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# Cloud Library for Minimizing E- library services divide among Ethiopian Public Higher Learning Institutions

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**Abstract:**

*Academic libraries of Public Higher Educational Institutions in Ethiopia (PHEIE) suffer from common problems, like dissimilar distribution, duplication and superfluous procurement of e-resources as well as technological infrastructure among university libraries. Moreover, information poverty is what these universities are epitomized with. The main aim of this study was to investigate ways to minimize e- resource divide between Ethiopian University libraries through the use of cloud library. The methodology employed to conduct this study was survey research. Simple random sampling method was used to select samples from study population and a purposive sampling method was used to select study areas. Questionnaire, semi-standardized face-to-face interview and observation were used to collect data. The results of the research show that 76.5% of respondents need to have cloud library system. The study also found that cloud library had a potential to minimize duplication of e-library projects with M=3.75, SD=1.28. The study also found that application of cloud*

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*technologies is at an infant stage in EPHLI and thus it can be said that the impact on e-resources sharing had not been well recognized.*

**Key words:** cloud Library, e-library, E-services, E-service divide.

## 1. Introduction

Student intake capacities in Ethiopian universities are on the increase from time to time (Minstery of education November 2013). Amit With the same rate, institutions are working individually to enhance their library services and resources to meet the information needs of their patrons at all levels. Without quality service, establishing libraries by itself cannot be the solution we seek for. Libraries should be supported by information technology (IT) infrastructure, web 2.0 applications, enough information resources, up to date information and services with better system for delivery (C. Maplas 2011).

Sharing resources among libraries define the "notion of what makes a library successful" (Chou.C, 2011). It is obvious that library is not only a knowledge ocean; its ultimate aim is to provide satisfactory services for all the users. So in the new era, library should improve itself constantly by sharing resource and information technologies (C. Maplas, 2011).

Academic libraries of Public Higher Educational Institutions in Ethiopia (PHEIE) suffer from common problems like flexibility associated with e-library services, lower levels of efficiency, unequal distribution of information resources and huge costs involved in managing the entire Information and Communication Technology (ICT) infrastructure. If the concept of cloud library is applied all the universities in the country have a chance to access similar e-resources. Thus the resources that can be shared by multiple organizations were placed in the cloud and then it can be made available to all hosted universities. For example, in Ethiopian universities e-granary

resources is required by every university; this means there is a need to buy the database for all the 33 universities in the country. If the e-granary for one university costs 15 thousand US $, then given the limited budget, we can imagine the amount it costs to have the e-granary resources in all universities. The same is true for other library services. But this cost can be significantly reduced by deploying a single copy of the e-granary database in to the cloud library and the e-resources can be shared by all 33 universities in the country.

## Objectives of the study

### *General objective*

The main objective of the study was to investigate how e-resources divide among Ethiopian university libraries could be enhanced by use of cloud library.

### *Specific objectives*

- To examine users awareness on the benefit of cloud library.
- To understand the level of e-resources and service differences between Ethiopian Public Higher Learning Institutions (EPHLI) library.
- To audit cloud library as a means to minimize e-resource resources divide.

## 2. Related works

As libraries move their focus from print collections to digital resources residing in the "cloud", the library way of accessing information also changed dramatically. Power has clearly shifted from the library to the user and the dependence relationship has been inverted. It is therefore important to think about how to ensure that users continue to use and value libraries. (Faiz Abidi and Hasan Jamal 2012) Discussed that

the changing relationship between libraries and their users in the changing ICT environment. It is not enough to provide useful, high quality and innovative library resources and services and stop improving the services pacing with unstoppable technological innovations. The sharp test of libraries success is whether they will be used frequently.

The growing need for virtual libraries to manage large amounts of data requires storage infrastructure that libraries can deploy quickly and economically. (Fox 2012) On his survey study stated that cloud computing is a new model that allows the provision of information technology (IT) resources on demand, lowering management complexity. Their paper was proposed cloud computing as a solution. The finding was, a file storage service that is implemented on a private/hybrid cloud computing environment is the best solution. Both the efficient strategy and the acquisition of storage services were discussed.

Libraries are in a good position to choose for centralized cloud solution because they handle huge data but with limited finances to afford continuous upgrades of their own computing facilities. (Holt 2007) More described OCLC's initiative in contribution an appropriate infrastructure to sustain large network of libraries, which share cataloguing records, digitized prints and digital repositories as a type of cloud service. The OCLC Research, together with HathiTrust Digital library, New York University Emer Bobst Library and ReCAP (Research Collection, Access and Preservation) Consortium has embarked on the cloud library project, funded by Andre W. Mellon Foundation. The objective was to outsource management of low use print books held in public libraries to shared service providers. This initiative was necessary due to the emergence of mass digitized book corpus enabled by the HathiTrust digital library, which together with ReCAP repository held about 6.3 million digitized items in 2010 with 6 percent growth each month and projected to be 16 million by 2013.

According to (Amit Kumar and Sukumar Mandal 2013) cloud based library system was a fatal solution for library operations. The ultimate goal of modern library is to offer appropriate, comprehensive and multi-level services for its users. These authors argued cloud computing is the only solution for libraries in order to advocated user centered services. Establishing a pubic cloud among many university libraries, it not only can conserve library resources but also can improve its user satisfaction. And it can be illustrated in Figure 1 below:

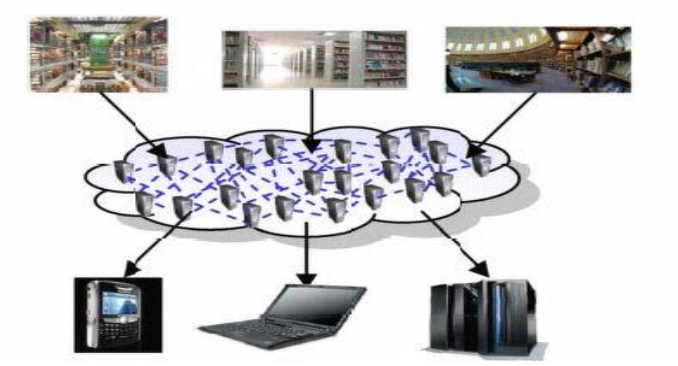

**Figure 1: Application of cloud computing in university library**

To date there is no study done on cloud libraries in Ethiopian higher educations. The development and growth of e-library in Ethiopian higher education is very slow, and also its usage has been stunted by poor infrastructure, high cost of running e-library and software development.

Libraries in public academic institutions in Ethiopia face a lot of problems in terms of costs, resource and technology. Hence the study of cloud library will highly benefit the institutions because the resources are shared by many and thus the utilization goes up. And modern developments like virtualization can make the same resources available to multiple users "simultaneously," thus reducing the need for physical resources even further.

## 3. Research Design and Methodology

### *3.1. Research design*

A survey research method was used to conduct this research. The design generally entailed use of standardized questions to investigate selected study samples to analyze and discover occurrences.

### *3.2. Description of the study sites*

There are 33 universities established in different parts of Ethiopia that have been authorized by the ministry of education [1]. Those universities are classified in to 3 generations based on their establishment period. Ten were relatively older and categorized in first generation, 11 were established somewhat later and categorized in 2nd generation and 12 were newly established and categorized in third generation which is in the process of developing library services and skilled professionals. Thus the researchers selected one university form each generations, which are Jimma University (JU), Hawassa University (HU), and Mizan Tepi University (MTU) respectively from 1st, 2nd and 3rd generation of universities.

### *3.3. Study population*

The respondents of the study included library staff, academic staff, undergraduates (graduating class), and post-graduate students. The researchers felt that these respondents were well suited for the study and would give in-depth information and provide better and comprehensive information on cloud library.

### *3.4. Sample size determination*

The sample size was calculated using a single population proportional formula.

$$n = \frac{z\left(\frac{\alpha}{2}\right) 2 * P(1-p)}{d^2}$$ (Kothari 2004)

Therefore, **t**he total sample size calculated for the study was 406. Among this total number of population 25 respondents were selected from librarians, 312 samples from students and 69 samples from staff. Table 2.1. Presents the population and sample size for all the three universities considered under this study.

**Table 2.1. Population and Sample**

| No | Item | Population | Sample | Sampling technique |
|---|---|---|---|---|
| 1 | University librarians | 25 | 25 | Availability |
| 2 | Academic Staffs | 2591 | 69 | Simple random sampling |
| 3 | Graduating class students | 8969 | 243 | Simple random sampling |
| 4 | Post Graduate students | 2565 | 69 | Simple random sampling |

### *3.5. Data collection*

The methods used to collect data for this study were fixed alternative questionnaire method, which is used to collect data from the students, academic staffs, librarians and IT technicians in the library, whereas semi-standardized face-to-face interview method was used to collect data from the library directors and computer & network service heads and also detailed observation was done for the availability of e-library services at each study site. The questionnaires included several types of questions: nominal, dichotomous and Likert type items.

### *3.6. Data collection procedure*

To collect data from the respondents the researcher got official letter from the Department of Information Science, Jimma University requesting for permission and the necessary assistance from institutions (departments) of all study sites of the study. Then the researchers submitted the letter to the academic vice presidents (AVPs) of the study sites to get permission to conduct the survey. The AVP forwarded the letter to all concerned bodies by approving the study can be done. After that the researchers went to the registrar and human resource management of the study institutions to find

out list of departments, students and staffs respectively. In addition, class schedule was also taken from the departments to know class rooms and specific time to get students in class rooms. Finally based on pre-calculated sample proportion the questionnaires were distributed to the students and staffs by using random sampling technique. Lottery system was used to pick a sample from each class.

### *3.7. Data analysis, presentation and interpretation*

Data analysis was done using statistical software, SPSS version 20 and was analyzed using both inferential and descriptive statistics. Thematic analysis was also done. This involved categorizing related data into themes or topics by perusing through the collected data and identifying information that is related to the research questions and the objectives. After categorizing the data, codes were developed based on the collected data then coded materials were placed under the identified themes. After that interpretation of the data was done and a summary report developed identifying the major themes and associations between them.

## 4. Results and Discussions

### *4.1. Results*

In this study a total of 406 respondents from three public universities (Jimma University, Hawassa University and Mizan-Teppi University) took part. The detail is presented in table 3.1.

**Table 3.1: Response rate of samples**

| Respondents | Respondents University | Frequency | Percentage % |
|---|---|---|---|
| Librarian | JU | 9 | 2.2% |
| | HU | 8 | 2% |
| | MTU | 6 | 1.5% |
| Students and staff | JU | 139 | 34.2% |
| | HU | 131 | 32.26% |
| | MTU | 53 | 13.9% |

| | | |
|---|---|---|
| Total responded | 323 | 79.6% |
| No response | 60 | 14.78% |
| Grand Total | 406 | 100% |

Table 3.1 depicts the participation level of the respondents from these three universities. From a total of 406 (100%) distributed questionnaires, 323 (79.6%) were properly filled out and returned, giving a response rate of 79.6%.

### *4.1.1. Computer literacy skills of patrons*

Respondents were asked questions to determine their computer literacy skills to have access to essential information and effective use of information and communication technologies. Accordingly, more than 80% of the respondents' computer literacy skill level is good.

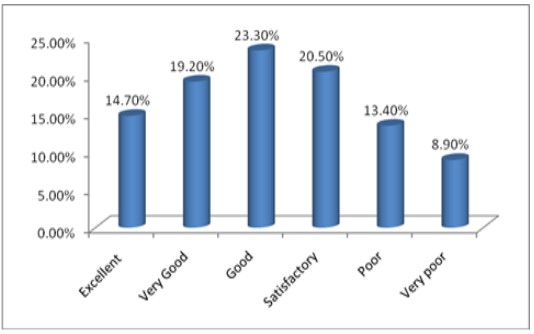


**Figure 3.1: Levels of respondents' computer literacy**

The result shows that computer literacy skill of users is good. This implies that the levels of computer literacy skill of users make them capable enough to use e-library service or would not face problems in accessing cloud library services if developed.

### 4.1.2. E-library service provision

One of the mechanisms to determine efficiency of e-library is examining the extent of availability of services. There are different questions and issues raised to address services provided in these universities. Respondents from JU and HU

indicated that majority of services were provided in their universities. Whereas respondents from MTU said provision of e-library services were not available (Table 3.2).

**Table 3.2. Summary of ANOVA table of differences in service availability among the three universities**

| E-library Services | Significant values between universities | | | | | |
|---|---|---|---|---|---|---|
| | JU | | HU | | MTU | |
| | HU | MTU | JU | MTU | JU | HU |
| Digital library | .142 | .000* | .142 | .001* | .000* | .001* |
| Institutional repository | .001* | .878 | .001* | .083 | .878 | .083 |
| Open url resolver | .975 | .029* | .975 | .021* | .029* | .021* |
| Library web site | .471 | .000* | .471 | .000* | .000* | .000* |
| E-database | .000* | .000* | .000* | .000* | .000* | .000* |
| E-journal | .091 | .000* | .091 | .000* | .000* | .000* |

Level of significant at $p \leq 0.05$

One way ANOVA was used to see whether the differences among the universities service provision is statistically significant. As depicted in table 3.2, variation on the availability and service provision of digital library, open url resolver, library website, e-data base and e-journals was observed among universities. The difference between JU and HU were not statistically significant, which show the e-library service provision between first and second generated universities were mostly similar. However, there is a difference statistically highly significant (P<0,001) when the first and second generation universities are compared with third generated university, except for open url resolver. From this it can be concluded that there were no balanced service provision between universities and thus the university communities in less resource distributed universities are highly disadvantageous.

### 4.1.3. E-library service quality measurements

One of the mechanisms to examine better services in the university library is examining the extent of services and their functionality with the satisfaction level of users from the

system. There are different questions and issues raised to know the availability of quality services and resources. Summary of the response of the respondents is presented in table 3.3 and 3.4.

**Table 3.3: Respondents' opinion about the quality of services in the Library**

| Service quality indicator | Service rating scales | | | | | Central tendency | | |
|---|---|---|---|---|---|---|---|---|
| | Strongly disagree | Disagree | Neutral | Agree | Strongly agree | Mean | Std. Deviation | Decision |
| Sufficient subscribed journals | 9.4% | 31.3% | 18.6% | 12.4% | 7.7% | 2.4 | 1.24 | DA |
| Sufficient purchased e-database | 28.2 % | 27.6% | 15.2% | 16.1% | 13% | 2.1 | 1.19 | DA |
| E-resources are easily accessible | 27.6 % | 26.9% | 11.7% | 18.9% | 14.9% | 2.6 | 1.31 | N |
| DL system satisfy your information need | 24.1% | 25.7% | 16.4% | 16.7% | 17% | 2.5 | 1.19 | N |
| Services are accessed from any location | 23.8% | 14.9% | 27.6% | 18.9% | 14.9% | 2.9 | 1.31 | N |
| No time limitation to access | 19.3% | 17.3% | 17% | 23.5% | 22.6% | 1.7 | 1.37 | DA |

Scale: 5=Strongly Agree (SA), 4=Agree (A), 3=Neutral (N), 2=Disagree (DA), 1=Strongly Disagree (SD)

The results presented in Table 3.3 shows that the most of response were strongly disagreed and disagreed for the questions related with subscribed journals, sufficient purchased e-database, DL system satisfy your information need and services are accessed from any location with mean values 2.4, 2.1, 2.6, 2.5, 2.9 and 1.7 respectively. From this, we can say that current university systems in providing quality services to the patrons are not efficient.

One of the mechanisms to understand the feeling of users about the benefits they gain from the cloud application is based on their previous experience. Thus, questions were asked

on some general benefits of cloud based application. The response is summarized in table 3.4 below:

**Table 3.4. Respondents' opinion about the benefit of cloud library use**

| Benefit of cloud library for users | Mean | Std. Deviation | Decision |
|---|---|---|---|
| Resources are accessed anywhere any time | 4.8 | 1.15 | SA |
| All services are accessed at one point | 4.7 | 1.2 | SA |
| Increase users motivation to use library | 3.75 | 1.3 | A |
| Save users time to search information | 3.63 | 1.3 | A |
| Easy to get disseminated information | 3.6 | 1.3 | A |
| Easy to aware current library services | 3.3 | 1.33 | A |

Scale: 5=Strongly Agree (SA), 4=Agree (A), 3=Neutral (N), 2=Disagree (DA), 1=Strongly Disagree (SD)

The respondents were asked different questions with respect to the benefits of using cloud applications. The result as presented in Table 3.4 shows that most of the respondents strongly agree that resources are accessed anywhere any time and all services are accessed at one point with Mean value of 4.8 and Mean 4.7, with standard deviation 1.15 and 1.2 respectively. The other response scale of the benefits, where the respondents agreed was cloud library increase user's motivation to use library, and save users time to search information with mean value 3.75, 3.63 3.6 and 3.3 respectively. Thus, the finding indicated that the need for cloud application is a paramount important in the public universities, because of its manifold benefits.

**Qualitative data result**

On the extent of developing e-library, all respondents from the three universities indicated that the cost required was very high. Even due to the high cost of e-journals subscription universities in Ethiopia are not in a position to go for it. The cost approximated for one journal subscription was not less than 10-25 thousand dollars. Also maintenance, IT equipment and human labor costs were the major area that libraries invest on.

University librarians were also asked to determine ways in which cloud library can be used to enhance e-resources sharing among universities. All the respondents indicated that its application will enhance collection size, balance haves and have not of information, enhance cooperation, make the process more efficient and effective. They also indicated that the cost invested for the same resources would be minimized and collaborative subscription for journals may ease the process and the costs required. In fact all the universities considered for the study have no plan to deploy the cloud technology. But they informed the researchers that there was national consortium initiated for the sake of sharing resources. However, so far how and what methods to be used were not identified yet.

Respondents' expressed needs for services available on clouds include digital library, institutional repository; integrated library automation system and bibliographic database management.

## 4.2. Discussion

The disproportionate distribution of resources and services with in public universities in Ethiopia needs to have necessitated change in the way libraries operate. Libraries are now required to embrace these changes and manage the resources and services in the best way that satisfy the users they serve.

On the basis of respondents' response, provision and availability of various e-library services of individual universities varies. It is quite interesting to note that the majority of respondent's satisfaction level on sufficiency of subscribed journals, e-databases, e-information resources and easily accessibility of services were low and the existing digital libraries and institutional repositories don't satisfy their information needs in general. Accordingly, the researchers concluded that service delivery strategy among universities was

independent of each other which needs cloud system to bring all the e-resources together. This finding is in agreement with (Faiz Abidi and Hasan Jamal 2012) who stated that Cloud library systems are all service oriented i.e. the systems are such that they are created out of other discrete services. If all electronic data resources of each university put together in a single place (cloud library) which may be accessed by a group of libraries, the whole electronic data base will become huge. This finding is in agreement to (Kueukshetra and Haryana 2012) who stated that using cloud technology can help to bring all services in one place which realizes the resource sharing and obtains a greater efficiency among libraries.

The researchers have a stand that cloud library is a best solution for minimizing e-resource divide among Ethiopian public higher educations. This thought is in agreement to (Li Yongxian et.al. 2009) and (Sanchati 2013) who argued that libraries are in a good position to opt for centralized cloud solution because they handle huge data but with limited finances to afford continuous upgrades of their own computing facilities. Cloud computing allows libraries to avoid locally hosting multiple servers and equipment and constantly deals with hardware failure, software installs, upgrades and compatibility issues and this is possible because processes get simplified and libraries save time and money. ICT related bottlenecks of libraries get reduced by the introduction of cloud technology in universities. This study is in agreement to (Sosa-sosa and Hernandez-ramirez 2012) who said that cloud library is the one point solution to get all updated software, applications with low cost and less maintain and without data and document scattering.

## 5. Conclusion and Recommendations

### 5.1. Conclusion

This research found out the serious need for cloud library in Ethiopian public universities. Library patrons agreed on the enormous importance of cloud library and the finding of this study is in line with other researches that have been conducted on related titles. Most of the study participants attested to the assumption that, as opposed to current system, cloud library makes resource sharing easier and faster. Thus, it can be concluded that Ethiopian universities libraries should develop a cloud library. If so, libraries have the opportunity to improve their services and relevance in today's information society and cloud library is one avenue for such a move. It can bring several benefits for libraries and give them a different future.

The cooperative effect of libraries using the same, shared hardware, services and data rather than hosting hardware and software on behalf of individual libraries can result in lowering the total costs of managing library collections and enhancing both library users' experience and library staff workflows. The vision is to use cloud library to deliver library resources, services and expertise at the point of need, within users' workflows and in a manner that users want and understand. It should relieve libraries from managing ICT, so that they focus on collection building, improved services and innovation. The cloud library model will encourage libraries and their users to participate in a network and community of libraries by enabling them to reuse information and socialize around information. Libraries should be able to share their electronic data and resources, which shall lead to reduction of duplicate, resulting in cutting down of the overall budget of the libraries.

## 5.2. Recommendations

Since the cloud library can be managed by one responsible organization with support of other stakeholders, appropriate policies should certainly have to be defined by the EPHLI together with MOE. Individual institutions should facilitate their own IT staff to focus on specific tasks within the organization, improve efficiency, and even create solutions that were not technically or economically feasible without the cloud technology.

All EHLI need to come together and develop a library resource sharing consortium at national level and discuss on what resources they share and how to manage. Once it is determined a cloud solution does accomplish this for the library then who owns the data stored in the system and what rights does the library have to extract their data for other uses or even to leave the service entirely should also be discussed . Since cloud library implementation depends on high Internet bandwidth each universities work hardly to enhance their internet

There is a need for more discussion with ICT professionals, Librarians, and policy makers to design a framework for cloud library development in EPHLI and must be evaluated. Another area for further research is that of assessing the social-technical impacts, i.e., the impact of migrating to cloud computing and its effects on the organizational culture, people and their relationships, work performance and system affordances of cloud computing in libraries. Research in this area should seek to answer questions such as: how does migrating to cloud affect the current work practices? Will system affordances change and how will they change?

The prototype cloud library should be developed and implemented at least in two universities libraries and tested with iterative feedback from the users so that framework is

modified before the full-fledged implementation in all university libraries.

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