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# Journal of Information Technology and Library Science

## Aims and Scope

This journal covering all area of library Science, technology, information and interdisciplinary research. The library science is an interdisciplinary field that applies the practices, perspectives and tools of management, information technology, education and other areas to libraries. The collection, organization, preservation, and dissemination of information resources; and the political economy of information are also included in library science.

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## Contents

# Problematic Issues with E-Journal Features: A Research Survey of Aerospace Scientists and Engineers of Bangalore

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## A B S T R A C T

*The coming of the World Wide Web has propelled this vigorous growth of the electronic forms of communication which simply do not fit into the traditional publishing format. With the coming of age of the electronic journals, it has totally altered the way scholarly information is disseminated throughout the world. There is no doubt that this particular innovation has changed the information usage of scientists. Invariably the role of the librarians has dramatically changed to meet the 'vibrant electronic needs' of the scientists and engineers. Electronic journals have greatly affected not only the way information has spread, but also the way in which electronic information is acquired and how the scientists, engineers, scholars researchers seek this needed information. However, electronic journals are not free from issues and problems. A research survey was undertaken to study the 'Problematic Issues with E-Journal Features' faced by the Aerospace Scientists and Engineers of the selected 16 aerospace organizations of Bangalore. The age-group of this study is between 21-60 years. Analysis of Variance (ANOVA) was applied for testing the significant difference among the 16 mean scores attained from the scientists and engineers of the aerospace organizations for 'Problematic Issues with e-Journal Features'. It is observed that all the 16 aerospace organizations show a significant difference ($P < 0.05$) in their mean scores viz., 'Videos or animated graphics that play slowly or poorly', 'Articles in PDF that download slowly' and 'e-Journals, that don't provide access to olderissues' except for 'Pictures in PDF that are too small to read clearly ($P = 0.091$)', 'Pictures in HTML that load slowly' and 'Pictures in PDF that are in black-and-white' instead of full-colour'.*

***Keywords: Aerospace Scientists and Engineers, E-Journal Features, Problematic Issues, ANOVA, P-Value, Videos or Animated Graphics, Articles in PDF, HTML.***

## 1. INTRODUCTION

Over the past decade, as the utility of the electronic medium expanded, scholarly journals have increasingly become Internet-based. Initially, the perceived benefits of the electronic medium seemed to some observers to inevitably lead to the obsolescence of printed journals. Another major incentive for the development of electronic journals was the perceived economic benefit of the new medium. Today, the electronic environment has become the fastest growing arena in scholarly publishing and a great incentive for journals to be accessed online, [1, 2].

Several studies have shown that scholars highly value „electronic journals“. Most importantly, electronic journals save time, make work easier, result in better quality research and enables the scholars

to find more materials. Another important factor of the electronic medium is the increased ability of scholars to engage in interactive forms of communication. [3]

Today, scholarly journals along with monographic works and conference proceedings are the primary medium for the formal display and dissemination of knowledge in the academic community, and they have been for hundreds of years, [4].

Various studies over the last 40 years have indicated that journals are extensively read; the information they contain is extremely useful for research, teaching and life-long learning; and the information is valuable in terms of the favourable outcomes from its use. All of these factors have remained stable over the years.

It is observed that some of the most salient features associated with online journals are:
(a) Hypertext links, (b) Graphics, (c) Audio and Video, (d) Post-Publication Comments, (e) Post Publication Discussions: Listserv lists, Chat Rooms etc., (f) Access to downloadable data files, (g) Electronic Review, (h) Correction of Errors, (i) Presentation in Multiple Formats, (DOC,DOCX, HTML, PDF etc..), (j) Full-Text Searching, (k) Electronic Notification of Publication, (l) Provision of Related Resources, (m) Constant Access [5]

However, electronic journals are not free from issues and problems. The authors in their paper discuss the „Problematic Issues with the e-Journal Features" that have been provided by various publishers and also through various open access resources that are available on the Internet.

## 2. REVIEW OF LITERATURE

By creating sites with more interactive features, scholarly publishers will be able to retain members and readers in an era in which an increasing amount of content will be freely available to all. They also emphasize that technology has progressed to the point at which implementing such interactive features is no longer the exclusive prerogative of the very wealthiest publishers. At the same time, journals, or at least society journals, view these features as a way to retain and increase membership in an era in which they no longer have exclusive rights to content. In a nutshell, information is no longer a scarce commodity. Publishers also see such "interactivity" as key to appealing to what some call the "Google Generation." Incorporating these features into their own sites may allow scholarly publishers not only to hold on to current readers, but also to appeal to the next generation of potential society members. Of course, interactivity has always been part of the print publishing business. However, new web tools make this interactivity possible at a speed and fluidity that was never possible in print, [6].

It is seen that one of the stumbling blocks to promoting the use of electronic journals is the potential plethora of interfaces and delivery mechanisms with which the user may be required to become familiar. The situation has become more or less stabilized considerably in the last year or so, with primary access via the Web and the delivery of full text as a PDF file almost becoming the norm. It is also important to note that, although Web interfaces may have many features in common, their implementation by different electronic journal publishers varies considerably, with a variety of search options and navigational tools. Also, increasingly, multi- media features are appearing in electronic articles, such as sound or video clips, and users will need to install the appropriate software and hardware to access them, [7].

The authors opine that E-Journal features do not share common locations across publisher‟s interfaces. Where there may be two distinct locations, these are on different sides of the screen. There is variation in terminology. E-Journal interfaces are adopting some visual conventions from other types of web sites to locate more generic features that are shared among sites. The authors also add that inconsistency among regular used interfaces may inhibit transfer from one journal to another. Some of the interfaces appear cluttered. A move towards standardization of terminologies and location of the most common features, drawing on existing conventions wherever possible, would ease frustrations in interacting with the interfaces [8].

This study by the authors examines users of electronic journals published in a hosting system called EJUM (Electronic Journal of the University of Malaya) and their perceived satisfaction with the electronic journals as well as their preferred features in electronic journals and problems they face when using the electronic journals. As far as the problems faced by the users, the respondents indicated “downloading articles” problematic (48, 38.1%), followed by “searching and browsing for articles” (42, 33.3%), “viewing articles” (21, 16.7%) and “printing articles to read later” (9, 7.1%). The problem in downloading may be because users do not have Adobe Acrobat Reader installed in their PCs and a link should be provided to users to download the Reader which is available gratis on the WWW [9].

## 3. CSIR-NATIONAL AEROSPACE LABORATORIES, BANGALORE AND ALLIED AEROSPACE ORGANIZATIONS IN BANGALORE: THE SCOPE OF THE PRESENT STUDY

The National Aerospace Laboratories is India‟s premier civil aviation R&D aerospace research organization in the country. Its main mandate is the „Development of aerospace technologies with a strong science content, design and build small and medium – sized civil aircraft, and support all national

aerospace programmes. NAL is also required „to use its aerospace technology base for general industrial applications". „Technology" would be its core engine-driver for the future. NAL is also best known forits main sophisticated aerospace R&D testing facilities which are not only unique for this country but also comparable to similar facilities elsewhere in the world.

Sixteen prominent aerospace organizations of Bangalore were selected for this research study (See Table 1), and many of these aerospace organizations come under the broad umbrella of (i) Council of Scientific and Industrial Research (CSIR), (ii) Defense Research and Development Organizations (DRDO), (iii) The Indian Air Force (IAF), (iv) Educational Institutions like IISc, and (v) Major public sector undertakings and (vi) The Department of Space. All of them in their own way have significantly contributed to a large number of Indian aerospace programmes.

## 4. NULL HYPOTHESES

- There is no significant difference in the mean scores of „Problematic Issues with E- Journal Features" among the aerospace scientists and engineers of Bangalore.

## 5. OBJECTIVES OF THE STUDY

- To determine the frequency of „Problematic Issues with E-Journal Features" among the aerospace scientists and engineers of Bangalore
- To ascertain whether the percentage of preference of the „Problematic Issues with E- Journal Features" by the aerospace engineers and scientists are approximately the same.
- To study whether there exists similar patterns (homogeneous) of „Problematic Issues with E-Journal Features" among the aerospace scientists and engineers Bangalore.

## 6. MATERIALS AND METHODS

The present study is restricted to the selected 16 prominent aerospace organizations in Bangalore. A total number of 650 survey questionnaires were distributed amongst the aerospace scientists and engineers belonging to these 16 aerospace organizations. A total number of 612 questionnaires were received back finally 583 (89.7%) were selected for the study which were found suitable for the study. A survey questionnaire has been used to conduct this research study. The total population size of this research study is restricted to the 1220 aerospace scientists and engineers in Bangalore. The distribution of Source Data is indicated in Table 1. The questionnaire distributed sample is indicated in Table 2 The mean scores of „Problematic Issues with E-Journal Features" are illustrated in Table 3, with the necessary statistical inferences. Random sampling technique has been used for selection of the sample size.

## 7. RESULTS AND DISCUSSION

- **Summary of Total Scores on Problematic Issues with e-Journal Features**

The summary of total mean scores obtained with regard to the Problematic issues with e- journal features" is as follows: The highest mean score of 2.06(CV=70.40) is represented by the option „Videos or animated graphics that play slowly or poorly". This is followed by „Articles in PDF that download slowly" with a mean score of 1.98(CV=64.74). The third highest mean score of 1.94(CV=76.14) is represented by „e-Journals, that don"t provide access to older issues". This is followed by a mean score of 1.93(CV=66.24) which is represented by „Pictures in PDF that are too small to read clearly". A mean score of 1.82(CV=72.17) is depicted for „Pictures in PDF that are black-and-white instead of full-colour". Finally, the lowest mean score of 1.73(CV=75.58) is represented by the option „Pictures in HTML that load slowly".

- **Analysis of Variance (ANOVA)** was applied for testing the significant difference among the 16 mean scores attained from the scientists and engineers of the aerospace organizations for „Problematic Issues with e-Journal Features". It is observed that all the 16 aerospace organizations show a significant difference ($P < 0.05$) in their mean scores viz., „Videos or animated graphics that play slowly or poorly", „Articles in PDF that download slowly" and „e- Journals, that don"t provide access to older issues" except for „Pictures in PDF that are too small to read clearly ($P = 0.091$)", „Pictures in HTML that load slowly" and „Pictures in PDF that are in black-and-white" instead of full-colour".

## 8. CONCLUSIONS

The main conclusions of this research study that the authors would like to present are:

- **Analysis of Variance (ANOVA)** was applied for testing the significant difference among the 16 mean scores attained from the scientists and engineers of the aerospace organizations for „Problematic Issues with e-Journal Features". It is observed that all the 16 aerospace organizations show a significant difference ($P < 0.05$) in their mean scores viz., „Videos or animated graphics that play slowly or poorly", „Articles in PDF that download slowly" and „e- Journals, that don"t provide access to older issues" except for „Pictures in PDF that are too small to read clearly ($P = 0.091$)", „Pictures in HTML that load slowly" and „Pictures in PDF that are in black-and-white" instead of full-colour".

- This also implies that, the percentage of preference of the „„„Problematic Issues with e- Journal Features““ by the aerospace engineers and scientists are not approximately the same, except for „Pictures in PDF that are too small to read clearly (P = 0.091)“, „Pictures in HTML that load slowly“ and „Pictures in PDF that are in black-and-white“ instead of full- colour“.
- The study also reveals that there is heterogeneity in the Use Patterns of „Strong Perceptions of e-Journals Access“, except for except for „Pictures in PDF that are too small to read clearly (P = 0.091)“, „Pictures in HTML that load slowly“ and „Pictures in PDF that are in black-and-white“ instead of full-colour“, among the aerospace scientists and engineers of Bangalore.

## 9. ACKNOWLEDGMENTS

The authors would like to thank Director, NAL and Head, KTMD for their support.

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## TABLES AND FIGURES

**Table-1: Distribution of Source Data (Sample Size)**

| Sl.No. | Organizations | No. of Questionnaires distributed | No. of Questionnaires received | No. of usable questionnaires usable |
|---|---|---|---|---|
| 1 | ADA | 67 | 63 | 58 |
| 2 | AFTC | 19 | 16 | 15 |
| 3 | ADE | 14 | 12 | 12 |
| 4 | ASTE | 33 | 30 | 29 |
| 5 | CABS | 16 | 15 | 14 |
| 6 | CEMILAC | 33 | 30 | 29 |
| 7 | C-MMACS | 8 | 6 | 6 |

| | | | | |
|---|---|---|---|---|
| 8 | DARE | 11 | 9 | 9 |
| 9 | LRDE | 5 | 3 | 2 |
| 10 | GTRE | 24 | 22 | 21 |
| 11 | HAL | 144 | 140 | 134 |
| 12 | IAM | 40 | 36 | 33 |
| 13 | ISRO-ISTRAC | 25 | 24 | 22 |
| 14 | IISc | 38 | 37 | 34 |
| 15 | JNCASR | 5 | 3 | 1 |
| 16 | NAL | 168 | 166 | 164 |
| **Total** | | **650** | **612** | **583 (89.7%)** |

Geographical Boundary of the Study (16 Prominent Aerospace Organizations of Bangalore, INDIA).

Key: ADA=Aeronautical Development Agency, AFTC=Air Force Technical College, ADE=Aeronautical Development Establishment, ASTE=Aircraft Systems Testing Establishment, CABS=Centre for Airborne Systems, CEMILAC=Centre for Military Airworthiness and Certification, C-MMACS=Centre for Mathematical Modeling and Computer Simulation, DARE=Defense Avionics Research Establishment, LRDE=Electronics and Radar Development Establishment, GTRE=Gas Turbine Research Establishment, HAL=Hindustan Aeronautics Limited, IAM=Institute of Aerospace Medicine, ISRO-ISTRAC=Indian Space Research Organization, IISc=Indian Institute of Science, JNCASR=Jawaharlal Nehru Centre for Advanced Scientific Research, NAL=National Aerospace Laboratories.

**Table 2: Questionnaire Distributed as part of the main survey: How problematic are the following issues with e-journal features?**

| 4 – to a great extent, 3 – to moderate extent, 2 – to a little extent, 1 – not at all, 0 – cannot say | | | | | | |
|---|---|---|---|---|---|---|
| **-1** | Videos or animated graphics that play slowly or poorly | **4** | **3** | **2** | **1** | **0** |
| **-2** | Articles in PDF that download slowly | **4** | **3** | **2** | **1** | **0** |
| **-3** | Pictures in PDF that are too small to read clearly | **4** | **3** | **2** | **1** | **0** |
| **-4** | Pictures in HTML that load slowly | **4** | **3** | **2** | **1** | **0** |
| **-5** | Pictures in PDF that are in black-and-white instead of full- colour | **4** | **3** | **2** | **1** | **0** |
| **-6** | E-Journals ,that don?t provide access to older issues | **4** | **3** | **2** | **1** | **0** |

**Table 3: Problematic Issues with e-Journal Features**

| S. N. | Organizations | Mean and CV | Problematic Issues | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Videos or animated graphics that play slowly or poorly | Articles in PDF that download slowly | Pictures in PDF that are too small to read clearly | Pictures in HTML that load slowly | Pictures in PDF that are in black- and-white instead of full- colour | e- Journals, that don't provide access to older issues |
| 1 | ADA | Mean | 2.26 | 2.26 | 2.29 | 2.02 | 2.14 | 2.09 |
| | | CV | 54.74 | 46.59 | 41.66 | 52.93 | 50.67 | 59.75 |
| 2 | AFTC | Mean | 0.87 | 0.73 | 1.13 | 1.27 | 1.93 | 1.07 |
| | | CV | 114.28 | 140.84 | 109.94 | 101.04 | 74.36 | 109.02 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3 | ADE | Mean | 1.92 | 1.83 | 1.75 | 1.83 | 1.75 | 1.42 |
| | | CV | 78.52 | 76.55 | 81.27 | 80.01 | 81.27 | 114.45 |
| 4 | ASTE | Mean | 1.97 | 1.69 | 1.66 | 1.66 | 1.66 | 1.66 |
| | | CV | 84.35 | 76.03 | 81.18 | 85.86 | 76.21 | 90.3 |
| 5 | CABS | Mean | 1.79 | 1.43 | 1.57 | 1.36 | 1.36 | 1.57 |
| | | CV | 85.57 | 93.97 | 81.7 | 84.79 | 89.58 | 81.7 |
| | CEMILAC | Mean | 1.52 | 1.69 | 1.69 | 1.52 | 1.69 | 1.07 |
| 6 | | CV | 103.65 | 95.04 | 95.04 | 102.14 | 92.37 | 127.32 |
| 7 | C- MMACS | Mean | 3 | 2.33 | 2.83 | 2 | 1.83 | 3.17 |
| | | CV | 42.16 | 34.99 | 26.57 | 63.25 | 41.06 | 36.92 |
| 8 | DARE | Mean | 2.44 | 2.33 | 2.22 | 1.78 | 2 | 1.67 |
| | | CV | 61.74 | 47.92 | 54.08 | 73.22 | 79.06 | 90 |
| 9 | LRDE | Mean | 4 | 2 | 2 | 3 | 2.5 | 4 |
| | | CV | 0 | 70.71 | 70.71 | 0 | 28.28 | 0 |
| 10 | GTRE | Mean | 2.52 | 1.95 | 2.29 | 2.19 | 2.14 | 2.9 |
| | | CV | 54.07 | 54.87 | 50.16 | 57.05 | 64.81 | 48.57 |
| 11 | HAL | Mean | 2.07 | 1.91 | 1.81 | 1.68 | 1.77 | 1.48 |
| | | CV | 74.61 | 73.88 | 81.05 | 83.46 | 81.42 | 95.97 |
| 12 | IAM | Mean | 2.15 | 2.06 | 1.76 | 1.48 | 1.55 | 1.7 |
| | | CV | 80.61 | 72.73 | 81.75 | 92.4 | 94.45 | 85.25 |
| | ISRO-ISTRAC | Mean | 2.32 | 2.14 | 2 | 1.5 | 1.68 | 2.23 |
| 13 | | | | | | | | |
| | | CV | 55.51 | 63.45 | 59.76 | 93.72 | 69.6 | 74.53 |
| 14 | IISc | Mean | 1.71 | 1.88 | 1.94 | 1.59 | 2.09 | 2.53 |
| | | CV | 79.74 | 63.76 | 56.63 | 77.68 | 60.54 | 59.39 |
| | JNCASR | Mean | 2 | 2 | 2 | 2 | 2 | 3 |
| 15 | | CV | 0 | 0 | 0 | 0 | 0 | 0 |
| 16 | NAL | Mean | 2.12 | 2.18 | 2.05 | 1.82 | 1.79 | 2.33 |
| | | CV | 62.91 | 52.06 | 55.88 | 68.72 | 68.66 | 59.99 |
| Mean Scores Obtained for Problematic e-Journal Features | | Mean | 2.06 | 1.98 | 1.93 | 1.73 | 1.82 | 1.94 |
| | | | | | | | | |
| | | CV | 70.4 | 64.74 | 66.24 | 75.58 | 72.17 | 76.14 |
| P Values | | | 0.019 | 0.016 | 0.091 | 0.471 | 0.728 | 0 |

**Key:** ADA=Aeronautical Development Agency, AFTC=Air Force Technical College, ADE=Aeronautical Development Establishment, ASTE=Aircraft Systems Testing Establishment, CABS=Centre for AirborneSystems, CEMILAC=Centre for Military Airworthiness and Certification, C-MMACS=Centre for Mathematical Modelling and Computer Simulation, DARE=Defense Avionics Research Establishment, LRDE=Electronics and Radar Development Establishment, GTRE=Gas Turbine Research Establishment, HAL=Hindustan Aeronautics Limited, IAM=Institute of Aerospace Medicine, ISRO-ISTRAC=Indian Space Research Organization, IISc=Indian Institute of Science, JNCASR=Jawaharlal Nehru Centre for Advanced Scientific Research, NAL=National Aerospace Laboratories.

## About the Authors

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# Designing an Integrated Library Management and Retrieval System using Open Source Tools

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## ABSTRACT

*The paper discusses the application of open source tools for the libraries in different cluster on Ubuntu operating system. Open source tools are essential in integrated library management and retrieval system for housekeeping operations and information retrieval system. This research work explores the twelve innovative open source tools on the basis of global recommendations and local requirements in different college libraries. How to use these tools in the college libraries both for the data management and backup and restoration. However, there are many tools are available in the open source environment but this research work select the most comprehensive in the level authority and bibliographic on different databases. These open source tools are to be easily managed the digital and library resources in the libraries.*

***Keywords: Open source tools, Integrated Library System, and Integration***

### 1.0 INTRODUCTION

Open source is more important for college libraries. Open source tools is one of the important concept in automated and digital library system. All the tools are to be access from the web to manage and maintain the library resources. It is source code available in online environment. Backup and restoration is also possible from these open source tools (Calvert, 2015). Basically there are six types of domain specific cluster including integrated library system cluster, digital media archiving cluster, content management system cluster, learning content management system cluster, federated search system cluster and community communication interaction cluster (Breeding, 2014). These clusters can be developed by using the open source software and open source tools. Housekeeping operations and information retrieval system is also performed by the open source tools. But this research paper only explores the important innovative open source tools which easily manage the domain specific cluster for designing and developing an integrated information management and retrieval system for libraries. There are many open source tools are available in online environment but this research work select only the most comprehensive tools and it helps in different areas like installation and configuration of domain specific software for college libraries. College librarians can easily manage the different tasks through these open source software. Privilege control is also possible from the graphical user interface of SQLyog and here librarians are the super user for managing the library operations effectively and efficiently. Content

management system and learning content management system is manage by open source tool which increase the use of information resources in college library to retrieved the right information at the right time.

### 1.1 Objectives

Actually unix was started in the university and academic purpose because its source code available in online environment. Since much of the development of Internet technologies took place within the walls of universities and research facilities, Unix became the operating system that was used for this development. The main objectives of this research paper are explained in the following ways :

(i) To explore the barcode generate in college libraries on housekeeping operations.

(ii) To provide the data backup, restoration and migration from one system to another on Ubuntu operating system.

(iii)To managed the authority data and bibliographic data through open source tools.

(iv)To retrieved and access the data through discovery tool and data transfer tools in Ubuntu OS.

These objectives are the most important in the research paper to setup the single list of parameters and it also possible to integrated all the open source tools in a single window based interface for the housekeeping operations and information retrieval system. In this paper only select these tools because open source software gives the user the right to use, copy, distribute, examine, change and improve the software architecture in different levels like barcode generation, spine label creation, file transfer and access, server maintenance on Ubuntu operating system.

### 1.2 Methodology

Open source tools are to be selected on the basis of global recommendations and local requirements in the college libraries. All the softwares are managed on Ubuntu operating system because it gives more security, user-friendly and reliability. There are several studies about how free and open source software is developed, who takes part in the development and their motives for developing this kind of software. One observation made is the high level of creativity in development projects for free and open source software. Matured level softwares are to be selected in the following areas:

| Parameters | Tools |
|---|---|
| Barcode generation | Glabels |
| Data backup and restoration | SQLyog, automysqlbackup and Postgresql |
| Data migration from one format to another | MarcEdit |
| Authority management | OCLC Dewey Cutter Program |
| FRBR and RDA | RIIMF |
| Discovery tool for the advanced users | VuFind |
| File access or run from the server machine | Telnet |
| File transfer | FTP |
| Offline communication in the campus | Squirrelmail or roundcubemail |
| System backup and installation | Remastersys |

**Table – 1: Tools selections in college libraries**

### 1.3 Open Source Tools Used in Libraries

Now, in modern age increasing the use of open source software in college libraries. All the softwares are open because its source code available and customize with maintain this software time to time from a particular software home page. The important tools are to be represents are as follows :

#### (I) Glabels

This is the barcode generation tool (See Figure – 1) in integrated library system. There are two ways to generate the barcode like direct export barcode in excel format from the Koha databases and on the otherhand it also possible to generate the barcode from the excel sheet under the open office in Ubuntu operating system. So as to its new innovative tool that can manage the barcode with size, position and color.


**Figure -1: Glabels in barcode generation**

#### (ii) SQLyog

It is the graphical user interface tool (See Figure – 2) and integrated with the MySQL superuser. This is the most powerful tool which manage the database and helps to the college librarians for backup and restoration of a particular databases. It is also known as open database connectivity for data transfer and migration. Backup all the data related with domain specific cluster by using this tool both user and librarian interface.

**Figure – 2 : SQLyog interface for data backup and restoration**

**(iii) Automysqlbackup**

Database backup is one of the important task in domain specific cluster. Automatically backup the databases just open the home folder in Ubuntu and here backup all the softwares in logically and systematically also (See Figure - 3). Database backup is possible in three intervals like daily, weekly and monthly for MySQL database. College librarians can easily backup the databases by using the automysqlbackup tool because its very easy and systematic. Open the terminal from the application and just write the command sudo automysqlbackup and press here enter. Now, the database will be stored under the home directory in automysqlbackup folder.

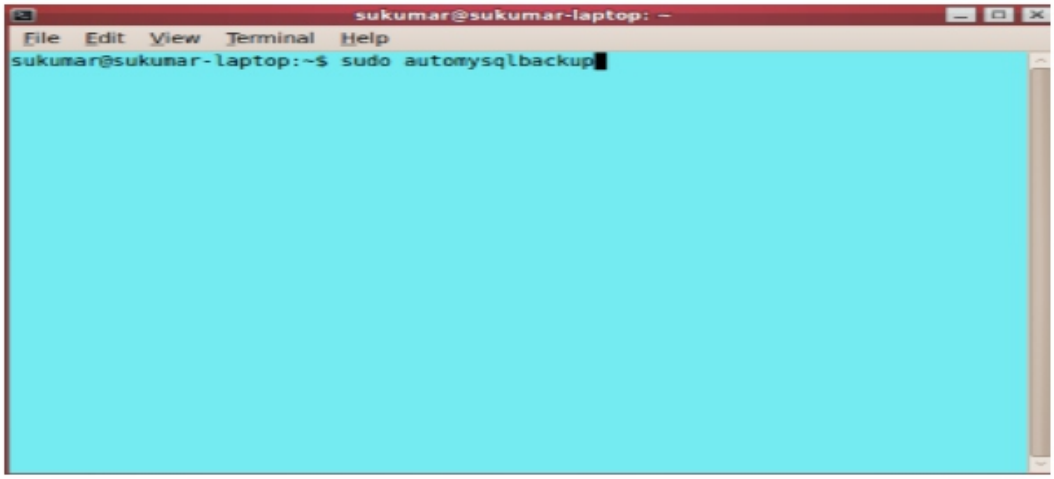


**Figure – 3 : Automysqlbackup interface**

**(iv) MarcEdit**

MarcEdit (See Figure - 4) is developed by Terry Reese during 1999 for the management of bibliographic data. Data conversion is also possible from one format to another format. Customized the necessary fields and sub-fields from the bibliographic and authority format. MARC file is created from the ISO file as CDS/ISIS Winisis and also convert the .mrk format to .mrc format. Data migration is also possible by using this tool from one system to another. Excel data is imported in Koha by the marceditor which helps to users for searching and downloading the bibliographic information. College librarians can easily convert the file from iso to marc format and other format also.


**Figure – 4 : MarcEdit interface for data migration**

### (v) OCLC Dewey Cutter Program

Cutter number is one important aspects in bibliographic information. It is a open source software that can manage the cutter numbers in two ways like four-figure cutter tables and cutter-Sanborn four-figure table based on the input text. The Figure – 5 is represents the OCLC Dewey Cutter program interface for college libraries. It is nicely works both the operating system like Windows and Linux and it enhances the classification efficiency under the tag of 082.

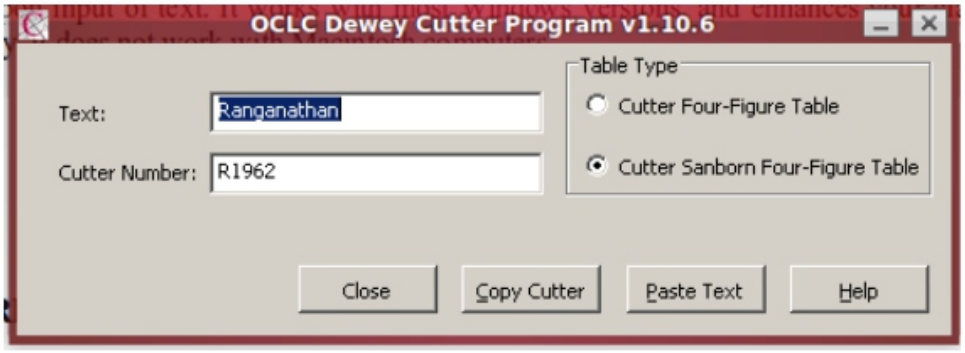


**Figure – 5 : OCLC Dewey Cutter Program interface**

### (vi) RIMMF

It is a open source tool for management of RDA related documents in library automation. RIMMF stands for RDA in Many Metadata Formats. It is support the different formats like RDF, XML, MARC and etc. It also helps to exported the excel formats. New record of any items against in work, expression, manifestation, item, person, family, corporate body, concept, object, event, place and etc. Apart from these it also manage the FRBR standards by using this tool. This is the new innovative tool for college libraries that can helps to import the authority records from the VIAF and from the other authority control tools. Visualized is better, simple and comprehensive in different item types. WEMI concept is to be presents in the Figure – 6 for a particular entity in a library.

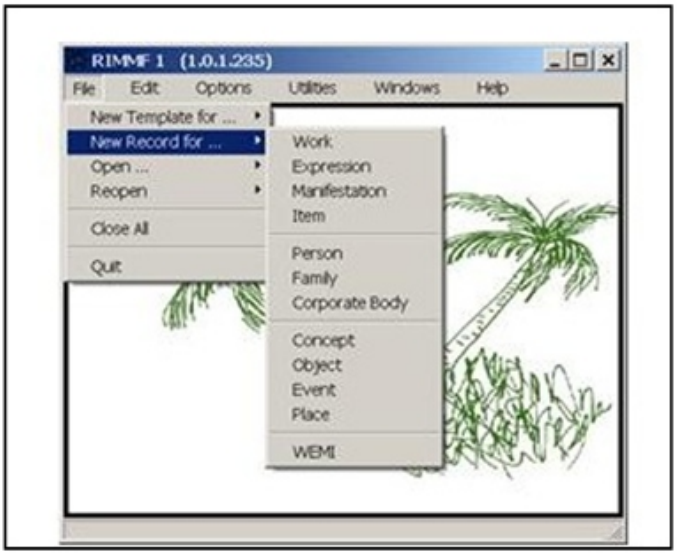


**Figure – 6 : RIMMF interface for RDA**

**(vii) PostgreSQL**

It is an open source object relational database management system and used in backup and restoration. This tool is greatly helps to connect the two domain specific software like DSpace and NewGenLib. The primary function is to store the data securely for retrieving of information to the college users efficiently and effectively. It can handle the large amount of data both for single machine or other machine if the computer is connected to the LAN. Triggers is the important due it fully support and attached to other tables. Update triggers are also nice performing in this section to execute the programs and set of conditions. The Figure – 7 is represents the postgresql interface in college libraries for data backup and restoration in different domain specific cluster.

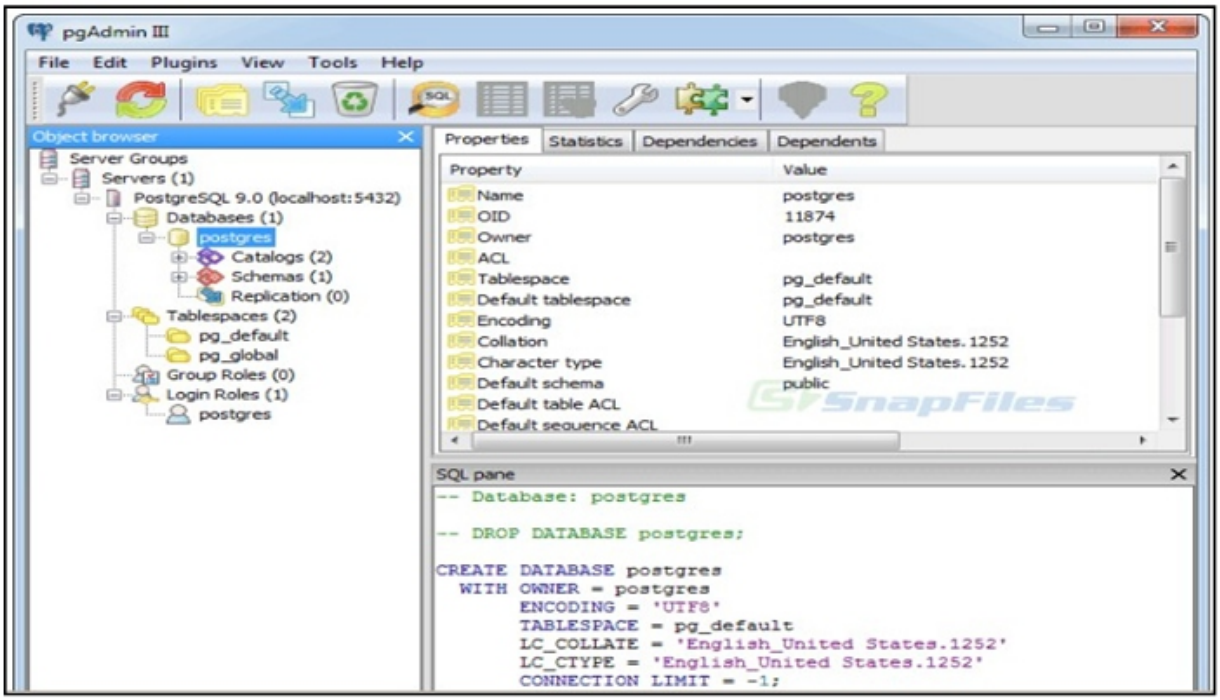


**Figure – 7 : Postgresql interface for databack and restoration**

**(viii) VuFind**

VuFind is an open source discovery tool developed by Villanova University in 2010. Search and browsing the bibliographic information from the traditional OPAC into the VuFind. This interface is very much simple, sophisticated and google like interface. Keywords searching is very flexible because retrieved the most relevant information which available in Koha databases or other databases both for integrated library system and digital library system (Carter, 2009). While most commonly used for searching catalog records, VuFind can be extended to search other library resources including but not limited to: locally cached journals, digital library items, and institutional repository and bibliography (Chickering & Yang, 2014). It supports the multilingual interface in user as well as admin interface. Faceted search results that allow users to narrow items by format, call number, language, author, genre, era, region, and more (Yang & Wagner, 2010). The Figure – 8 represents the discovery interface of

VuFind for browsing capability. Personal organization and annotation of resources through favorites lists, texting, e- mailing, tagging, and commenting features (Elleroa, 2014). A patron centered library is extensible; it remains flexible and reactive to user needs. Technology is a tool, not an end, so librarians explore new technology in a climate where experimentation is encouraged through sound management techniques (Hofmann & Yang, 2012). Access services, document delivery and ILL operations are being redesigned to improve the user experience (Hoeppner, 2012). It support the Solr indexing tool as discovery layer services for the libraries. SolrMarc is used to import MARC metadata to the "biblio" index on Solr used by VuFind. The import process is controlled by the settings in the import/marc. properties file under the directory of /usr/local/vufind/import in VuFind installation directory. Sometimes, it is necessary to perform special data manipulation beyond the capabilities of the built-in SolrMarc functions. Apache Solr, an open source search engine, offers amazing performance and scalability to allow for VuFind to respond to search queries in milliseconds time. It has the ability to be distributed if you need to spread the load of the catalog over many servers or in a server farm environment. Solr is bundled as the built-in search in many applications such as CMS systems. The major Hadoop distributions from Cloudera, Hortonworks and MapR all bundle Solr as the search engine for their Big Data platforms. Solr is supported as an end point in various data processing frameworks and Enterprise integration frameworks.

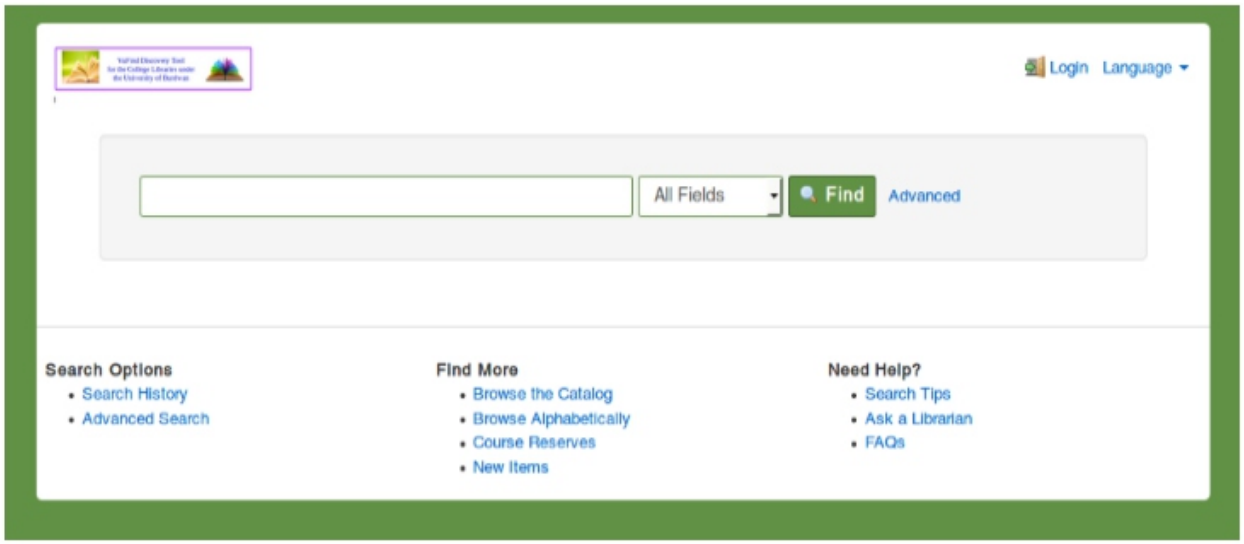


**Figure – 8 : VuFind discovery tool interface**

### (ix) Squirrelmail

Squirrelmail is an open source tool developed by Nathan and Luke Ehresman in 1999 and written in php programming language. It is support the LAMP architecture because its support the cross-platform. Offline mail is possible within the campus or colleges when Internet is not present in the college campuses. But here only required the LAN connectivity to transfer the message and files from one computer to another. It is also known as client-server architecture that can easily manage the IMAP server. Multilingual information is to be transfer due its fully support the Unicode based standards. It can

be run through the Mozilla Web browser and Google chrome also. File attachment is also possible during the mail sending to the friends or other persons. The Figure – 9 is represents the squirrelmail interface of college libraries in domain specific cluster which can helps the community communication interactions (Levine-Clark, 2014).

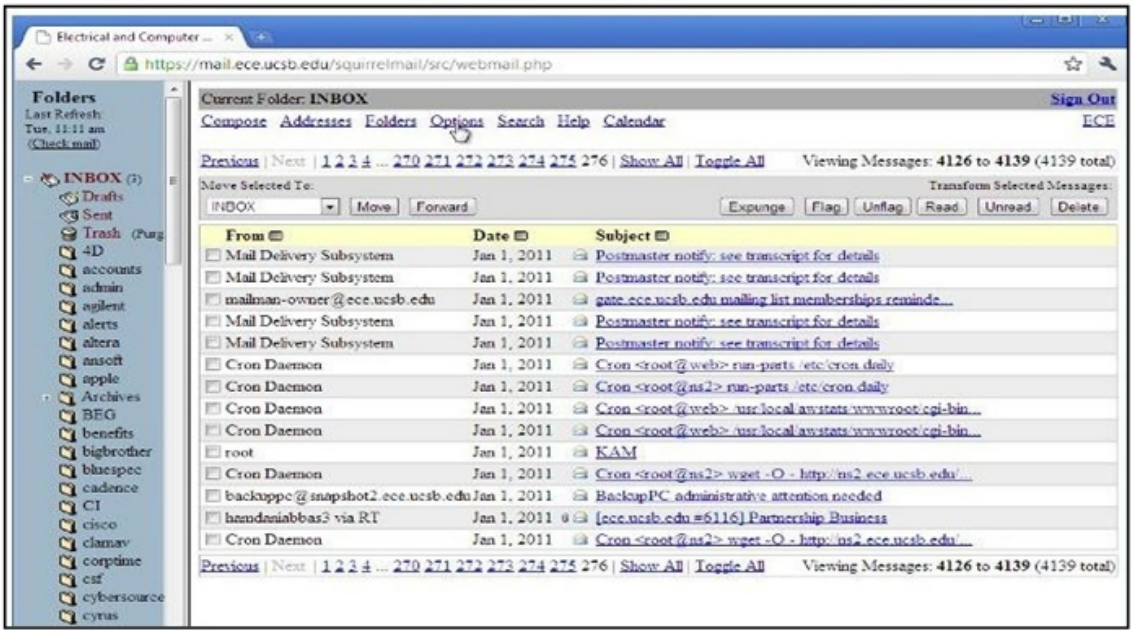


**Figure – 9 : Squirrelmail interface of domain specific cluster**

**(x) Telnet**

Telnet is a telecommunication network based on client server protocol which is more reliable in domain specific cluster to access the files from the server machine. TCP/IP is the king protocol of the Internet that can transfer and manage the network resources in the college libraries. Other software is to be run and access by using this tool and the Figure – 10 is represents the telnet command on terminal with machine IP address. VuFind discovery tool is also run by using the terminal from the client machine and virtual terminal connection.

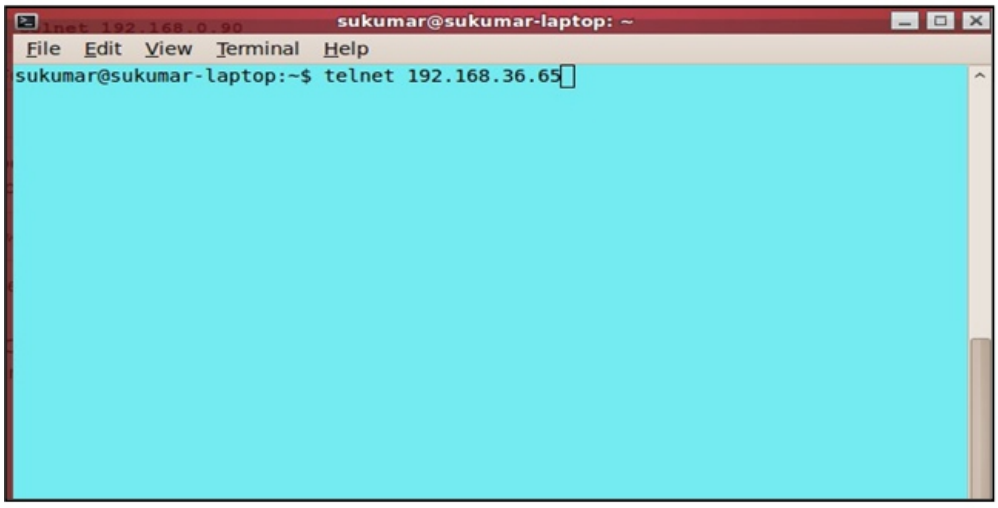


**Figure – 10 : Telnet interface in domain specific cluster**

**(xi) File Transfer Protocol**

FTP stands for file transfer protocol and used for transfer the files from one computer to another. Get the files from the server machine if its connected to the local area networking based on the client server architecture. It also support the hypertext transfer protocol which fix the bug for small ephemeral transfer. The Figure – 11 is represent the file transfer protocol interface in the domain specific cluster for community communication interaction. FTP has a stateful control connection which maintains a current working directory and other flags, and each transfer requires a secondary connection through which the data are transferred. In "passive" mode this secondary connection is from client to server, whereas in the default "active" mode this connection is from server to client.

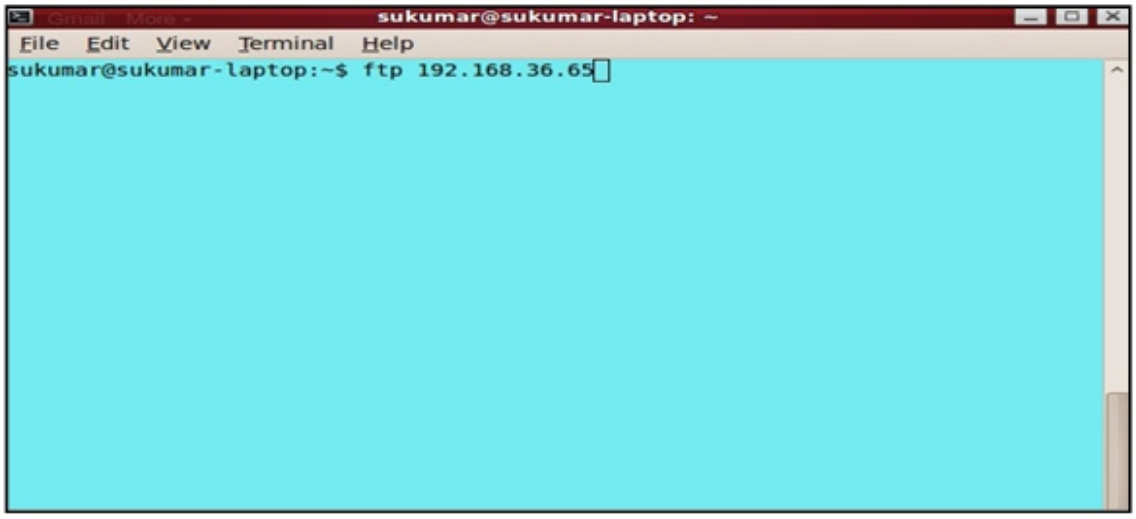


**Figure – 11 : File transfer protocol interface in domain specific cluster**

**(xii) Remastersys**

Remastersys is also an important open source live DVD creation tool in this framework to provide the all files and users data. It is support both the operating system like Windows and Ubuntu, so as to it is known as cross-platform. It is also found in two formats like .deb and wget format but this research work select the second option because this is very easy to create the ISO image file in Ubuntu (http://remastersys.org/). Backup can be made on the basis of size of the files if file size larger then only backup the user data (i.e super user) and on the other hand it will select the whole backup file size is small. Settings is also an important aspects in live DVD format first name the live DVD (e.g CLBU Live DVD) and it will stored in the specific location on Ubuntu (/home/remastersys/CLBU.iso) for buruning and run the system. Burning is also possible from the option of bracero after that run and successfully installed the Live DVD on Ubuntu. All the college libraries can run their necessary cluster by using the whole system in a single window based interface.

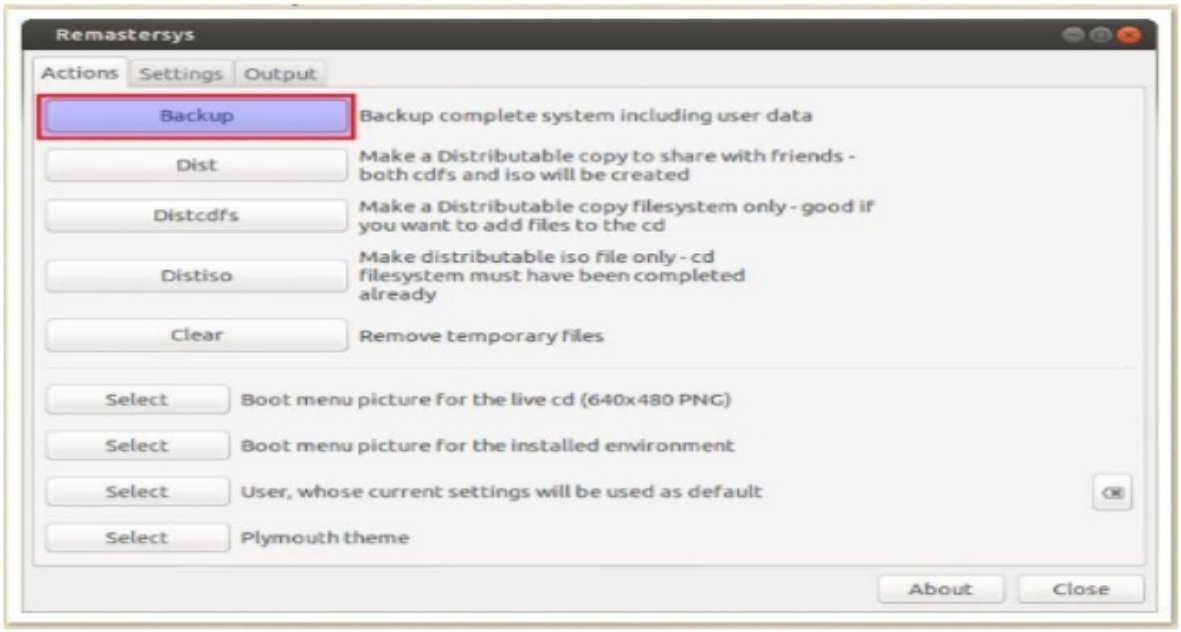


**Figure – : Remastersys backup on Ubuntu**

### 1.4 Integration in Ubuntu Operating System

Integration facilities is one of the important aspects in Ubuntu operating system. This research work successfully integrated the above mentioned open source tools in Ubuntu to provide the better services in libraries. The most comprehensive parameters are to be selected and integrated in housekeeping operations and information retrieval system for the users as well as library professionals. After creation the files through remastersys and its possible to installation and configuration of other target libraries. Data migration is also an important tasks in automated and digital library system and this can be done through MarcEditor. Most comprehensive tasks is Backup and restoration in integrated library management and retrieval system this can be achievd through SQLyog. Another difference of Telnet from a raw TCP session is that Telnet is not 8-bit clean by default. 8-bit mode may be negotiated, but high-bit-set octets may be garbled until this mode was requested, and it obviously will not be requested in non-Telnet connection. Explicit FTPS is an extension to the FTP standard that allows clients to request FTP sessions to be encrypted. This is done by sending the "AUTH TLS" command. The server has the option of allowing or denying connections that do not request TLS. The SSH file transfer protocol (chronologically the second of the two protocols abbreviated SFTP) transfers files and has a similar command set for users, but uses the Secure Shell protocol (SSH) to transfer files.

### 1.5 Findings

The findings of this research paper are explained in the following ways :

(I) It is easily possible data conversion and data migration from one system to another through MarcEditor.

(ii) Data backup and restoration is possible through two important tools like SQL yog and automysqlbackup.

(iii) Author mark is managed by the OCLC Dewey Cutter program under the MARC tag 082.

(iv) RDA and Vocabulary is managed by the RIIMF in college libraries and it also support the FRBR entity relationship model.

(v) Remastersys helps to create the live DVD both for data and user related documents.

(vi) File access and transfer from one computer to another computers are managed by the telnet and ftp in college libraries.

(vii) Offline community communication is possible through squirrelmail in the college campus.

(viii) Bibliographic and authority data is managed and send to the users mobile through VuFind discovery tool.

(ix) Glabels can managed the barcode in college libraries and it also managed the patron card layout.

(x) Postgresql helps to achived the backup in digital media archiving cluster like DSpace and this can be easily possible through open source tool.

### 1.6 Conclusion

The domain specific cluster is one of the important things in college libraries. Technology is inevitable and indispensable and in this respect one important quotes is given by the Arthur C. Clarke : "Any sufficiently advanced technology is indistinguishable from magic.". All the tools of domain specific cluster are important because it can easily manage the housekeeping operations and information retrieval system in college libraries. Backup and restoration is possible through these tools which can increase the library services for the students and teachers also. The college librarians can easily manage and maintain the domain specific cluster in different areas including integrated library system, digital media archiving cluster, content management system, learning content management system, community communication interaction and federated search system also. Search, browse and retrieve the relevant information to the users from one computer to another computer by using the backup and restoration tool like SQLyog and postgresql. So, as it can conclude that these tools are to easily and efficiently solved the problem of different advanced level tasks in libraries.

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# Design of Cloud-based E-Learning System for Virtual Classroom

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## A B S T R A C T

*Cloud computing provides a great collection of computing resources that can be rapidly and elastically provisioned and released based on users' demand to serve a wide and regularly expanding variety of information processing requirements. Due to its tremendous advantages this technology is maturing quickly and is being adopted in many applications including government, business, and cloud- education. This research employs the Cloud as a learning environment for teaching Computer Science and related courses by removing the locality constraints, while simultaneously improving students' understanding of the material provided through practical experience with the finer details and subjects' complexities.*

*Most of the universities infrastructures are underutilized and in some cases over utilization of resources occurs, in order to balance the usage of the resources there is need for an elastic technology. In order to develop an e-Learning platform for virtual or open distance learning (ODL) undergraduate students of computer science new methodologies (like cloud based e- Learning) should be taken into consideration for project, problem based learning and virtual computorium. The research identified several potential Computer Science courses which could be launched and taught through Clouds. This framework addresses the services of cloud computing in a new dimension and each layer (in virtual classroom cloud-based system) specifies the essential components (that is matching of computer science courses with cloud layers) needed to construct an academic cloud in an open distance learning environment. And finally, a way of implementing the framework is proposed.*

***Keywords: Cloud computing, e-Learning, based e-learning, distance learning, classroom.***

## 1.0 INTRODUCTION

In modern time, web based technologies have an enormous contribution in reducing routine work. Many institutions and universities are introducing some new courses to give knowledge about these technologies. But institutions are facing many problems like lack of experienced teachers to teach technical courses to their students. So to overcome this problem, many institutions introduce online education service for those courses. Virtual or E-learning is a term used to describe any form of electronically-based learning and teaching, including computer- based teaching both in and outside of the classroom, such as the streaming of university lectures on an institution's website. So it becomes necessity for many countries especially developing nations such as Nigeria to implement the e-Learning software solutions to improve their educational standard. But there are many problems to implement

these solutions like lack of infrastructure and proper facilities in educational institutes throughout the country. Thus, the cloud computing technology in e- Learning is the best solution to overcome this problem. [1].

University has various departments where many students need to access the computing and resources such as highly available software and hardware. Cloud computing has the capacity of scaling and elasticity which is perfect for such an environment. A cloud computing service has ubiquitous access through a Web browser or mobile device with application programming interface (APIs) or special desktop applications. Use of Cloud Computing on universities has many benefits such as accessing the file storages, databases, educational resources, research applications and tools anywhere, anytime on demand. Furthermore, cloud computing reduces universities' information technology (IT) complexity and cost. The main goal of an academic cloud is to manage effectively the technological needs of universities such as delivery of software, providing of development platform, storage of data, and computing. The implementation of cloud services at universities provides various opportunities and benefits for the users of the university. For example, in a typical university scenario, personal computer laboratories and servers are under-utilized during the night and semester breaks. In addition, these resources are on high demands mainly towards the end of a semester, following a dynamic rule of use. The Physical machines are old even when they are idle, wasting its full potential. Every day that goes by, research and educational needs of universities' change with developing technology. All the software and hardware of universities' must be renewed in accordance with the changes. For example, there are office applications, programming language, and multimedia developing courses in computer education. Also every year, the new versions of applications were used for courses with respect to the needs of industry. [2]

Thus, the aim of this work is design an cloud based e-learning framework for Ladoke Akintola University of Technology Open Distance Learning (LAUTECH ODL) using Computer Science education as a case study. This research is intended to create a framework for Computer Science education to remove some of the above limitations and challenges by harnessing the power of Cloud Computing. The framework removes the locality constraints, allowing students and faculty to collaborate in a distributed and interactive surrounding. In addition, Cloud Computing provides a set of tools to help educators explore subject complexities in a manageable manner without the risk of harming the system because of the virtualization technology within the Cloud Computing preventing the damage. The new Cloud-based E-learning environment can be solid, hold more sophisticated packages, and support synchronized contents without much concern about the infrastructure limitations. The resources, when they are needed, can be rented from the Cloud. [3]

## 2.0 LAUTECH E-LEARNING MODEL

An e-Learning system is a popular technology for distance education. The e-Learning education system based on the web models conventional in-person education by providing equivalent virtual access to classes, contents, and other resources. It is also a social space where students and teacher can interact through threaded discussions or chat. E-learning systems are usually developed as distributed applications. The architecture of distributed E-learning systems includes software components, like the client applications, an application server and a database server and the necessary hardware components like client computer, communication infrastructure and servers. Overall, this design is called a three-tiered architecture. The architecture for E-learning system is shown in Figure 1.

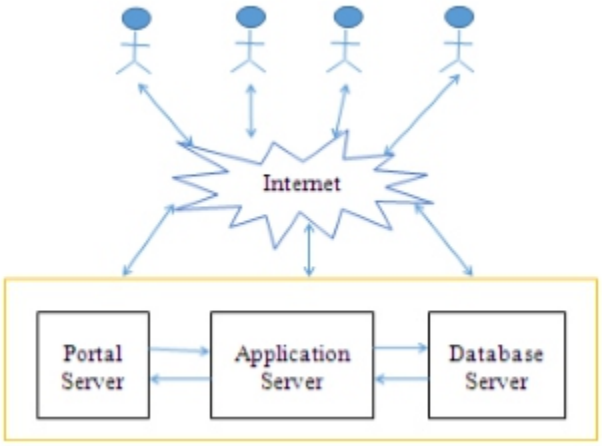


**Figure 1: LAUTECH E-learning Architecture**

In a LAUTECH E-learning system, all three tiers are maintained at a central location by the content provider and this design implementation is called E-Learning Server. The problem with the existing technologies is that they are platform specific and are not interoperable. They do not allow the learners to avail the e-learning resources from different places. They are not flexible and dynamically scalable infrastructure. Also, they decrease the performance and increases the overall cost.

## 3.0 BASICS OF CLOUD COMPUTING

Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. Cloud Computing is a technology that uses the internet and central remote servers to maintain data and applications. There are five essential characteristics of cloud computing: on-demand self-service, broad network access, resource pooling, rapid elasticity or expansion, and measured service.

**3.1 Cloud Services:** Cloud offers services that can be grouped into the following categories as shown in figure 2:

**(i) Infrastructure as a service (IaaS):** Hardware resources (such as storage) and computing power (CPU and memory) are offered as services to customers. This enables businesses to rent these resources rather than spending money to buy dedicated servers and networking equipment. Here, Amazon1 offers simple storage services (S3) for storage, elastic compute cloud (EC20 for computing power, and single queue server (SQS) for network communication for small businesses and individual consumers.

**(ii) Software as a service (SaaS):** In this service, software applications are offered as services on the Internet rather than as software packages to be purchased by individual customers. Examples include Salesforce.com , Google web-based office applications (word processors, spreadsheets, etc.),

**(iii) Platform as a service (PaaS):** This refers to providing facilities to support the entire application development lifecycle including design, implementation, debugging, testing, deployment, operation and support of rich Web applications and services on the Internet. Most often Internet browsers are used as the development environment. Examples of platforms in this category are Microsoft Azure Services platform6, Google App Engine7, etc.

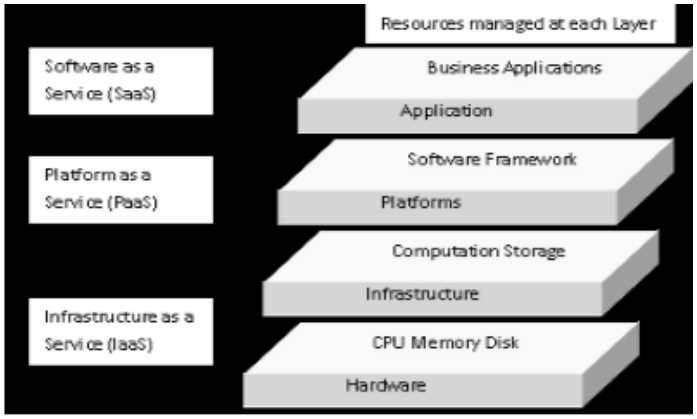


**Figure 2: Cloud Computing Architecture.**

**3.2 Cloud Models:** There are four "deployment models" (private, community, public and hybrid) that together categorize ways to deliver cloud services. A private cloud exists for the use of one consumer (business) exclusively. The cloud may be used by many business units within the same enterprise but the service provision may, in fact, be outsourced to a third party. A community cloud is similar except that the consumer in this case is a group of interested parties that are not from the same enterprise. The service

may be managed by one of the parties in the community or by a third party. A public cloud provides applications, storage and other resources to the general public. These services are free or offered on pay per use model. An hybrid cloud, is the use a combination of any of the three aforementioned deployment models. The models remain distinctive but are linked by standards or proprietary systems that permit data and/or application portability. [4]

## 4.0 RELATED WORK

Over the years of inception of e-learning, various researchers have came up with different e- learning architectures. Ivica et al. [5] developed a system called StartHPC to teach parallel programming at MIT. This system is based on a virtual image of Amazon EC2 machine which is used to build the class cluster. By using Cloud Computing, both the faculty and the students were allowed to focus on the concepts of parallel programming in OpenMPI and OpenMP without being distracted by non-related details such as networking and installation problems. Tian et al., [6] in 2010 developed a high serving education fields and research institutes to manage a virtual Cloud lab‘s resources allocation, users, and access with the ability to deploy it on a public or private Cloud. They implemented the framework using the VMware workstation 5.5 which creates virtual platforms; Apache web server, MySQL database server, and security remote access tools. Their framework enhances resource utilization and sharing. The researchers design and implement the framework to manage PaaS in virtual Computing labs (VCL). Yang and Zhu[7] built Open-source software (OSS) for e-learning based on Cloud Computing in China. They proposed the EduCloud platform to launch their e-learning environment on a public Cloud, using IaaS and SaaS to overcome resource limitation and lack of e-learning scalability.

Virtual Computing Laboratory (VCL), developed by Vouk et al [8] in North Carolina State University (USA), enables students to reserve and access virtual machines (VMs) with a basic image or specific applications environments, such as Matlab and Autodesk. VCL does not offer collaboration features, but offers (IaaS and PaaS) platforms which could be used to host collaboration systems (SaaS) on top of it. Bo Dong et al [9] presented an e-Learning framework called Blue-sky cloud framework in which physical machines have been virtualized and allocated on demand for e-Learning systems. It also solves the challenges faced by e-Learning systems. It also consists of three layers such as the virtual infrastructure, capability and data caching layer. It improves the availability, performance and scalability of e-Learning systems. Other works can be found in Al-Zoube [10]; Xu et al. [11]

## 5.0 METHODOLOGY

### 5.1 Identifying the Computer Science and related Courses

To determine the potential Computer Science and related courses, it is pertinent to analyzing computer science related courses. The analyzing process was based on the assignment types, components of the syllabus, and the course with respect to the basic Cloud Computing service layers, as shown in Figure 3 adopted from [3]. In teaching the concepts of computer science courses in a much more interactive platform, comparing to simulation scenarios with a local cluster, it is better to spotlight the non-theory courses since most of the Cloud's PaaS services depend on a programming model. All courses can benefit from SaaS and IaaS layers, such as Cloud based virtual classroom applications and tools. In addition, multi levels of difficulty to the courses which can fit in more than one layer of Cloud basic layers of services are identified. Moving from the SaaS layer to the PaaS means the course depth and difficulty increases, and students have to understand course concepts more deeply. In the same way, moving from the PaaS layer to the IaaS, more sophisticated courses with higher levels of difficulty which reached the details of VMs configuration and details of networking and operating systems are added.

### 5.2 Building the Framework

Distance learning (DL) in its current shape is very primitive and harnessing the cloud into the e- learning environment gives more flexibilities and dynamic resource allocation which solves the scalability issue. Then the virtual classroom on the top of Cloud Computing layer helps to conquer some DL limitations. Applying the Cloud based architecture to Computer Science courses will result in adding the course content in the appropriate layer through the interface by adding the content. Using this architecture will enhance the quality of service for adding more students and more multimedia content. In addition, the live video streaming is a problematic in the previous systems, but when utilizing the Cloud infrastructure, this problem will be eliminated when we have a good bandwidth for the private networking.

Based on the identified courses, a Virtual Classroom for Computer Sciences based on Cloud Computing (VC-CS) framework is built based on [3]. Now, to integrate the course to use the Cloud in its teaching process is focused. By highlighting the how part, we can proceed to the details of the framework layers and architecture. The following figure 3 shows the VC-CS framework. The presented frame work namely VC-CS contains four layers (User Interface, SaaS, PaaS and IaaS) and three modules (User log database, system security, and service management).

**User Interface Layer:** A user Interface represents LMS since it acts as an interface between the user and the e-learning content. The User Interface layer contains three important components: User Portals: provide an access path to specific web applications or services since everything is located on the web and can be accessed using an Internet connection. Service Catalog: contains different types of services with detailed information about the additional access information, such as what layer the service is located and who can access this specific service. Courses Repository: composed of the courses content categorized and arranged depend on the course name and access level which may be in one of the three other layers (SaaS, PaaS, or IaaS).

**SaaS Layer:** This layer provides access to hosted programs–applications or tools on the Cloud— used most of the time by beginner levels, such as Intro to Computer Science, Fundamentals of Data Structures, Foundations of Sequential Program, Information Technology Law, Data Management I, Algorithms and Complexity Analysis and Discrete Structure. Using Microsoft Word, Microsoft Access or Microsoft Excel, for example, as a hosted application on the Cloud by Google Apps [12] is considered as a component for this layer.

**PaaS Layer:** In the PaaS level courses, they need more than just an existing application to reach their goal. Building a distributed system or simulation needs control of the number and the IPs for the virtual machines (VMs) with a platform to host the developed application. For For Human-Computer interaction course, there is need for a platform to host and deploy the developed application or system to measure and test the usability of the deployed system. For the Information Management and DB courses, they are able to build more sophisticated systems and distributed DBs using different tools to manage these systems and DBs. They can use different programming languages to build an application or system on the provided platform for the PaaS level. In the PaaS level, the user can access the VM level with some limitations, and with this access, they are able to control part of the networking issues, such as IPs and routing mechanism which help in teaching Computer Networks and Communication, Net-Centric Computing courses for the beginner. For the Computational Sciences course, they can build a temporary multiprocessing system using multiple VMs to solve an existing problem quickly and efficiently. The Software Engineering courses need a platform to develop the software which can be found on the PaaS level. Also, we can choose multiple Operating Systems (OS), build specific scheduling algorithm, and compare the Central Processing Unit (CPU) utilization and speed when using different OS. Lastly in the Computer Security course, in the PaaS level the user is enabled to build inception keys and data encoding mechanisms.

**IaaS Layer:** Infrastructure-as-a-Service (IaaS) is a computational service model widely applied in the cloud computing paradigm. In this model, virtualization technologies can be used to provide resources to cloud consumers. The IaaS level gives more flexibility to Computer Hardware course when dealing with the Hardware layer but through the virtualization. Now, the point where there is need to build the servers and set up their configurations is reached as represented in the Database management II course. For the Distributed Computing course, the user can personalize their firewalls, ports, and IPs access. In this level, the OS and the network can be manipulated more deeply above the virtualization layer. Meanwhile with Artificial Intelligence, combining the complexity of machine learning with the scalability of cloud computing resources makes for a powerful match. By offering machine learning tools through the cloud, the idea is to democratise access - both in terms of hardware costs for compute and storage, and also access to data science skills needed to benefit from the technology. [3].

## 6.0 SELECTING APPROPRIATE CLOUDS

Cloud candidates considered for this work are Amazon, IBM Clouds, and Windows Azure based on the following criteria:

- Identification of Clouds that provide a platform as a service since it is the most appropriate layer to deploy the framework on;
- Since the courses would utilize the PaaS to develop and deploy their application besides the course interface which would be built using IaaS and PaaS, especially for virtual classroom tools that can be found in the PaaS layer;
- To include the Clouds that affords a great amount of services to apply more courses.
- Also to depend on ease of the use and the existence of ongoing technical support services.

## 7.0 CONCLUSION

Cloud computing is a new emerging technology that is expected to significantly change the field of IT in the next few years and lead it for the coming decades. Numerous services and applications can be provided in the Cloud due to its many interesting and promising characteristics. Cloud services and applications are expected to attract many individuals and organizations from different disciplines and our project helps them understand the impact of these services on their e-learning, however, cloud computing technology is not free of risks and concerns. Examples of Six pilot Computer Science courses have been given. The selected courses are Database Management, Human-Computer interaction, Operating System, Parallel Programming, Artificial Intelligence and Data Communication and Network. Because CloudSim is the only existing open source simulation toolkit that simulates the IaaS, we could not use it to simulate PaaS, the main layer in our framework. This framework helps and satisfies organizations, institutions, learners and instructors to provide an efficient e-Learning mechanism using

cloud computing. By means of the cloud based e- Learning, students will attain the 21st century skills within them and also increases the university-industry collaboration.

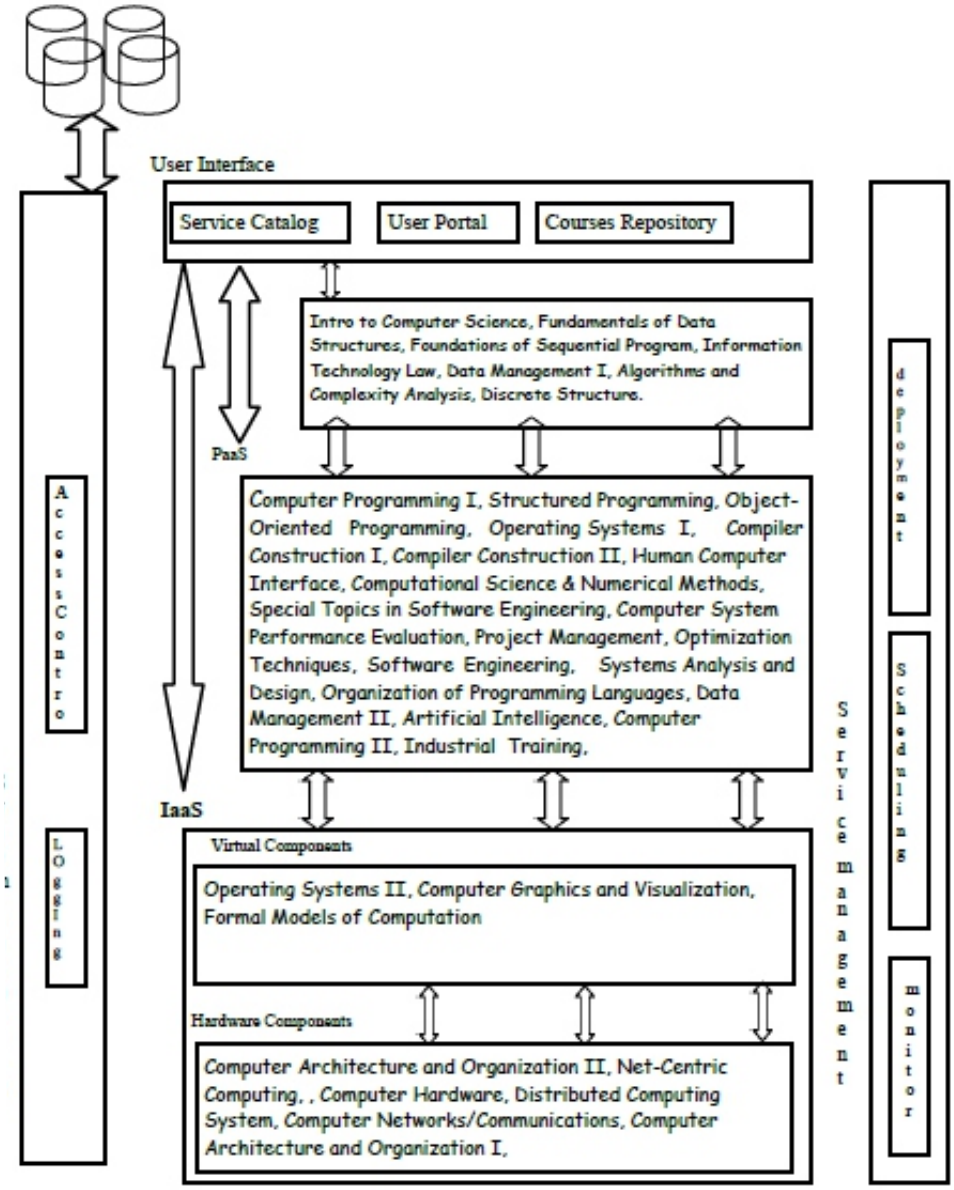


**Figure 3: Virtual Classroom for Computer Science based on Cloud Computing. (Adapted from [3]).**

This research identified the potential advantages of using Cloud Computing in educational settings as well as limitations that should be considered. In short, without any doubt, Cloud Computing offers a plethora of tools and choices, which should be carefully evaluated to ensure that all the educational stake-holders gain the maximum benefits from such technology.

Security and privacy issues continue to be the biggest concern on cloud computing that limits its adoption in practice. The multi tenancy nature and resource and data outsourcing are the main reasons for the security issue in cloud computing. Organizations and individuals are still concerned about storing

and processing their sensitive data and critical applications on the cloud. They continue to raise many questions for their CSPs such as where is their data located and who manages and accesses it, why is their personal information requested and who uses it and what is the fate of their data in case of disasters or when the CSP went out of business. It is not surprising that much of the future work in cloud computing will focus on developing approach that are able to address its security issues.

The research possibilities regarding Cloud Computing for educational purposes are immense since the technology is relatively new. Research in the education fields has much to be examined, but there is not yet a clear definition and standard for such technology. The movement will be rapid after the standardization. The future works on educational cloud computing include but not limited to:

- Investigate the effectiveness of the course content and placement in the framework as well as the ability to move and add courses. In other words, refine the framework after examining actual scenarios.
- Compare the implementation of the framework on the public Cloud, private Cloud, and hybrid Cloud by highlighting the strengths and weaknesses of each Cloud architecture while considering the performance and security issues.

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# Information Literacy among Engineering Students in Chennai: Role of Libraries

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## ABSTRACT

*This paper examines the information literacy among engineering students in Chennai. The study was conducted among engineering students and libraries in Chennai. Majority of the respondents are male, undergraduate and CSE department. Libraries provided information literacy as awareness about Information resources and services. There is no significant difference between the Information literary provided by the Libraries among personal factor.*

***Keywords: Information Literacy, Libraries, Engineering students, Chennai.***

## INTRODUCTION

Information literacy is a set of abilities requiring individuals to "recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information. Information literacy forms the basis for lifelong learning. It is common to all disciplines, to all learning environments, and to all levels of education. It enables learners to master content and extend their investigations become more self directed and assume greater control over their own learning. Information literacy also is increasingly important in the contemporary environment of rapid technological change and proliferating information resources.

Information literacy in higher education is the mission of higher education institution is central to lifelong learners. By ensuring that individuals have the intellectual abilities of reasoning and critical thinking and by helping them to instruct how to learn, how to develop their careers as well as in their roles as informed citizen because of Information literacy student's are competency with evaluating, managing, and using information. Academic libraries coordinate the evaluation and selection of intellectual resources to explore the unknown, offer guidance on how best to fulfill information needs.

## REVIEW OF LITERATURE

Zurkowski (1974) According to Zurkowski, "People trained in the application of information resources to their work can be called information literates. They have learned techniques and skills for utilizing the wide range of information tools as well as primary source in modeling information solution to their problems".

The final reports of the American Library Association Presidential Committee on Information Literacy (1989) not only recognize the importance of information literacy to a democratic society, but provided a definition in terms of requisites skills.

Chakravarty.R information literacy competency is the skill to be assessed to understand at what level an individual is information literate. Information competencies are a key factor in lifelong learning. They are the first step in achieving educational goals.

## OBJECTIVES OF THE STUDY

- To analyze Information Literacy provided by the libraries in engineering colleges.
- To know the purpose of Information Literacy provided by the libraries in engineering colleges.
- To identify the Proficiency level of Information Literacy provided by the libraries among engineering students.

## Hypotheses

**$H_{01}$:** There is no significant difference between Information Literacy provided by the libraries among personal factor of the respondents.

**$H_{02}$:** There is no significant difference between purposes of Information Literacy provided by the libraries among personal factor of the respondents.

**$H_{03}$:** There is no significant difference between proficiency level of Information Literacy provided by the libraries among personal factor of the respondents.

## METHODOLOGY

The main purpose of this study is to find out the information literacy provided by the libraries among engineering students in Chennai. The samples are selected by stratified random sample method. A total of 150 questionnaires were distributed to the engineering students on a five point Likert Scale of Strongly Agree, Agree, Neither Agree Nor Disagree, Disagree, Strongly Disagree. Nearly 110 questionnaires are received by the respondents and the response rate is 73.3%.

## DATA ANALYSIS AND INTERPRETATION

The data collected has been analyzed using SPSS software package which is used for percentage analysis and chi-square analysis.

**Table 1: Demographical Information of the Respondents**

| Personal Factor | Description | No. of Respondents | Percentage |
|---|---|---|---|
| Gender | Male | 58 | 52.7 |
| | Female | 52 | 47.3 |
| Course | UG | 58 | 52.7 |
| | PG | 38 | 34.5 |
| | PhD | 14 | 12.7 |
| Department | CSE | 26 | 23.6 |
| | MECH | 25 | 22.7 |
| | ECE | 24 | 21.8 |
| | EEE | 23 | 20.9 |
| | CIVIL | 12 | 10.9 |

Table 1 shows that the demographical data of the respondents majority of the respondents are male 58 (52.7%) and 52 (47.3%) of the respondents are female. Majority of the respondents are studying Undergraduate 58 (52.7%) followed by Postgraduate are 38 (34.5%) and 14(12.7%) of the respondents are studying Doctorate course. Then department wise distribution are 26(23.6%) of the respondents are CSE, 25(22.7%) of the respondents are MECH, 24(21.8%) of the respondents are ECE, 23 (20.9%) of the respondents are EEE and 12 (10.9%) of the respondent are Civil department.

**Table 2: Information Literacy provided by the libraries**

| Description | No. of Respondents | Percentage |
|---|---|---|
| Library Orientation / User Education Programmes | 85 | 77.20% |
| Aware about Information Sources and Services | 105 | 95.40% |
| Guide to access through Search Techniques | 80 | 72.70% |
| Create knowledge about Shelf Arrangement and Call number | 72 | 65.40% |
| Develop ICT and Web Tools and Resources | 93 | 84.50% |

Table 2 Shows that Majority (95..4%) of the respondents are aware about information sources and services through information literacy provided by the libraries, 84.5% of the respondents are develop ICT and web tools and resources followed by 77.2% of the respondents are library orientation and user education programmes, 72.7% of the respondents are guide to access through search techniques and 65.4% of the respondent are create knowledge about shelf arrangement and call number through information literacy provided by the libraries.

**Table 3: Information Literacy provided by the libraries Vs Personal Factor of the respondents**

| Personal Factor | Chi Square Value | P Value | Significant / Not Significiant |
|---|---|---|---|
| Gender | 22.471 | 0.004 | S |
| Course | 99.674 | 0 | S |
| Department | 122.571 | 0 | S |

**S – Significant (p value <0.05) NS – Not Significant (p value > 0.05)**

Table 3 shows that information literacy provided by the libraries among personal factor of the respondents are statistically significant as the p value is .004, .000 and .000 ($p<0.05$). Thus there is no

difference between personal factor of the respondents and information literacy provided by the libraries. Hence we accept the null hypothesis and conclude that there is no significant difference between Information Literacy provided by the libraries among personal factor of the respondents.

**Table 4: Purposes of Information LiteracyVs Personal Factor of the respondents**

| Personal Factor | Chi Square Value | P Value | Significant / Not Significiant |
|---|---|---|---|
| Gender | 14.701 | 0.099 | NS |
| Course | 65.082 | 0 | S |
| Department | 114.852 | 0 | S |

**S – Significant (p value <0.05) NS – Not Significant (p value > 0.05)**

Table 4 shows that purpose of information literacy provided by the libraries among personal factor of the respondents are not statistically significant as the p value is .099 to gender, course and department are statistically significant as the p value is .000 and .000 ($p<0.05$). Thus there is difference between purpose of information literacy among gender and there is no different between purpose of information literacy among course and department of the respondents. Hence we reject the null hypothesis to gender and accept the null hypothesis to course and department and conclude that there is no significant difference between purpose of Information Literacy provided by the libraries among personal factor of the respondents are course and department.

**Table 5: Proficiency level of Information Literacy VS Personal Factor of the respondents**

| Personal Factor | Chi Square Value | P Value | Significant / Not Significiant |
|---|---|---|---|
| Gender | 31.223 | 0.052 | NS |
| Course | 15.793 | 0.106 | NS |
| Department | 72.5 | 0.001 | S |

**S – Significant (p value <0.05) NS – Not Significant (p value > 0.05)**

Table 5 shows that proficiency level of information literacy among personal factor of the respondents are not statistically significant to gender and course as the p value is .052 and .106 and statistically significant to department as the p value is .001 ($p<0.05$). Hence we reject the null hypothesis and there is different between proficiency level of information literacy among gender and course and conclude that there is significant difference between proficiency level of information literacy among personal factor of the respondents are gender and course.

## CONCLUSION

Information literacy is ability to recognize resources in the libraries. It prepares the individual for lifelong learning, to create critical thinking and competent researchers etc. the libraries of the academic

institution to become a learning organization in which library professionals are prepared to develop new skills and competencies as required. Among the students majority stated that they are using the libraries resources and services. They also suggested that information literacy has been integrated in to course curriculum, printed literacy instruction, online instruction etc.

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# Managing Digital Library with Open Source Softwares: With Special Reference to KOHA

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## ABSTRACT

*With the growing technology, the challenges for librarians and libraries are growing with the same pace. Even the definition and role of library has changed for the diverse user community of the modern era. This paper discusses different open sources, different softwares available for libraries, initiatives by various organizations, advantages and limitations of open source, and detailed features of KOHA and its popularity in India.*

***Keywords : Open Source, OSS, OSS for Libraries, Digital Library, Koha, IISERs, IISERB***

## INTRODUCTION

Automation in any library covers the basic functions including cataloguing, circulation, acquisition, serials control and reference services. Modern digital libraries are working and moving on the way to match the user work pattern and this is true speacially for the libraries of research institutes like IISERs.Many commercial softwares are available in market for library management like LibSys, VTLS etc. for which new libraries have to pay good amount of money. The main attraction towards open source softwares (OSS) is its availability at no cost alongwith the source code. ‟Free‟ and „Open Source‟ are being used as synonymous terms. Free, here, refers to one‟s freedom to use rather than freedom from price (Stallman, 1998a).

## EMERGENCE AND DEVELOPMENT OF OPEN SOURCE SOFTWARES

Eric Raymond, author of The Cathedral and the Bazaar and co-founder of the Open Source Initiative, agrees but says, for practical purposes, that the birth of the Open Source, Free Software, culture we that know today can be conveniently dated to 1961 (Raymond, 1999).

In 1983 the Free Software Foundation was founded by Richard Stallman and the term „Open Source‟ was introduced in 1998. It grew out of MIT‟s Artificial Intelligence Laboratory where Stallman worked throughout the 1970s and early 1980s. In 1985, to promote the software that the GNU Project was producing, Stallman created the Free Software Foundation (FSF), a tax- exempt charity for the development and promotion of free software (Stallman, 1999).

Free access to library resources, like free access to software, has often been confused with a freedom from cost. This is not how the word free, in this context, should be understood. Richard Stallman (2000) says, “Free software is a matter of liberty, not price … Free software refers to the users' freedom to run, copy, distribute, study, change and improve the software.” As per Ranganathan‟s law „ Every reader his/her book‟, but this does not mean that there is no cost involved with this facility. Free software, on the other hand, is often made available on a web site for no charge other than the cost of an Internet connection and, at the same time, sold on a compact disc for a profit; free software can also be given, freely, from one person to another. Richard Stallman (2000) says, “You should be free to redistribute copies, either with or without modifications, either gratis or charging a fee for distribution, to anyone anywhere. Being free to do these things means (among other things) that you do not have to ask or pay for permission.”

There are many open software projects that libraries use, often without even realizing they are using, open source software. These programs are often Internet based, have a long history of successful use, and are generally recognized by the computing community as stable, reliable, and well supported by their developer communities. Examples of such open source projects include BIND, Perl, Apache, and Linux. If a library is connected to the Internet, more than likely it is using at least two or three of the above in one way or another. The last, Linux, is probably installed in the library even if the administration or system administrators are unaware of it.

BIND is an open source program that any library on the Internet probably uses. BIND, the Berkeley Internet Name Domain package, is software that allows one computer to find another without having to know its unique Internet Protocol (IP) numeric address. BIND has been in use since 1984.

Perl is another open source project that is widely used. A scripting language, Perl is responsible for much of the active content on the World Wide Web. It has been called the “duct tape of the Internet.” Perl has been in use since 1987 and is most commonly used for CGI scripting, accessing databases, text processing, XML processing, system administration, web transactions, and many other activities.

Apache, an open source web server, is more than likely the web server most libraries are using to serve their library‟s web site, assuming libraries select a web server for the same reasons other site owners do. Since January, 1998, Apache has been the number one web server used on the World Wide Web, as noted in a survey by Netcraft; the survey‟s authors observe that Apache is used on over fifty percent of the World Wide Web‟s web sites (Apache Software Foundation, 1998).

**Initiatives of National and International Organizations**

1. International organizations like UNESCO,United Nations Development Program ( UNDP) FSF, IFLA, International Open Source Network( IOSN) promoted open source in e-learning, content management, digital library and integrated library management fields.
2. In India, Knowledge commission under chairmanship of Sam Pitroda recommended open source software for e-governance and information management.
3. UNESCO‟s FOSS Portal can be found at http://www.unesco.org/cgi- bin/webworld/portal_freesoftware/cgi
4. CDS/ISIS as a software has been „free‟ and „open‟ since its early days, long before Free and Open Source Software (FOSS) became a known software model.
5. The Asia Pacific Development Information Programme (APDIP) is an initiative of the United Nations Development Programme (UNDP) that aims to promote the developmemt and application of new information and communication technology(ICT) for human development in Asia Pacific region.
6. International Open Source Network (IOSN) is an initiative of APDIP and supported by the International Development Research Center of Canada. IOSN provides policy and technical advice on FOSS to governments, civil society and the private sectors and works primarily through its web portal www.iosn.net/ that is collectively managed by FOSS community.
7. IFLA working with other agencies actively engaged in open source to encourage regional support initiatives for open source, recommended projects that facilitates adoption of open source and work with UN/UNESCO and EIFL-NET in their open source initiatives.

**Advantages of OSS**

1. Provides cheaper option to the Librarians in comparison to commercial softwares. The expenditure hardly is for media, documentation and support if required.
2. Source code is available to the libraries.
3. License management is very simple, because as many times it can be installed and in number of locations as required once the library has obtained the software.
4. It can be better quality and more secure and less prone to bugs than proprietary systems, because it has so many users and developers poring over it and weeding out problems.
5. Dependence on vendors in not involved.
6. The library is free to modify and use the software according to their particular requirements.
7. Support is available freely through online community via internet and many technological companies are also supporting with free online and multiple levels of paid support.
8. The software can be used in any way and for any legal purposes.

9. There is no restriction in a unilateral way on how the software could be used.

10. Specific technologies such as Common Information Model and Web Based Enterprise Management provide the capability to integrate or consolidate the server, service, application and workstation management for powerful administration.

**Limitations of OSS**

1. There is no assurance on when the codes are going to be fixed if there a bugs in it, as no one is responsible for the codes. There, unless the problem is solved one is supposed to use the problematic software.
2. OSS requires technical expertise to operate and maintain open source costs more to support because the software is typically self supporting.
3. Open source usually comes without warranty and after sales support should the software fail or malfunction. This is because the software usually distributed free of charge or sold for very minimal fees.

**OSS available for Libraries**

**Basic Computer Programs**

**1. Ubuntu:** The most popular player in the Linux-based operating system game. (Linux is the open-source answer to Microsoft's Windows operating system; Ubuntu is a modification of Linux). Ubuntu is a perfect solution for libraries who need to upgrade their older computers using outdated Windows or for bulk computer purchases requiring a new operating system.

**2. Firefox:** Firefox is the Mozilla organizations answer to Microsoft's Internet Explorer web browser, and has taken the web by storm over the past few years as the biggest competitor to IE in quite some time. Firefox offers a much more secure browsing experience compared to IE.

**3. Open Office:** Another component you'll find bundled with your Ubuntu operating system is a software package known as Open Office. Open Office can do the same thing, and you can use both programs to handle each others file formatting. Open Office also comes with a calculator, draw, and mathematics program as well.

**4. Thunderbird:** Thunderbird, is the Mozilla foundations open-source alternative to Microsoft's Outlook Express. The program works exactly like Outlook, providing you with a secure and safe desktop

email solution. And just like Firefox, the open source programming community has created free add-ons to make the Thunderbird email client customized to your liking.

## DIGITAL LIBRARY MANAGEMENT SOFTWARES

**1. Koha:** It is a promising full featured open source ILS (integrated library system) currently being used by many of the libraries all over the world. It was created in 1999 by Katipo communications for the Horowhenua Library Trust in New Zealand. Koha is built using library ILS standards and uses the OPAC (open public access catalog) interface.It supports MARC 21 and UNIMARC support, Z39.50.

**2. Evergreen:** Evergreen ILS is another option when researching open source ILS options. Developed by Equinox Software, Evergreen is a robust, enterprise level ILS solution developed to be capable of supporting the workload of large libraries in a fault-tolerant system. It too is standards compliant and uses the OPAC interface, and offers many features including flexible administration, work-flow customization, adaptable programming interfaces, and because its open source, cannot be locked away and can benefit from any community contributions.

**3. NewGenlib:** It is an integrated library management system developed by Verus Solutions Pvt Ltd. Domain expertise is provided by Kesavan Institute of Information and Knowledge Management in Hyderabad, India. NewGenLib version 1.0 was released in March 2005. On 9 January 2008, NewGenLib was declared Open Source Software under GNU GPL.[1] The latest version of NewGenLib is 3.0.4 R1 released on 13 September 2012.[2] Many libraries across the globe (mainly from the developing countries) are using NewGenLib as their Primary integrated library management system as seen form the NewGenlib discussion forum .

**4. VuFind:** This is a new open source OPAC that you can put over your ILS (in this case, replacing the basic OPAC of Koha). VuFind suggests that is is "the library OPAC meets Web 2.0"; it enables users to search through all of your library's resources (as opposed to limited resources through the traditional OPAC) through an easy to use web interface. VuFind is modular, meaning that you are free to only use the components of the program that you deem necessary. VuFind is powered by another open source program known as Solr Energy (Apache Solr, an open source search engine technology).

**5. LibLime:** It is an open source library automation system and is the library communities most trusted open-source software solution. LibLime provides commercial support services including hosting, migration assistance, staff training, and software maintenance, development, and support. LibLime will

help take care of installation of the aforementioned Koha and Evergreen Ils programs if your library does not have the in- house technical support to install it yourself, and because of their expertise in the library environment, are the most educated partners to have when deciding on which solutions to use in your specific library.

**6. PhpMyLibrary:** It is a PHP MySQL Library automation application. The program consist of cataloging, circulation, and the webpac module. The programs also has an import export feature. The program strictly follow the USMARC standard for adding materials.

**7. OpenBiblio:** OpenBiblio is an easy to use, open source, automated library software written in PHP. This software has facilities of OPAC, circulation, cataloging, and other administrative work. Open Biblio is well documented, easy to install with minimal expertise and designed with common library feature.

**8. Avanti :** Avanti Micro LCS Software is developed by Avanti Library Systems in Java language. This is a small, simple, and easy to install and use open source software.

It is a platform independent, and can run on any system that supports a Java runtime environment. This software is useful for small libraries; it has a powerful and very flexible architecture that allows it to be adapted for use in libraries of any type. This software incorporates standards such as MARC and Z39.50 as modules and interfaces.

**9. ABCD:** This represents the "Automation of libraries and Centres of documentation". The name itself expresses the ambition of the software suite to provide not only automation functions for traditional libraries but also other information providers such as documentation centers. It has been developed by BIREME (WHO, Brazil) in collaboration with the Flemish Interuniversity Council, Belgium, and using UNESCO"s ISIS database technology. This software provides flexibility and versatility (Dhamdhere,2011). The bibliographic structures, including all types of digital resources, can be managed by this software and created along with non- bibliographic structures (Dhamdhere,2011).The first version of ABCD(v1.0) was released on 5th December,2009. ABCD has been built up with technologies such as ISIS database,ISIS formatting language,CISIS, ISIS Script, ISIS NBP, Java Script, Groovy and Jetty, PHP, My SQL, Apache, and YAZ.

**10. E-Prints :** E-Prints has been developed at the University of Southampton School of Electronics and Computer Science in 2000 and released under a GPL license for building open access repositories that

are compliant with the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH). It shares many of the features commonly seen in document management systems, but is primarily used for institutional repositories and scientific journals.

**11. Fedora:** Fedora software gives organizations a flexible service oriented architecture for managing and delivering their digital content. Digital objects exist within a repository architecture that supports a variety of management functions. All functions of Fedora, both at the object and repository level, are exposed as web services. These functions can be protected with fine-grained access control policies. This unique combination of features makes Fedora an attractive solution in a variety of domains. Some examples of applications that are built upon Fedora include library collections management, multimedia authoring systems, archival repositories, institutional repositories, and digital libraries for education.

**12. Greenstone:** The Greenstone Digital Library Software (GSDL) is a top of the line and internationally renowned „Open Source Software" system for developing digital libraries, promoted by the New Zealand Digital Library project research group at the University of Waikato and is sponsored by the UNESCO(http://www.unesco.org). The software is issued under the terms of GNU General Public License. Greenstone provides a way of building, maintaining and distributing digital library collections, opening up new possibilities for organizing information and making it available over the Internet or on CD-ROM.

**13. D-Space :** D-Space is an open source software package that provides the tools for management of digital assets, and is commonly used as the basis for an institutional repository. It supports a wide variety of data, including books, theses, and 3D digital scans of objects, photo-graphs, film, video, research data sets and other forms of content. The data is arranged as community collections of items, which bundle bit streams together. D-Space isalso intended as a platform for digital preservation activities. D-Space was released by HPMIT Alliance in 2002 and since its release is very popular open source software. It has been installed and successfully working extensively and widely in universities, higher education colleges, cultural organizations, and research centers etc.It is shared under a Berkeley Software Distribution license, which enables users to customize or extend the software as needed.

**KOHA**

Koha, the name comes from a Maori language which means gift or donation. It is an open source Integrated Library System (ILS), used world-wide by public, school , special libraries, and academic libraries. Koha was created in 1999 by Katipo Communications for the Horowhenua Library Trust in New Zealand, and the first installation went live in January 2000.

In India it is becoming popular mainly due to its active user‟s community. Many prestigious library automation projects in India have adopted Koha due to its capability to handle India languages. In the year 2000 Koha was deployed in India in St. Joseph‟s College, Devagiri in the state of Kerala. Thereafter, there have been a number of installations in India and the group of active users of Koha is also growing.Delhi Public Library started using Koha in 2007 which has a collection of over 15 lac books. The Government of Kerala has basically made a decision to make Koha as its official software to computerization of Government administered libraries. Educational institutions under Institute of Human Resources Development (IHRD) have adopted Koha in their libraries by providing in-house training for library professionals. Professional organizations, library schools and prestigious libraries in India have organized Koha workshops. DELNET, NCSI, DRTC, Kerala Library Association, Cochin University, University of Kerala, University of Burdwan, Mahatma Gandhi University, NISCAIR and OSS Labs have organized Koha training. Koha is distributed under the Free Software General Public License (GPL) version 2 or later.

**Main features of Koha**

A full acquisitions module complete with budgets, book funds, suppliers and exchange rates.

- Circulation: a fully featured circulation with circulation rules customisable to suit your library.
- An OPAC: the public side of Koha. This has all the features you would expect, plus enhanced content from sources like Amazon, Google Books, etc.
- Flexible reporting: you have access to all the data in the database and a reporting engine is provided to help you query it.
- Customisable item types: you can choose exactly how you want to catalogue your items. This flexibility also allows Koha to be used to manage inventory such as cameras or computers.
- Barcode scanning: Koha works in a web browser, so any scanner that works with your PCs can be used with Koha.
- Barcode printing: Koha can be used to print barcodes and spine labels.
- User management: Koha manages your users, including integration with systems like LDAP, Radius, Active Directory and SAML, to allow single sign-on.
- Koha uses a full text indexing engine to allow for fast and powerful searching of all of your metadata.
- Mature support for all major library standards including MARC21, UNIMARC, Z39.50, SRU/SW, SIP2 and many more.
- Automated overdue notices either by email or SMS. Koha can also send advance notices to warn a borrower that an item is nearly due. Koha can email issue slips instead of printing them at point of circulation.

- Koha can work in consortia, multi-branch or single-branch mode.
- Koha has been translated into many languages including Te Reo Māori. Koha has an offline circulation module.
- Self Check: Koha can be used with any SIP2 compliant self-check machines. Faceted search: Search results are classified for easier drilling down.

**Benefits over any other proprietary ILS**

Distributed under the General Public License, Koha has no vendor lock-in, no set term contracts, and no restrictions on changing support or exporting your data at any given time. As a Koha user you are in control of your ILS. You have the freedom to tailor your ILS specifically to your requirements, your collection, your budget and your patrons. You also have the security of knowing that there will always be technical support for Koha, since it isn't tied to a single manufacturer or vendor.

The benefits of Koha as open source software are that bugs can be dealt with as soon as they are logged, and users have open and constant dialogue with the developers that leads to a positive and collaborative environment. This is a driving force of the Koha community and leads to higher customer satisfaction rates than often found in traditional ILS's.

Koha is continually updated, so you can choose to benefit from new features frequently, rather than having to wait for major all-in-one version releases of your current system.

**Koha Live Cd's**

Koha Live CD"s are useful tools for installation and learning purpose. A „Live CD" is a bootable CD, which contains pre-configured software which allows user to be productive without accessing any other hard drives. Live CDs and DVDs should not be used to run a library. These are not officially supported by Koha, and any difficulties should be taken up with the creator of them.

**Koha 3.8.6 Live CD Lite released**

Koha Live CD Lite is based on Ubuntu 12.04 LTS and Koha 3.8.6. File size is 690 MB. LiveCDis customized forready to use. Highlights are:

- Easy installation steps,
- Koha installation based on Ubuntu packages, it means easy to upgrade Koha in future,
- Koha customised for ready to use,
- Zebra server enabled,
- Customised MARC fields in cataloguing,

- Scheduled database backup,
- Build on Ubuntu 12.04 LTS with OpenBox Desktop,
- Detailed Read Me file,
- Sample reports,
- Visit for download https://sourceforge.net/projects/kohalivecd-lite/files/

Upgrade to new version of Koha is now very easy with this Live CD. No need to execute lot of commands and editing various files to upgrade to a new version. Installation made from Koha package repository. When new version of Koha available, you can upgrade Koha using only two commands in Terminal. It automatically download new release from Internet and will make necessary changes.

**Major Indian Academic Libraries adopting Koha with help from OSS Lab**

In the year 2011- 2012 , major academic libraries in India have adopted Koha with our help, here is a listing:

- North East Hill University, Shillong
- University of Agricultural Sciences, Bangalore
- Goa University, Panajim
- Indian Institute of Technology, Mandi
- Chennai Mathematical Institute, Chennai
- Bhavans Library, Mumbai
- Azim Premji University, Bangalore
- Many more can be included in the list above but

## CONCLUSION

In India Koha is being adopted by many new institutes of reputation like IISER Mohali , IIT Mandi and now IISER Bhopal is also moving on the same path. The study shows that future of OSS is very bright in the libraries in the world including India. The library professionals should be very alert and work together to adopt the open source softwares to increase their utility and efficiency for the benefit of the whole library community.

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