Cloud Initiative for Special Libraries in Sri Lanka: A Landmark for Storage, Management and Sharing of Library Resources

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Abstract
This paper analytically present the current situation of cloud computing in special libraries of Sri Lanka and the feasibility to establish, storage, management and sharing of library resources through clustered cloud library system. The main objective of the study was to highlight the basic cloud computing applications to the Special Libraries in Sri Lanka and to orient and motivate the library professionals in Special Libraries towards cloud computing storage, management and sharing activities to minimize the cost and delays and improve the efficiency of information dissemination, to provide proper guidelines to the policy makers and professionals for this.The semi-structured questionnaire was used to collect primary data and secondary sources were used to prove the current application of the cloud computing in the special libraries of Sri Lanka. 15 questionnaires were sent to Special Libraries electronically and through post. Only 11 libraries responded and the response rate was(73%). SPSS ver.13 was used to analyze the data.

Key Words: Cloud Library, Cloud Computing, Special libraries in Sri Lanka

1.   Introduction
1.1 What is Cloud computing?
According to the most productive NIST definition of cloud computing; the term "Cloud computing" has defined as "It is a model for enabling convenient, on demand network access to a shared pool of configurable computing recourses (e.g., network, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction" (Yuvaraj, 2013).
Nevertheless, it has introduced those 3 models of cloud computing; they are as follows;
1. Infrastructure as a service (IaaS)
2. Platform as a service (PaaS)
3. Software as a service (SaaS)

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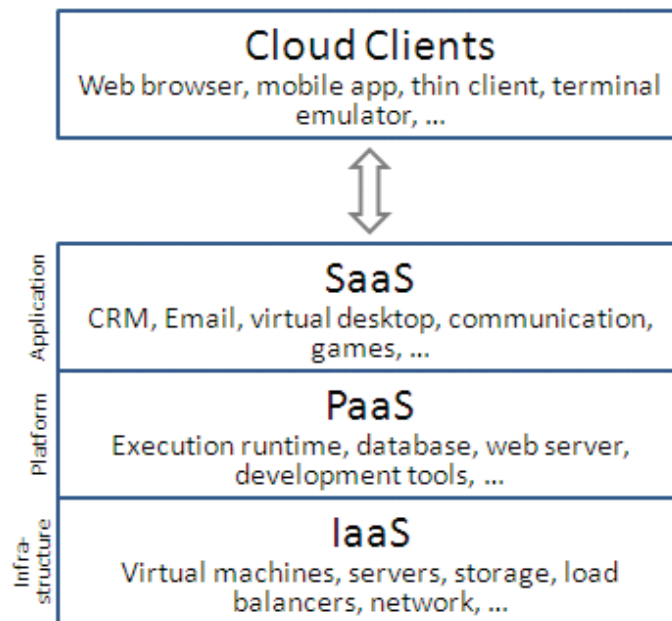
Source : (Yuvaraj, 2013)

(Jayatunga, 2013) has introduced new category to the cloud computing "Desktop as a Service (Daas). DaaS is a cloud computing solution in which virtual desktop infrastructure is outsourced to a third-party provider. It is functionality relies on the virtual desktop, which is a user-controlled session or dedicated machine that transforms on-demand cloud services for users and organizations around the world. This is an efficient model in which the service provider manages all the back-end responsibilities that would

The practice of using a network of remote servers hosted on the Internet to store, manage, and process data, rather than a local server or a personal computer. Cloud computing metaphor: For a user, the network elements representing the provider-rendered services are invisible, as if obscured by a cloud as follows (http://en.wikipedia.org/wiki/Cloud_computing).
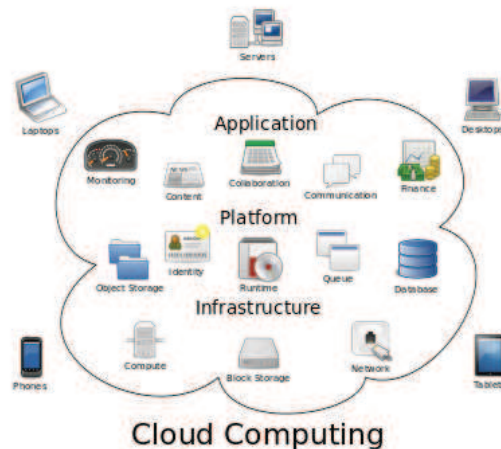
Source: (Yuvaraj, 2013)

1.2 What is Cloud Library?
Since profound definitions on "Cloud Libraries" were not published, the very phenomenon could be explained as an application on innovative way to browse, borrow and read popular fiction, non-fiction and non-eBooks from local library.

Users can access to the materials and resources from the Cloud Libraries through their mobile devices such as e-Readers, PCs, Tablets, Kindle, Nook, iPad, iPhone, iPod, Android-based tablets, Kindle fire, Smart phones via Wi-Fi connections (Dhamdhere & Lihitkar, 2013). The sole concept is that librarians upload varied types of files and resources to be saved online ("to the cloud") as named because the files have been sent away to an ethereal place, where users can access them from any computers or devices that can connect to the internet and has access to their account. Any reader can go to the website and share the files or music, photos, movies or TV shows stored there. Actually, the **cloud** is the library's massive data center where its media is stored on warehouses full of computers servers. The cloud will consist of a white part (trusted and checked information), a grey part (question mark) and a black part (crap information: un trusted, unchecked, violent, fraudulent) (Bullinga, 2014) There are number of active Cloud library systems can be located in the world, especially in the western hemisphere. Among those the Amazon.com cloud, OCLC cloud, Ex-Libris and 3M cloud are effectively used by the Information sector and Commerce and business sectors. Most of the publishers utilize Amazon Com Cloud. Amazon Web Services, LLC offers Web services that allow users to create and build businesses. Its Web services are self-contained functions that can be published and invoked across the Web using XML-based protocols. It offers functions for directly accessing Amazon's technology platform and product data ranging from retrieving information on set of products to adding an item to a shopping cart. Amazon has also launched a dedicated digital security management system named Cloud HSM and Amazon's Virtual Private Cloud (VPC) for the benefit of their user worldwide.

The OCLC Cloud system is mainly confined to the Library and Information clientele where sharing, publishing and promoting the library resources digital and electronic is prime objective. The OCLC's World Cat is one of the cloud based catalog data sharing pathway.
The 3M Cloud Library is an app that allows library patrons and researchers to browse and borrow audio books and e-books via 3M digital kiosks in the library or online. The system also actively engaged in publishing the books, journals electronically from world most reputed nook sellers and publishers. Also the system allows clientele to use their mobile devices to read e-materials by downloading apps related. In the USA, Canada, UK and Ec countries quite a large number of Public and special libraries utilize 3M Cloud system to cater to their users information needs.
Google renders a number of Cloud applications to the world apart from the search engine. The Google Books, DropBox, Google transliteration cloud, Translation cloud, Google Image are among such applications and services.

1.3 Development of special libraries in Sri Lanka

1.3.1 What is Special Library?
The term **Special Library** was defined by number of sources. The IFLA has defined Special Library in a simplest way as: A library established, supported, and administered by a business firm, private corporation, association, government agency, etc., to meet the needs of its members or staff in pursuing the goals of the organization. (http://www.ifla.org)
Wikipedia defines it in an elaborated way: A **special library** is a term for a library that is neither an academic, school, public or national library. Special libraries include corporate libraries, law libraries, medical libraries, museum libraries, news libraries, and nonprofit libraries. These libraries are not usually open to the general public, though many are available to specific elements of the public or scheduled appointments. Special libraries are also sometimes known as "information centers". They are generally staffed by librarians, although many librarians employed in special libraries are specialists in the library's field rather than generally trained librarians, and often are not required to have advanced degrees in

specifically library-related field due to the specialized content and clientele of the library (http://en.wikipedia.org/wiki/Special_library)

Famous Online Dictionary of LIS ABCD-ODLIS defines Special Library as A library established and funded by a commercial firm, private association, government agency, non-profit organization, or special interest group to meet the information needs of its employees, members, or staff in accordance with the organization's mission and goals. The scope of the collection is usually limited to the interests of the host organization. ABCD – ODLIS Dictiomary: http://www.abc-clio.com/ODLIS/odlis_c.aspx

1.3.2 History of Special Libraries in Sri Lanka
Recorded history of the first Sri Lankan Special Library ran as far back as to the British colonial era when the Ceylon National Museum was established in 1837. The National Museum Library started in the same year. When the Britishers started plantation crops in the up-country and wet zones of the country, three major research institutes for Tea, Coconut and Rubber were established viz. Tea Research Institute (TRI), Coconut Research Institute (CRI), and Rubber Research Institute (RRI). The first Special Library for Plantation Sector RRI library was started in 1922. The Legislative Council for Ceylon (now Sri Lanka) established and its special library came into being in 1877. Later on government body became the Parliament and Parliament Library was started in 1927. As the government and non-government institutions emerged in later years, a number of Special Libraries came into existence. (eg. National Science Foundation (NSF) Library in 1965; ITI Library in 1955). At present there are 45 special libraries in the country.

1.3.3 Present situation of Special Libraries in Sri Lanka
In Sri Lanka, most of the Special Libraries administered under the supervision of their parent organizations and its Librarian is a senior or mid-level member of the staff and solely all managerial and bibliographical tasks of the library is handled by the librarian. In most of the Special Libraries, LIS professionals are recruited and they possessed graduate or post-graduates with a suitable subject background. But in a few places non-professional librarians can be found. Some of the Librarians may have lesser IT background. Nevertheless, they have opportunities to get professional education and required qualifications. For that purpose LIS and ICT education can be obtained from the educational institutions like, University of Kelaniya, SLLA and NILIS full-time or part-time basis. Various training courses, workshops and demonstrations are organized by the Professional Associations like SLLA, NSF, CARPSL, ULA etc. There is a special group named Special Library Group for Special Librarians carrier upliftment at in the SLLA. A small number of privileged members get chance to win scholarships for overseas trainings. Most of the Special Libraries have automated and digitized their collections using commercial and open-source software.

1.3.4 Current situation of cloud library in Special Library Context in Sri Lanka
As discussed earlier, most of the Special libraries suffer from lack of funds, infrastructure facilities, sufficient manpower, enthusiasm etc. for initiation of cloud environments. Managerial and administrative bureaucracy is also a hindrance for a novel scenario. Technophobia also can be considered as a limiting factor. National Science Foundation Library has enthusiasm to initiate Cloud library system and they have organized a Workshop on "S&T Cloud Library for Sri Lanka" in February 13, 2013. NSF also have taken steps to digitize their and participating S&T Libraries' resources and create a Virtual S&T Library in the same year. According to its Director this very step could be considered as a precursor of shifting to Cloud scenario (NSJ. 2014). The Centre for Poverty Analysis (CEPA) Information Centre and Library has already taken an initiative to build a prototype Cloud Library. Parliament Library is discussing about the Cloud Library conversion and the Institute for Technical Industries (ITI) has planned to go for a cloud system in 2014.

2. Literature Review

Panday and Satna (2014) have discussed about initiatives of cloud computing and libraries with defining the term "Cloud computing" is a "web based computing where all the resources, software and information may be shared and provided on demand". They mentioned that this technology is good for organizations which expect to work collaboratively others for extending hard disk for storage purpose.

The authors considered that benefits of cloud computing for libraries which rose by Padhy and Mahapatra and pointed out various ways this technology can be apply to the libraries to reduce the cost and high slandered resource allocations to the local functions. Finally they concluded libraries could be able to give services anytime anywhere by using the internet and central remote server through cloud technology without installing any server or software. Further they have recommended this technology to adopt to the library services to storing the data, memory, processing allows for much more computing in efficient way (Panday, Vipin and Satna, 2014).

Starr (2011) discussed and projected about the current happenings at the academic library field. He developed the foundation of his paper referring the article which published in the Chronicle of Higher Education's January issue, " Academic Library Autopsy Report, 2050" and informed to the Academic Librarians to aware about the ways to function libraries without the physical surfaces. This will reflected the future need of library services which can be host using cloud environment. He shared that his past experiences in conventional banking and current experiences in online banking to prove the enhancements in new system of cloud technology and expressed the importance of awareness about A-Z cloud technology which can be able to apply at the library and information science field. He concluded his argument quoting the "When one door close, another door opens; but we so often look so long and regretfully upon the closed door, that we do not see the ones which open for us" the famous read by Alexander Graham Bell (Starr, 2011). Mitchell (2010) examined some of the key issues related to the use of different forms of cloud computing in libraries and discusses the experience of one library in moving to cloud-based infrastructure. This technology refers to the abstraction of information technology (IT) software and services from the hardware they run on.

According to the author's explanation; the cloud computing can be divided into three categories: Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS), and Infrastructure-as-a-Service (IaaS). In a SaaS environment, organizations use an application via a hosted service. They do not have access to the underlying infrastructure (i.e. network or server elements) and are not responsible for managing the underlying software. Further, he discussed the impact of cloud computing in the libraries and projected the SaaS and PaaS solutions are difficult to implement in libraries due to need of core applications often require specialized software or configurations which are either localized or simply application specific. By using an Iaas; infrastructure level service we were able to bring our library applications online without having to find a service that supported the correct versions of the underlying technology (Mitchell, 2010).

Shivalingaiah (2012) discussed about the "Applications of Cloud computing for resource sharing in academic libraries" and stated that common problems such as shrinking budgets, accommodating resources within the budgetary constraints, countering increased scope of interdisciplinary and multidisciplinary nature of subjects, flexibility associated with the e-data, diminished levels of efficiency, and huge cost involved in managing the entire IT infrastructure in the modern day academic libraries. The author mentioned that libraries are at the threshold of embracing the concept of cloud computing because of its both technological and economic advantages. He rose many advantages which can be obtained by the uses who using cloud computing facilities in libraries such as "resource sharing, cost cutting, knowledge sharing etc. the authors have made an attempt to discuss the types, applications, advantages and disadvantages of implementing cloud computing mainly for resource sharing in an academic library environment. The purpose of this article was to look specifically at how cloud computing can be employed by libraries and what are the potential areas need to be

considered before moving into a cloud computing solution implementation (Shivalingaiah, D and Sheshadri, 2012).

(Jayatunga, 2013) has introduced new category to the cloud computing "Desktop as a Service (Daas)". DaaS is a cloud computing solution in which virtual desktop infrastructure is outsourced to a third-party provider. It is functionality relies on the virtual desktop, which is a user-controlled session or dedicated machine that transforms on-demand cloud services for users and organizations around the world. This is an efficient model in which the service provider manages all the back-end responsibilities that would normally be provided by application software. Desktop as a service is also known as a virtual desktop or hosted desktop services.

3. Research design
3.1 Problem statement

Sri Lanka has more than 100 special libraries providing services to the various users' and institutions'. Most of the libraries are still in state of conversion library mode and showed lowliness to introduce new technology to enhance their services like cloud library system.

3.2 Objectives of the study
- ❖ To implicate the basic cloud computing applications to the Special Libraries in Sri Lanka.
- ❖ To motivate the library professionals in Special Libraries towards the cloud computing storage, manage and sharing activities to minimize the cost and delays and improve the efficiency of information dissemination.
- ❖ To provide the proper guideline to the policy makers and professionals involve in the information and communication technology authorities in Sri Lanka.
- ❖ To provide the proper training module for Special Library professionals to enhance the knowledge of Cloud computing usage in libraries.
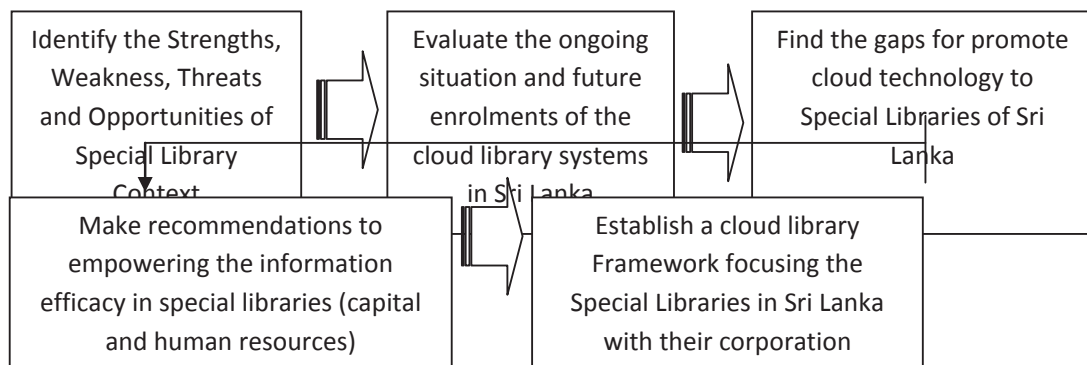
3.3 Significance of the study
This study will be most beneficial to professionals who engage in information repackaging and disseminating among the users' in Sri Lanka.

3.4   Limitation of the study

The study will be limited only to the particular special libraries in Sri Lanka.
3.5 Conceptual Framework
The conceptual framework of the study will be consisted with following steps:

Identify the Strengths, Weakness, Threats and Opportunities of Special Library Context	→	Evaluate the ongoing situation and future enrolments of the cloud library systems in Sri Lanka	→	Find the gaps for promote cloud technology to Special Libraries of Sri Lanka
Make recommendations to empowering the information efficacy in special libraries (capital and human resources)	←	Establish a cloud library Framework focusing the Special Libraries in Sri Lanka with their corporation		

3.5   Hypotheses

The study expects to investigate the current situation according to the following hypotheses and projected to eliminate identified shortcomings and barriers.

Hypothesis 1: There is sufficient Infrastructure as a service (IaaS) to run the cloud based system has established within the special libraries of Sri Lanka.

Hypothesis 2: There is sufficient Platform as a service (PaaS) to run the cloud based system has established within the special libraries in Sri Lanka.

Hypothesis 3: There is sufficient Software as a service (SaaS) to run the cloud based system has established within the special libraries in Sri Lanka.

Hypothesis 4: There is sufficient Desktop as a service (DaaS) to run the cloud based system has established within the special libraries in Sri Lanka.

3.7. Questionnaire design

In this study uses Likert 5 scales to measure ever item. Respondents are asked to answer all questions from "1=strongly disagree" to "5=strongly agree" and their privacy will be strictly secured.

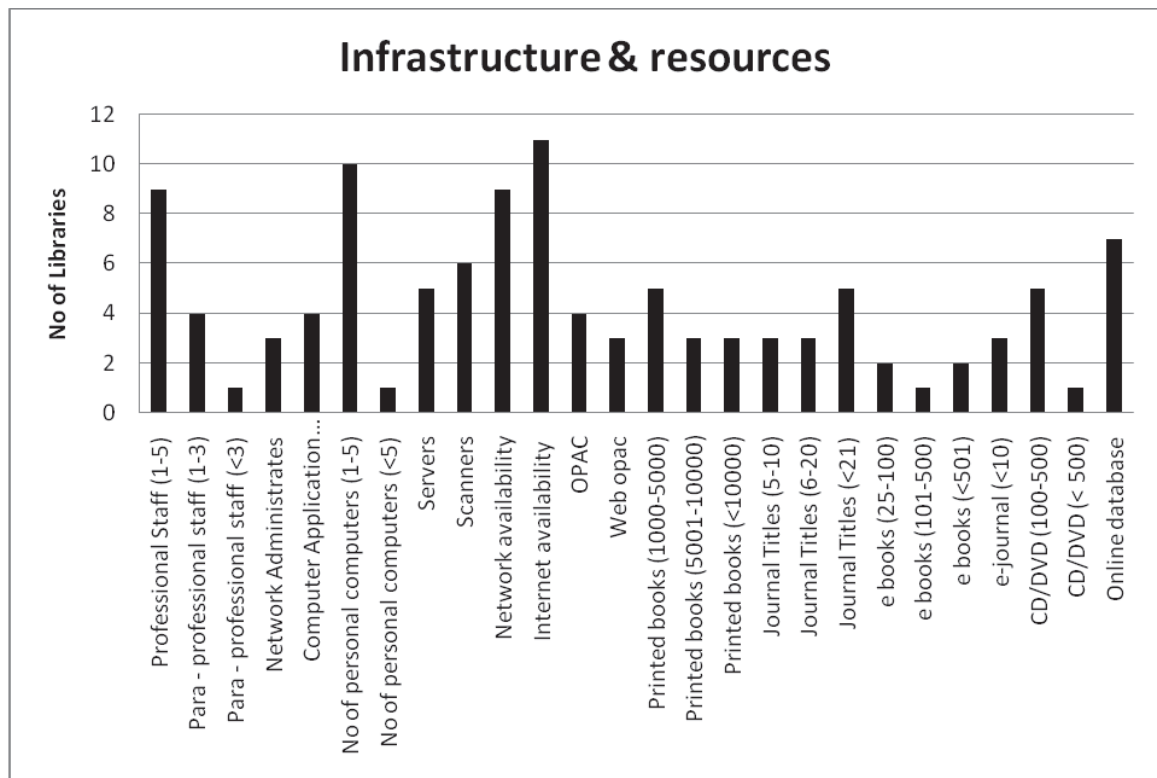### 3.8. Population and Selecting the Sample

Population was 35 Special Libraries and sample was 20 out of them under the random sampling. The response rate was 75% (15 Libraries).

4.0 Discussion and suggestions
4.1 Discussion
4.1.1 Infrastructure & resources

Figure 1: Infrastructure and Resources

Source: Survey Data 2015

According to the figure 1, there are 9 special libraries with 1-5 professionals while there are 4 libraries comprise of 1-3 para-professionals. There are 3 libraries with Network Administrators

and 4 libraries posses with Computer Application Assistants. Infrastructure of special libraries comprise 10 libraries with 1-5 personal computers while one library with more than 5 computers, 5 libraries with server computers and 6 libraries with scanners.

It seems that most of the libraries indicated that availability of affordable number of personal computers however number of servers in those libraries shown insufficient for the online activities.

It is shown that 81% of the responded libraries available with any type of network system with one library comprise with a WAN (Wide Area Network) while showing 100% internet availability via broadband or mobile dongles. This also is encouraging those libraries to enhance the network activities.

Sharing of resources of responded libraries commenced on active OPACs (4) and Web OPACs (3).

Number of printed books of the responded libraries deviated from 1000 to 5000 (5 libraries) and over 5000 (3 libraries). There are 3 libraries handling the e-books and e-journals shows positive trends towered the online library activities. It is noted that 7 libraries already accessed to online databases (AGORA, HINARI, EBSCO).

4.1.2 Availability of cloud library activities
It is found that only single library among the responded special libraries operates a cloud storage and retrieval system to serve their clientele needs. This library named Sri Lanka Council for Agriculture Research Policy (SLCARP established in 1994) located in Colombo District and serves to users especially in the agriculture sector. National Science Foundation of Sri Lanka (NSF Library and Information Center established in 1977) has already established a virtual library for Science and Technology based libraries in 2013. They planned to step forward to convert the virtual system to a cloud library through the SLSTINET (Sri Lanka Science and Technology Information Network) in near future with the assistances of its Library Professionals and Network Administrators utilizing their own network infrastructure.

4.1.3 Drawbacks of cloud library activities

Table 4.1: Drawbacks of implementation of cloud system

Drawbacks of implementation of cloud system	Responds
Unawareness of the cloud storage and retrieval systems	4
No any access to such a system	7
Not available any competent staff	6
Restrictions by the parent organization/body	5
Lack of funds available for such activities	7
Lack of infrastructure facilities in the library eg: no such kind of scanners, servers, etc.	7
Other (Please Specify) Lack of interest of the management	1

Source: Survey Data 2015

The responded special libraries which do not have proper cloud library initiatives have mentioned reasons for them. There are 7 libraries have mentioned that about the inaccessibility for cloud systems, lack of funds and infrastructure facilities to run such kind of systems. Another major drawback reported by the libraries is that lack of competent staff to function cloud library activities. It is reported that restrictions by the parent organization to implement such kind of systems (4). The reason for this would be legal aspects such as

Intellectual Property Law, Objectives of organization and bureaucracy of organizations, mainly the lack of interest of the management.

4.1.4 Perspectives of Library professionals towards the Cloud Library Activities
According to the analysis of questions under the Likert Scale, It showed that most of the library professionals in Special Libraries in Sri Lanka are willing to implement the cloud library systems using their existing resources (4 = Agree, mean 3.91, standard deviation 1.514) however they have mentioned that their unawareness of the basic concepts of cloud library systems tend to prevent change over to such a system. The responded professionals of the above libraries believed that converting their existing conventional resources into electronic media which could be ultimately accessed via cloud cluster system comfortably. Nevertheless, they positively agreed about future threats such as virus attacks, hacking and unauthorized malfunctions for harming the operational level of the cloud system. They revealed that they will not be any circumstances of incompatibility of formats of existing resources and data when migrate to the cloud system because such a complexness could be resolved by the improved application software which can be found under commercial or open source platforms.

4.2 Suggestions
In order to initiate an efficient Cloud Library system for existing Special Libraries of Sri Lanka, infrastructure facilities should be improvised and updated for smooth functioning. As the initial step, a proper survey of the vital components of the libraries such as man power (Professional, para-professional and supportive staff). Existing equipments, IT facilities, Networking etc. should be upgraded suitably in order to cope up with the new situation. Need to make the top level management aware about the novel developments and functioning. Educate the librarians and professional staff theoretically and practically about the new technology. Existing collections and resources of the libraries should be carefully digitized and stored in named files and databases so that uploading would be easily handled. Studies should be carried out on other functioning cloud systems and gain sound knowledge about pros and cons of the system. Steps should be taken to organize consortia on Cloud Library system and share the views and thoughts on this sophisticated system.

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