Attitude of Library Professionals' on Cloud Computing Applications: A Study on the Kerala University Library

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Abstract: The huge demand of web based applications in libraries has catalyzed the development of cloud computing services and it has become an inevitable technology for libraries of today. The study is based on a survey of library professionals employed in the Kerala University library using questionnaire, to assess the attitude of the library professionals towards cloud computing technologies in libraries. The study revealed that majority of the respondents does not have much idea about cloud computing technologies and its application in libraries. Analysis also showed that the library professionals have a positive attitude towards the cloud computing applications in libraries. A good number of professionals indicated inadequate training as the main constraint in the application of ICT in libraries. The paper also discusses how cloud computing solutions could be beneficial to libraries and some of the cloud computing initiatives in libraries.

Key words: Cloud Computing, SaaS, IaaS, PaaS, Attitude, Kerala University Library

1. Introduction

Libraries are undergoing transition from traditional library to a digital resource centre (giving information in various formats viz., text, image video, audio etc). One of the big shifts can be seen in the move from print journal subscription to e-journal/ database model purchase which helped the libraries to provide better services to the patrons. Likewise shifting to cloud solutions gives libraries an opportunity to save time and resources. Cloud computing (CC) enable the migration of desktop application to web-based applications such as communication tools (Gmail, Google Calendar, and Google Talk) and productivity tools (Google Docs: text files, spreadsheets, and presentations) [1]. The Gartner Group[2] defines cloud computing as "a style of computing in which massively scalable and elastic IT-enabled capabilities are delivered as a service to external customers using Internet technologies." Cloud Computing is considered as the fifth generation of computing after Mainframe, Personal Computer, Client-Server Computing, and the web. In a cloud computing environment, the organization running an application does not typically own the physical hardware used for the applications. Instead a subscriber copies files to the server over the Internet[3].

Hosting services (cloud providers) offer virtual platforms that enable libraries to manage library resources and services. The main advantage of using hosting service is that the service gets instant upgrades when a software updating is occurring. It also provide backup facility, reliability

and scalability (service can be modified according to requirement at any time). There is also no need or cost for file storage equipment, server setup and maintenance, staff time, power usage, and backup. Training costs for IT staff to stay current in an ever-changing field can be reduced or eliminated[4]. Libraries can get out of the business of technology and focus on collection building, patron service and innovation.

The Kerala University Library, established in1942, has over 3 lakh books and over 1000 bound volumes of journals[5]. Kerala University Library system comprises of the Central Library located at Palayam, the Campus Library at Kariavattom campus, and the Departmental libraries at Kariavattom and within the city, the Study Centre libraries at Alappuzha, Pandalam, Kollam and College of Engineering Library at Kariavattom. The library system follows a decentralized pattern with a Central library and department libraries attached to the teaching departments of the universities.

2. Major CC Initiatives in Libraries

The widely-used web cataloging tools of OCLC are the most prominent examples of cloud computing in the library arena. Each local library uploads its cataloging records to the shared resource center of OCLC over the web.

Google Apps allows migration from desktop to Web-accessible applications, such as communication tools (Gmail, Google Calendar, and Google Talk) and productivity tools (Google Docs: text files, spreadsheets, and presentations)[6].

OCLC's Worldshare Management Services (WMS) allows libraries to manage entire collection management life cycle in a cloud-based application. It offers unified web based applications from acquisition and circulation to metadata and licensing management, resource sharing and analytics[7].

Ex-Libris a leading library software vendor from USA, who initially implemented solutions as locally and at a later stage adapted them to a hosted environment. The company's next-generation library system, Alma, was conceived as a cloud-based service to transform the traditional management of library resources[8].

OSS labs from India is using Amazon's elastic cloud computing platform and offering Koha ILS and DSpace institutional repository hosting and software maintenance subscription services for libraries[9].

Duraspace which is a collaboration of the Dspace digital library software and Fedora Commons provide repository services for all type of libraries and also for consortia. Its new service DuraCloud offers complete solution for digital library with open source code and the code needs to be installed on your machine[10].

Dropbox is a file hosting service operated by Dropbox, Inc., that offers cloud storage, file synchronization, and client software. Dropbox allows users to create a special folder on each of their computers, regardless of which computer is used to view it[11].

Polaris: Polaris Library Automation System, provides standard acquisition and processing system. The systems uses number of well known standards like MARC 21 for bibliographic data, XML, Z39.50 for information retrieval, Unicode etc[12].

LibLime: Hosted in LibLime's distributed cloud computing data center, hundreds of libraries are able to alleviate their internal IT support needs[13].

3. Implications of CC Applications in Libraries

Libraries have been adopting cloud-based solutions services like electronic journal access management, statistics tracking, digital library hosting and now trend is coming up for hosted library management systems. The use of SaaS in libraries dates back to early 2000 with establishment of companies like SerialsSolutions [14]. The widely-used web cataloging tools of OCLC are the most prominent examples of cloud computing in the library arena. OCLC WorldShare Management Services are the first cooperative, Webscale library management services solution that streamlines cataloguing, acquisitions, circulation, license management and workflows and include a next-gen discovery tool for library users-WorldCat Local[15].

Libraries around the world are using cloud computing in number of areas starting from federated search, website hosting, digital libraries, library automation, etc. Google App services are the effective technologies among cloud technology like Google Docs used to collect responses to web forms, Google Calendar for instruction and meeting rooms, and Google Analytics to collect statistics about their website, catalogue and blogs. Cloud-based content management systems like Ex Libris's bX can combine usage data from millions of researchers to create a scholarly recommendation service. Cloud technology can also be applied for backing up of media collections and storing and accessing of bibliographic data. Online documents such as Google Drive can be used to create and share documents in support of collaborative work[16]. Libraries can build digital library, content management system, institutional repository, Inter Library Loan (IIL) system, access to OPAC and Integrated Library Management System (ILS) from locally-managed to vendor-hosted environment, of their own with the help of cloud technology. Polaris library automation system provides standard acquisition and processing system. No software is installed on desktops and no servers are required in the libraries. LibraryThing is another applications runs on the Cloud Computing Environment. It is a good example of being able to build recommender services based on the aggregation of what thousands of people hold in their personal libraries[17].

4. Review of Related Studies

A number of studies have been conducted on cloud computing and the application of the technology in libraries. Yuvaraj[18] analyses the technology acceptance model (TAM) in order to examine the librarians' behavioural intentions to use cloud computing applications using questionnaire survey. Results show that librarians' perceived ease of use had significant impact on the attitude towards use. In another study he[19] also reports the finding of a study on librarian's adoption of cloud computing technology in central university libraries of India using diffusion of innovation theory. Yuvaraj and Singh[20] gives a snapshot of various open source cloud based operating systems in order to use the various computing activities that we installed or downloaded on traditional computers.

Choukimath, Agadi and Koganuramath [21] investigated and design reference architecture to digital library systems with scalability using cloud computing. In a study, Mavodza[22] reveals that libraries are using the cloud for putting together user resources, i.e. using Software as a Service (SaaS), such as in library catalogues, WorldCat, Googledocs, and others; the web Platform as a Service (PaaS) as in the use of GoogleApp Engine; or Infrastructure as a Service (IaaS) as in the use of D-Space, FEDORA, and others. Pandya[23] investigated the issues of cloud computing in libraries on the basis of SWOT analysis and pointed out the strengths, weaknesses, opportunities,

and threats associated with cloud computing and libraries. Paul, Karn, and Chaterjee[24] described cloud computing and its application emphasizing in the field of information networks and electronic information grids. In a study of cloud computing for Indian universities, Bhanti, Lehri and Kumar[25] depicted that cloud computing will help the universities to go green by centralizing all resources and efficient utilization. Gital and Zambuk[26] explored the application of loud computing in higher education in Nigeria, and touches upon some aspired benefits as well as expected limitations. Galibeen[27] provided the concept of cloud computing and also highlighted that how libraries can be benefited using cloud computing technology by providing some live examples. Srivastava and Kumar[28] presented the vision of cloud computing with various commercially cloud services available on the Infrastructure as-a-Service (IaaS) and found that cloud computing is changing the way towards hardware and software for on demand capacity fulfillment and development of web applications to make business decisions.

Jordan[29] expressed that cloud computing technology are clubbing with libraries services and web scale services are developing on the web in order to present the library services when and where required the users by example of Online Computer Library Center (OCLC) services. Wang[30] examined the trends of cloud computing on the basis of extant information systems literature, industry reports and practical experience reflections and also pointed out the significance of cloud computing and its implications for practitioner and academics. Xiaona and Lingyun[31] presented the idea of establishment of a public cloud among many university libraries which not only conserve library resources but also can improve its user satisfaction. Murley[32] provided an overview of cloud computing and list of resources and services may attach with cloud computing technology particularly in law libraries. Analysis of ICT skills among the library professionals of Kerala University Library conducted by Seena and Sudhier[33] revealed that the professionals have relatively average level of skills in handling ICT.

5. Objectives of the study

The objectives of the study are:

- To identify the awareness of cloud computing technologies among the library professionals in university of Kerala;
- To measure the attitude of library professionals towards the impact of cloud computing technologies;
- To identify the constraints in acquiring technology skills by library professionals under study; and.
- To suggest the measures for the improvement of cloud computing technology skill developments for the LIS professionals.

6. Methodology

The study attempts to examine the awareness and attitude towards cloud computing technologies among the library professionals employed in the central, campus, college of engineering and departmental libraries of the University of Kerala. The study is based on survey method and questionnaire was used as the tool to collect data. A structured questionnaire was designed, keeping in view the basic objectives of the study. The questionnaire of the research consists of both optional type and statements in Lickert's 5- point scale. A total of 112 questionnaires were distributed and 102 dully filled in questionnaires were received, thus resulting into a response

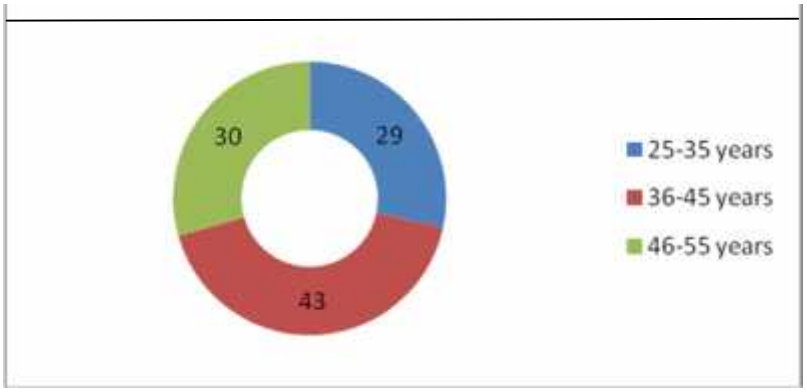
rate of 91%. The collected data was analysed using latest version of MS-Excel for appropriate statistical analysis and description.

7. Data Analysis and Interpretations

The data is analysed and interpreted based on the responses and suggestions received through the questionnaire and are presented in the subsequent sections.

7.1. Age-wise Distribution of Respondents

Figure 1. Age-wise distribution



Data about respondents' demographic details including age and gender were collected and analysed. Gender-wise analysis showed that the majority of library professionals in the University of Kerala are females (60.78%) and 39.22% are males. Figure 1 shows the age-wise distribution of respondents. Figure indicates that most of the library professionals fall in the age group between 36 and 45 years (42.16%) at the time of survey. It is also clear from the figure that 29.41% of the professionals are above 46 years of age and the remaining 28.43% are below 35 years.

7.2. Basic Qualification of Respondents

The details of basic qualification of library professionals in KUL are presented in Table 1. Analysis showed that 61.76% of the respondents have post graduate degree and 38.24% has degree in their basic subject. Out of 102 respondents, 38 (37.25%) possess MA as basic qualification. A few professionals also have additional technical qualifications like DCA (18.63%), and PGDCA (9.80%), in addition to the basic qualifications. The table also represents the high average of professional qualification of the LIS professionals in the University of Kerala. The basic qualification for entry cadre as a Library professional in Universities being Degree with BLISc, it can be seen that professionals having only BLISc degree are 9.80%. It is also worth to notice that professionals who have MPhil degrees are 23.53% and 8.82% are PhDs.

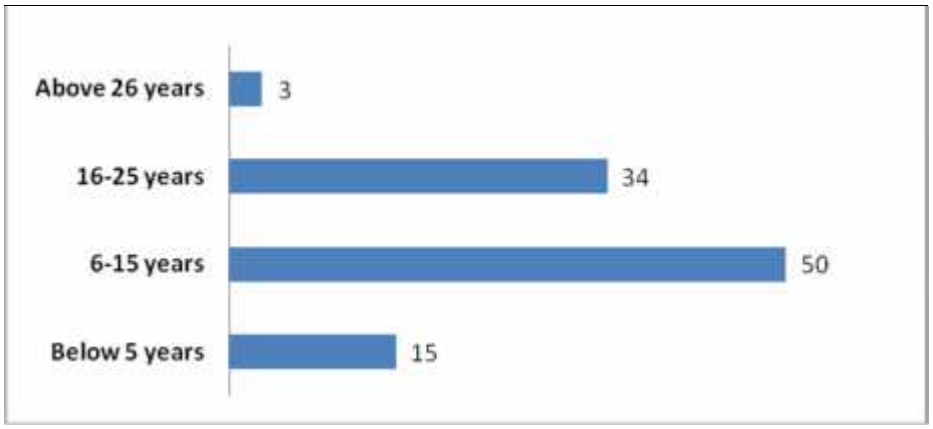
Table 1. Basic qualification of respondents

Profile of Respondents		No. of Respondents (%)
Basic Educational Qualifications	BA	22 (21.57%)
	BSc	10 (9.80%)
	BCom	7 (6.86%)
	MA	38 (37.25%)
	MSc	18 (17.75%)
	MCom	7 (6.86%)
	Total	**102 (100%)**
Professional Qualifications	BLISc	10 (9.80%)
	MLISc	59 (57.84%)
	MPhil	24 (23.53%)
	PhD	9 (8.82%)
	Total	**102 (100%)**

7.3. Professional Experience of Respondents

Figure 2 reveals that most of the respondents have professional experience ranges from 6-15 years (49.02%). As seen from the figure, 34 (33.33%) professionals have 16-25 years of experience and 14.71% has below 5 years of experience. It is also noted that there are only three professionals who have above 26 years of professional experience in KUL.

Figure 2. Professional experience of respondents



7.4. Awareness of CC Technologies

As seen from Table 3, majority of the library professionals (42.16%) are not aware of the technology. Only 36.27% of the respondents know the technology and 21.57% of the respondents have a little knowledge. The fact realized was that the library staff members were already experienced users of cloud computing – without even knowing it. It was observed that

most of the qualified library professionals don't get an opportunity to be familiar with the cloud services.

Table 3. Awareness of CC technologies

Response	No of respondents
Yes	37 (36.27%)
No	43 (42.16%)
A little	22 (21.57%)
Total	102 00%)

7.5. Awareness of CC Service Model

Table 6 gives a clear picture of respondents' awareness of SaaS, PaaS and IaaS, that are particularly based on type of services that any user can access on a cloud computing platform. Analysis showed that the library professionals in University of Kerala have relatively very low level of knowledge about the cloud computing technologies especially the cloud service models. It is evident from the table that out 102 library professionals under study only 12.75% of the professionals are aware of SaaS, 10.78% and 9.80% are aware of IaaS and PaaS respectively.

Table 4. Awareness of cloud computing service model

Service models	No of respondents
SaaS	12 (12.75%)
PaaS	10 (9.80%)
IaaS	11 10.78%)

7.6. Awareness of CC Technologies in Libraries

Table 5. Awareness of cloud computing technologies in libraries

Response	No of respondents
Yes	33 (32.35%)
No	69 (67.06%)
Total	102 (100%)

The huge demand of web-based applications in users' information requirements and the information retrieval processes caused the libraries of today to be in a position to adopt cloud computing technologies. Table 7 illustrates the respondents' awareness of cloud computing application in libraries. From the table it is clear that only 32.35% of the respondents are aware of the cloud computing applications in libraries. Most of the library professionals (67.06%) are not aware of the technology in libraries.

7.7. Attitude of the impact of CC Technologies

It is evident from Table 6 that most of the library professionals agree with the positive aspects of cloud computing applications listed in the study. Majority of the professionals strongly agreed with the opinion that 'cloud computing applications improve quality of library services' (53.92%). The professionals also agreed that cloud computing reduces space management problems (57.84%). A large percentage (50.98%) of professionals agreed to the variables such as

'Cloud computing helps in high storage capacity' and 'Cloud computing technologies help in easy information dissemination'. Of the negative aspect listed, to the parameter 'using cloud computing will create data security problems', 38.24% of the respondents agreed and 32.35% of the respondents disagreed. Thus the analysis showed that even though the professionals are not much aware of cloud computing technologies in libraries, they have a positive attitude regarding its applications in libraries.

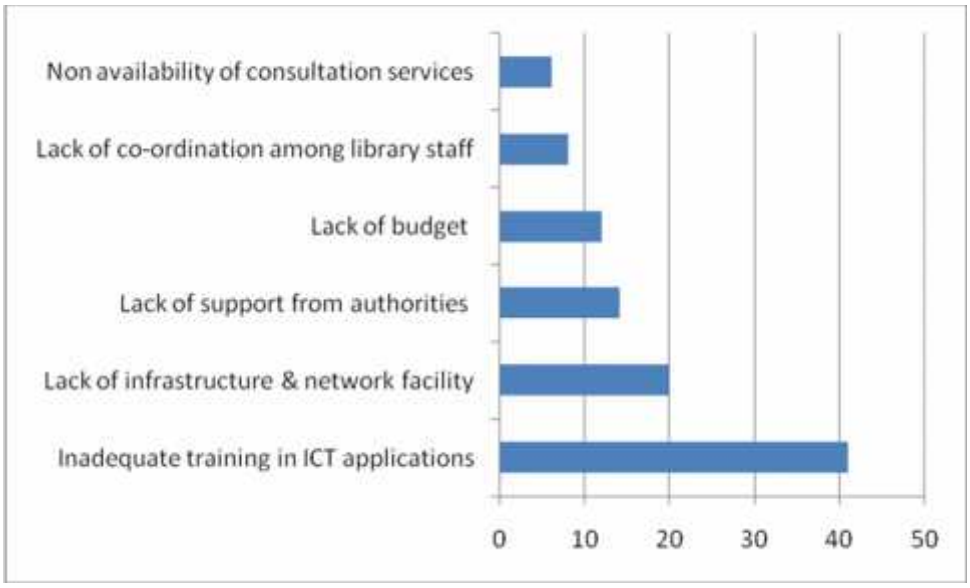
Table 6. Attitude of the impact of CC Technologies

Sl. No	Attitude	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree	Total
1.	Application of cloud computing facilitates quick access to data.	45 (44.12%)	54 (52.94%)	2 (1.96%)	0 (0%)	1 (0.98%)	102 (100%)
2.	Cloud computing applications improve quality of library services.	55 (53.92%)	45 (44.12%)	2 (1.96%)	0 (0%)	0 (0%)	102 (100%)
3.	Cloud computing helps in high storage capacity.	43 (42.16%)	52 (50.98%)	6 (5.88%)	1 (0.98%)	0 (0%)	102 (100%)
4.	Cloud computing technologies help in easy information dissemination.	40 (39.22%)	52 (50.98%)	6 (5.88%)	4 (3.92%)	0 (0%)	102 (100%)
5.	Cloud computing reduces space management problems.	30 (29.41%)	59 (57.84%)	9 (8.82%)	4 (3.92%)	0 (0%)	102 (100%)
6.	Using cloud computing technologies will create data security problems.	8 (7.84%)	39 (38.24%)	20 (19.61%)	33 (32.35%)	2 (1.96%)	102 (100%)

7.8. Constraints in Acquiring ICT skills

Figure 4 depicts the constraints identified by the professionals in successful implementation of technological developments in libraries. A significant number of library professionals indicated that the main issue relating to the application of Information and Communication Technology in libraries as the lack of training (40.2%) which is followed by lack of infrastructure & network facility (19.61%). Lack of cooperation of authority in implementing the technology is another problem faced by library professionals.

Figure 4- Constraints in acquiring technology skills



8. Suggestions

Based on the views and comments offered by the library professionals, the investigators put forward the following feasible suggestions:

- The present study revealed that the majority of the library professionals do not have much idea about cloud computing. These issues should be addressed by providing adequate training to the LIS professionals about the use of online communication tools and first make them confident users.
- Library professionals should be encouraged to attend orientation and training programmes at regular intervals in the area of ICT and its implementation in libraries for effective improvement.
- Sufficient funds should be made available by the authorities for developments of ICT infrastructure, digital resource development, and application of ICT enabled services in university libraries.
- The authorities need to review their policies regarding the implementation of technological developments in libraries.
- A new model curriculum for the information science course in universities should be devised by integrating the traditional and modern knowledge and applications.

9. Conclusion

By utilizing information technology, libraries are undergoing drastic changes, incorporating digital services like library automation, OPAC, library website, digital reference service, chat, email and other web 2.0 services, some transforming into digital library, and now up to cloud computing technology. Cloud computing reduces time spent on technical issues and enables library staff to focus more on client-facing services. By introducing CC, libraries can establish a shared public cloud jointly which can have infinite storage capacity and computing power bringing obvious benefits to libraries. The challenging part will be how to re-shape our library and provide services according to patrons needs. Lack of proper planning and supervision and frequent change in infrastructure are the basic hurdles in successful development of ICT in

university library. Combining underutilized systems into a CC environment, thus reducing carbon emission footprints and making libraries greener and healthier enjoyable planet.

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