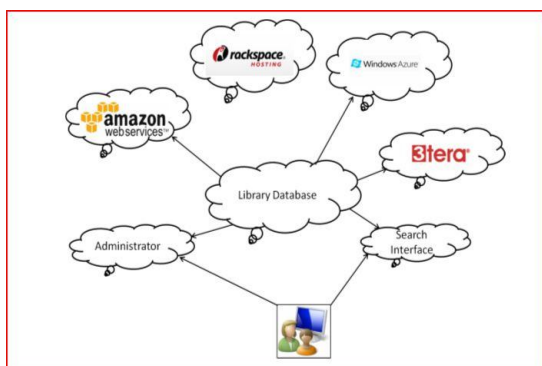


Figure - 2

As shown in the above figure there are three cloud service providers, who provides the storage server, application and database related services. Data will be stored in a server of the any service provider. They will assign user name and password to access the application and one can administer all the jobs involved. They will also provide single search platform to search from multiple databases if, the database of print and electronic material will be on same server we can also use federated search engine to search content from all databases.

### 3.3 Service providers of Cloud computing for libraries

1) **Ex Libris**<sup>4</sup>: Ex Libris is a well known cloud service provider based in USA. They are providing

cloud solution in the field of library with all the software and hardware support needed to provide services to the users. Ex Libris is available for all type of libraries and also for consortia. Ex Libris is built on various standard and contains number of features like compatibility with Unicode font, flexibility, migration of data, customization etc.,

2) **Polaris Library Systems**<sup>8</sup>: Polaris is one of the cloud based library automation system available in the market. The company also provides standard acquisition and processing system. Also, with a Polaris ILS Client License, the library can integrate various PC and print management systems at no extra cost. The systems uses number of well know standards like MARC 21 for bibliographic data, XML, Z39.50 for information retrieval, Unicode etc.,

3) **Dura Cloud**<sup>2</sup>: Dura Cloud is providing cloud solution for digital library services. Dura Cloud is a sister concern of the Duraspace which is a collaboration of the Dspace digital library software and Fedora Commons. Fedora Commons is a framework for digital repository. It offers complete solution for digital library with standard software and hardware solution. Dura cloud also provides open source code and the code needs to be installed on your machine. Where in case if you use Dura Cloud Storage and software you have to subscribe Dura Cloud services with a nominal cost.

### 4. Advantages and Disadvantages

Like any other technology, cloud computing do also have its advantages and disadvantages, which needs to be taken into consideration before implementing this new technology.

#### 4.1 Advantages

- 1) Cost effective
- 2) Flexible and innovative
- 3) Round the clock access
- 4) Simplified Cost and Consumption Model
- 5) Enterprise Grade Services and Management
- 6) Faster Provisioning of Systems and Applications
- 7) Simplicity of Integration.
- 8) Highly Secured Infrastructure.
- 9) Compliant Facilities and Processes
- 10) Flexible and resilient in disaster recovery.
- 11) Reduces hardware and maintenance cost

#### 4.2 Disadvantages

- 1) Risk or data loss
- 2) Failure in compliance
- 3) Constant connectivity required
- 4) Dependency
- 5) Quality problems with cloud service provider
- 6) Time and Budget Constraints
- 7) Since all the development and deployment have been done by Cloud service provider, it is very difficult to get good grip on overall system.

#### 5. SWOT Analysis of Cloud Computing with a view to Indian Libraries

SWOT analysis is a strategic planning method used to evaluate the Strengths, Weaknesses, Opportunities, and Threats involved in a project or in any venture. It involves specifying the objective of the project and identifying the internal and external factors that are favorable and unfavorable to achieve the objective.

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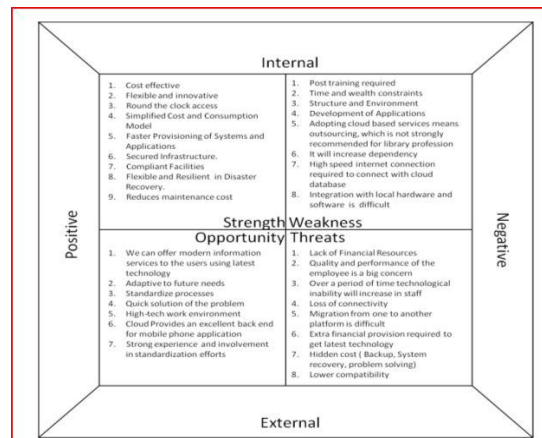


Figure -3

SWOT is a measure of analyzing a system as it displays good factors and bad factors for evaluation. Basically, SWOT analysis is used to evaluate market situation when a person wants to enter in the market. Nowadays Indian libraries can plan to move towards Cloud based environment because most of the Indian libraries have budget constraints and therefore, before choosing cloud environment one needs to have some fare idea about the cloud and cloud computing services. Hence, SWOT analysis provides some evidences; we are trying to evaluate the cloud computing on SWOT principle.

**1. Strengths:** India has a particularly strong IT industry that can be an important commercial factor for the western countries to consider in their future cloud related development. Accordingly, an Indian library does not have the economic strength to impact on the western countries. The main strength and hence advantage of India, however, consists in its consolidated and synergetic efforts to address new technological innovations, trends and governmental issues. As India has strong IT industry now, up-coming Indian companies are offering cloud services for Indian libraries at

affordable prices. Moreover in India many institutes are not in condition to purchase high end server and costly software for their library, in this situation the cloud computing will provide grate platform to host their data on cloud to serve their users.

**2. Weakness:** However, India is not as fast as US and Europe in the development and considering the timelines of research to reach market-readiness as opposed to the fast movements in the market itself. The time is a critical resource with respect to positioning India in the global cloud development market. Implementation of cloud in the libraries is not easy task as there are many administrative and financial matters involved. Adopting cloud services means we have to be depending on the service provider. Many Indian libraries does not have even internet connection to connect with the cloud, in this case, it is very difficult to implement cloud based services.

**3. Opportunities:** India is an emerging market for IT industry and, Indian government is also providing help to Indian university libraries to get high speed internet connection for research purpose, in view of these libraries/institutions/universities can consider cloud based library services to serve their users. Using cloud computing libraries can offer modern information services in user friendly format. With the use of these advanced technology library staff can also get an opportunity to learn new technological changes occurred in the field. As the cloud is a third party service if, any problem occurs, then the experts will provide the quick solution without interrupting library services.

**4. Threats:** These opportunities are obviously counterweighted by some threats that particularly

relate to the effort involved in the implementation. The threats namely connectivity problem, hidden cost for add-on services by service provider, compatibility, lock in period etc. The most important is migration of data from one service provider to other is a very difficult task.

## **6. Conclusion**

The cloud computing has its own merits and demerits. Moreover, newly coming up libraries which do not have sufficient budget to acquire high-end technology with proper hardware and software can choose cloud. To cope up with the new technological innovation in the field one need to know and explore the cloud computing. From Indian perspective the concept of cloud is not much accepted in libraries as there are many issues involved. But, in future it may increase looking into the advantages of this technology, which relieves libraries and library professionals from maintaining the servers and software.

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