

Use of open source software in the learning resource centre of Indira Gandhi Institute of Technology: a case study

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Provides an insight into the practical implementation aspects of selection and implementation of Open Source Software (OSS) for managing the activities and services of a library or an information centre. Identifies that a main pre-requisite for OSS use in libraries is for the librarian to be able to harness the potential capabilities of its staff by motivating them effectively. Finds that OSS is more future oriented and more easily amenable for customization and can be an effective low-cost alternative to their proprietary counterpart.

Introduction

During the last decade, the open source software (OSS) phenomenon has become a trend in information systems research because of fast-growing number of OSS users and software products in a large variety of domains. OSS is already being adopted and used as software platform in a number of fields including library and information management. The focus of OSS is freedom. For most proprietary or closed source programs (such as Windows, Oracle), the source code is not available for users or programmers to alter. Thus, if a user encounters a bug in the closed source program, he/she will not be able to fix it without relying on the software vendor to fix the error. The situation is very frustrating as this can often take a very long time¹. By contrast, the source code is freely available in case of OSS. The availability of the source code allows users to modify and make improvements to it, and such contributions could come from a diverse talent pool of programmers. This facility along with the absence of license restrictions and the possibility of interoperation with other applications makes OSS one of the options for libraries. This new trend towards the use of OSS in libraries is also reflected frequently in library literature, conferences and workshops on OSS in libraries, etc.

Many librarians are now considering OSS because of its low purchase costs. Though, unlike commercial software, there are no initial purchase fees, licensing fees, or upgrade fees, but a reality is that OSS is not

zero-cost software. Like all software packages, OSS demands an investment of time and effort by the user, often neither of which is free². Today, there are several OSS with cutting edge technology and large user experiences available for various library activities which can be comparable to their proprietary alternatives. These solutions range from Operating System (OS) to specialized institutional repositories (IR) software. The Learning Resource Centre of Indira Gandhi Institute of Technology, New Delhi is using OSS solutions to computerize its entire house-keeping jobs as well as for developing IR systems.

The IGIT and its LRC

The Indira Gandhi Institute of Technology (IGIT) is a constituent college of Guru Gobind Singh Indraprastha University (a Delhi State University), is the first engineering college for women in Delhi, established by Department of Training and Technical Education, Government of Delhi in the year 1998. At present, it runs three B. Tech and one M. Tech courses having a total strength of about 900 students. The Learning Resource Centre (LRC) was established as a part of IGIT to serve the academic needs of students, research scholars, faculty members and other technical and administrative staff of the Institute. The LRC has a highly selective collection of over 18,000 books in the areas of science, engineering, technology and management. While print journals/magazines subscriptions go beyond 50, a

number of e- journals are also subscribed through a consortia mode subscription. There is also a good collection of theses of final year students.

All the housekeeping operations of LRC were carried out manually until 2007. There were only two Intel P-3 computers in LRC, one for internet and e-journal access, and other for MS-office application jobs. In the absence of any Integrated Library Management System (ILMS) software, it was very difficult to provide effective services to the user both in anticipation and on demand.

Computerization process

Automation of library in-house activities and setting up of a digital library requires a well designed sequential plan based on analysis of how computerization can best be accomplished for a particular library.

The following sequence has been followed in computerization of the activities of LRC

1. Deciding on the tasks / jobs / routines to be computerized.
2. Requirement specifications for the tasks / jobs / routines
3. Assessing the computer proficiency of the library staff
4. Selection of one or more softwares.
5. Selection of hardware
6. Methodology to be followed and step-wise implementation

Tasks/Jobs/Routines to be computerised

Keeping in view the information requirements of the faculty, research scholars, students, and other technical and administrative staff of the Institute, it was decided to computerise the following activities and services:-

1. Acquisition of books & monographs
2. Periodicals acquisition & control
3. Circulation
4. Web OPAC
5. Interlibrary loans
6. Establishment of digital Library

Finalising Task / Job specifications

The specifications for automation tasks can be listed down from some commonly used ILMS software. However, from the analysis of work flow in the LRC and the identified information needs of the target users, the following core specifications were derived:-

1. Integrating the work processes done in different modules of the software viz., acquisition, cataloguing, circulation, serials control and budgetary control. Also, obtaining different types of reports and bar-code generation facilities, etc.
2. OPAC: A user friendly Web OPAC providing a single interface with integration of maximum possible resources. It should also have log-in facility for the members to see their circulation data, to reserve a document and to recommend documents / publications for procurement. Since most of the users are students, different types of search options like free, basic and advanced search options with search help menu should be included in the Web OPAC home page.
3. Cataloguing: Must be compliant to international standards followed for data interoperability viz., MARC-21, Z39.5, XML, OAI-PMH etc. Should have the ability to link locally and externally hosted online documents in a range of formats. Should provide interface for importing and exporting of Marc21- compliant cataloguing data, viz., Library of Congress cataloguing data.
4. Circulation: Should cover fine administration and overdue notice, RFID support, Inter - Library Loans, etc.
5. Acquisition and Budget Control: Should provide for communication with suppliers of books, journals and databases, support for multiple budgets; support for different ownership of collections; gift items procurement, etc.,
6. Serial Management and binding: Communication with journals suppliers, auto reminder to suppliers/publishers for non-receipts of journal issues, management of binding of journals, etc.
7. Some additional facilities like integration of RSS facility, automated e-mail system for reminders, overdue notices, etc., can be added on. The software must run in the networked environment in client server architecture and must be based on web- based technology. The most important point

is the system should be user friendly and require minimum training for staff.

For providing a good retrieval system for the information generated within the institution and to manage the digital resources acquired, the LRC decided to implement a suitable the software to develop institutional repositories / digital library. The first criteria for selection was that the software must provide facility to capture and organize everything, beginning from digitized versions of papers and lecture notes to videos – into an "institutional repository" to make it available to the future generations in its original digital form. The software must also provide a user friendly search environment with metadata /keyword search facility as well as full text search facility. There should be an easy back up of data stored in the database. Easy customization of user interface can be an added feature.

Assessing the computer proficiency of LRC Staffs

In the mid-2007, a proposal for automation of LRC was moved after a few LIS professionals joined the Institute. Earlier, the LRC was managed by the librarian with the help of two semi –professional assistants who did not have basic computer literacy. The librarian and the new professionals had the advanced Associateship in Information Science degree from NISCAIR and had had a good exposure to computerisation of LIS activities. They had varying experience of different library management software packages including commercial ones like SLIM++, LibSys, Troodon, etc., and the OSS, Greenstone Digital Library Software (GSDL). The semiprofessionals were first trained to use computer for basic office works like MS office, internet and e-mail. Then, they were attached with the professionals during the course of implementation of automation works and were gradually trained in-house to handle automation works.

Selection of Software

Selection of ILMS

Selecting an integrated library management system (ILMS) software is to be based on several practical aspects. This means, final choice may not be the best suited to a particular library's needs, features, and functions and often the selection has to be for the best among those available with provision for trouble –

free customisation. In the mid 2007, an internal study was carried out on the most prevalent commercial software packages for ILMS in Delhi viz., LibSys, SLIM++ and Troodon. It was found that all these commercial ILMS softwares were available against high license fees along with separate annual maintenance contracts, updating fees, customisation charges and many other hidden costs. Also, the customer support services provided by the commonly used ILMS software suppliers in Delhi were found to be very frustrating. It is seen that a most commonly used ILMS software in Delhi has made an oligopoly and virtually control the ILMS software market in Delhi and have kept their price quite high. Moreover, commercial ILMS softwares are basically available in a generic or fit to all size models and customization needs vendor support which is on extra charges. The IGIT management could not be convinced with these factors and also for the reason that the library budget was limited. Further, professionals in the LRC had already worked with most commonly used ILMS softwares in Delhi. Thus, working with OSS seemed to be challenging and thus it was decided to use OSS in the library.

After a quick survey of the available OSS for library automation, KOHA and NewGenLib were chosen as the options. While Koha is the most visible of all the open source library solutions with a large user base and a good documentation, NewGenLib is relatively new. In India, Koha has been implemented by several libraries and about three commercial service providers provide technical support. On the other hand, NewGenLib was declared Open Source Software under GNU General Public License on January 9, 2008. Earlier, it was proprietary software. The proprietary version is successfully deployed in different university libraries having large collections like Goa University Library. A study of the features and functions of the two softwares was made and it was found from literature that the serial control section of the Koha was not well made³ (Boss, 2008), but all the other features of it are comparable. On the other hand, the aspects of NewGenLib were developed in India by a reputed Librarian and so the software was made with a good understanding of the local practices and application environment. If we encounter any problem with this software we can make AMC contract with the vendor easily. Thus, an initial proposal for experimenting with NewGenLib was decided in February, 2008 for a period of six

months. If it was found that this would be suitable to the needs of LRC management, it could be implemented. Since NewGenLib uses open standards, this gives us opportunity to switch over to other ILMS software with minimal efforts.

Selection of Digital Library Software

The availability of several mature Open Source Digital Library Softwares, has encouraged us to choose an OSS for developing the digital library. Among the OSS for DLs, Greenstone, DSpace, Fedora and E-prints are widely used by several libraries across the world. But, in the selection process, more emphasis was given on a live OSS project with proactive development community. This ultimately led short-listing Greenstone and DSpace. Greenstone is easy to install on windows as well as on Linux and customization is also comparatively simple. Greenstone is designed to be usable by non-specialist users also, create collections from existing "resources" (comprising both "items" and metadata resources) and distributing them over the Web or on removable media, possibly in an international setting⁴. So in the beginning, it was decided to proceed with Greenstone. The prior experience of LIS professionals in the institute with Greenstone was also a reason to proceed with Greenstone. Later, a detailed analysis of our requirements, specially the facility for 'user submissions of documents to the system', and define metadata for them led to use DSpace for LRC Digital Library.

Selection of Operating System (OS)

Selecting open source Operating System (OS) naturally led us to Linux. But the question arose which distros to be preferred among Red Hat, Fedora, CentOS, OpenSUSE and Ubuntu. Since all the professionals in LRC are used to windows desktop environment and have a little experience with Linux, Ubuntu 9.04 has been preferred because of its similarity with windows desktop environment in many ways.

The following things have been taken into account while selecting Ubuntu 9.04 as OS⁵.

1. Easy and straightforward installation with the click of the mouse.
2. It focuses on desktop users by providing fresh and familiar GUI environment.

3. Installation of different application programs can be easily done through Synaptic Manager, a very simple interface.
4. Ease of Use.
5. Supports a wide range of hardware (like HP Scanner, HP Printer) needed in computerization of the library.
6. The most important point is the massive community of Ubuntu users around the world and arguably the biggest user base of any version of Linux. The magnificent technical support offered at ubuntu.com and at ubuntuforums.org are no doubt the most useful⁶.
7. Has a large community of developers and enthusiasts who can resolve issues online free of cost
8. The other advantage is that Firefox web browser and Open Office suite come pre-installed with Ubuntu. The word processing, spreadsheet and presentation tools are all accessible from the open office submenu under application.
9. Last but not the least, documentation in Ubuntu is fascinating and there are abundant resources from internet and number of books on Ubuntu available, some for free download from internet.

Selection of Bar-coding software

Bar-coding of documents is essential to mechanize the process of circulation. Barcode uses the accession number of documents for identification. KBarCode, an OSS was selected for this purpose because of its easy to use WYSIWYG based interface.

Hardware Selection

The initial plan was to implement software for operating an Integrated Library Management System (ILMS) and to develop a Digital Library for LRC. Thus, before procuring any computers and hardware, a detailed analysis of the requirements of hardware for effective functioning of different softwares for ILMS and DLs was done, keeping in view about the present as well as future development issues of softwares. Thus, the hardwares procured for the

Table 1—List of Hardwares (with their specifications) procured for the automation of LRC

System Type	Specification of Systems	Number
Server	Intel Xeon @5540 CPU, 12MB L2 Cache, 8GB RAM, 360GB SATA HDDs, 3 LAN Cards, DVD RW Driver	1
Client PCs	a). Intel Core 2 Duo CPU, 3.24 GB RAM, 180GB SATA HDDs, DVD RW driver b). Intel P4 CPU, 1GB RAM, 80GB HDD, Combo drive.	a) 4 b) 2*
Printers	HP Laserjet 1505, Black and White	2
Scanner	HP Scanjet 5590	1
Bar Code readers	Hand held wired barcode reader	2
UPS	5KVA Central online UPS	1

* Received from Computer Lab

automation of housekeeping operations of LRC is given in Table 1.

In addition a Local Area Network (LAN) was established with 12 nodes, so that all the systems could be put on LAN. They were also connected with the 5KVA central UPS. Internet facility is available with all the systems.

Methodology Followed and Step-wise Implementation

In the beginning, the chosen operating system was Windows XP because it required some time to get familiar with Ubuntu. Thus, all the software was installed on Windows platform. But simultaneous experimentation with Ubuntu was also carried on. In the NewGenLib, for about one month, partial data (about 1000 books) on existing document collections was entered in the database through the catalogue module and minimum details of about 200 users were also entered in the database. Then, it was put on a trial in circulation along with the traditional card system. This was done to explore the possibilities and problems with the NewGenLib. When it was found satisfactory after around one month of experimentation, an online presentation of the NewGenLib was done to the management. Although, initially the higher management was somewhat skeptical about the implementation of OSS in LRC, subsequently they were very much appreciative and encouraging. Finally, it was decided to use this software in a full-fledged form along with the traditional system. The data on the existing entire collection was keyed into the catalogue module with the help of six trainee DLIS students of Meerabai Polytechnic, Delhi. All the documents in the LRC were also bar-coded. Bar-coded student ID cards were

also generated with the help of a modified version of KBarcode. The circulation was started experimentally in August 2008 along with the existing manual system. Gradually, other data like that on binding of books, missing books, data on Serials Control was keyed in into the software. From January 2009 onwards, the software has been fully implemented and the corresponding manual activities were discontinued. From January 2010, the OS platform was migrated to Ubuntu Linux 9.04. The LRC is thus presently using the general OSS version of NewGenLib without any customization. But, there are certain areas which need improvements like report modules, configuring associate libraries, etc mentioned latter.

In case of DLs, first the Dspace 1.5.2 version was installed on Windows platform. Then, uploading of digital data in different formats was done along with creation of metadata. A little modification of the user interface was done as per the requirement of LRC. Then 'self deposit of digital assets to the restricted users' feature was experimented and check-sum procedure was verified and found to be successful. From December 2009, the OS platform was migrated to Ubuntu Linux 9.04. We are still exploring the DSpace to customize it according to our needs.

Initially, a few presentations were made before both the faculties and students to educate them to use the computerize system of LRC effectively. On each new academic session, a live presentation on OPAC for search, reservations, book recommendation, were given before both the students and faculties. A few special presentations were also given before the faculties to educate them about the self submission process and check-sum procedure of DSpace.

Problems encountered

Implementation of OSS in the LRC in the absence of IT experts has been a huge task with a number of hurdles. The prominent one is proper installation of the software. Though installation of NewGenLib and DSpace in Windows platform was relatively easy, installation of them on Linux platform needed some command over specific distros and the version of Linux. In the absence of any formal training on the specific software, exploration of every module in the software was very much time consuming. Trouble shooting was also a very mammoth task. For this one needs to visit specific discussion forum and to interact with the specific group of software users regularly. Since all the LIS professionals in the LRC are not equally proficient in using computers, in-house training of them was also required to train them to work with the selected software.

There were certain specific problems faced by the staff members while using the software package. These include the following:-

1. It has been claimed by the developer of NewGenLib (Verus Solution and KIIM) that open source version of the NewGenLib is the complete 2.1 version of NewGenLib, but it has been found that in the open source version, associate library can't be configured.
2. NewGenLib uses Java2SDK1.4 to run the application programs and JBoss-3.2.1_tomcat-4.1.24 as application server. Since all the systems are connected with internet, sometimes users unknowingly updated the Java into its latest version i.e., JDK6 which is not properly compatible with JBoss-3.2.1_tomcat-4.1.24 application server. So, the software fails to run properly.
3. The documentation of NewGenLib needs to be improved. There are certain areas like how to configure the fine system, how to configure associate libraries in a network or entering multi-volume books in the software, and some other associated aspects should be given in detail preferably with screen-shots.
4. Bar coding of books can be done using NewGenLib and integration of IDAutomationCode39 with the system. But, the barcode output was found to be unsatisfactory. Because of this, barcode is generated in using KBarcode software which requires re-entry of accession numbers of documents in the software.
5. The present version of NewGenLib does not have the provision to print student I-Card. Thus, a separate attempt was to be made to customize and configure the KBarcode to suit the LRC requirements. For printing the user ID card, re-entry of all the data about the users is required.
6. The report module of NewGenLib, i.e., the NewGenLib Desktop application module does not give consolidated print summary of per-day- fine report. Thus, administration of fine charging is quite cumbersome. It also does not provide print summary of consolidated holdings which is often required for academic engineering colleges for submitting to the AICTE.

Features explored

NewGenLib

- This Integrated Library Management Software system works in standalone as well as in network system.
- Uses all open source components like PostgreSQL as RDBMS, JBoss-Tomcat as Application Server etc.,
- It is a completely Web based solution with the inclusion of help menu in every module
- A most user-friendly OPAC is the one of the attractive aspect. The use of Lucene indexing makes the relevancy as well as precision of search results in OPAC is far better than most of its commercial counterparts.
- Use of international metadata and interoperability standards like MARC-21, MARC-XML, z39.50, SRU/W, OAI-PMH, Unicode 3.0, make import of cataloguing data directly from a MARC -21 data source such as LOC and NAL and other OPACs of NewGelib, very easy and mechanical.
- Integrated, automated email/instant messaging system is one of the great advantages.
- Important innovation of dashboard to monitor the unfinished jobs.

- Works well with Windows as well with Linux platforms.
- Uploading of digital content to the local server or Web server under the control of LRC, is easy
- Metadata creation can be done for all possible range of materials and files.
- Set-up parameters of the software can be easily configured to suit specific needs.
- Though integration of RFID and RSS facility are possible, we have only integrated RSS.

DSpace

The key features that weighed in favour of DSpace include the following:-

- Requirement for establishing repositories at institutional level
- The software has facility for self-deposit of digital assets by faculty.
- End-user interface for depositors is available.
- Assets can be made available for searching and browsing.
- Institutional commitment is available for the continued availability of certain named formats.
- Checksum feature is available to ensure the authenticity of the documents.
- Authorizations can be set so that access to specific documents is limited to specific users

Implementation problems and suggested approach

The migration and adoption process of OSS in a library is a complex process, and requires complete understanding of the work flow in different activities and how people interact with IT systems in their daily work. Most of the library professionals have a limited knowledge of information technology. With this expertise, one may find it difficult to proceed with OSS in absence of any help from computer professionals within the institute. Thus, library professionals require a healthy dose of enlightened self-interest to work with OSS.

Working with OSS requires considerable knowledge in information technology. Thus, migration to OSS requires a clear assessment of staff competency level

in IT in the Library.

Another important factor is work environment. Management support and commitment have been repeatedly found to be crucial for success of implementation of OSS in the library. But, initially higher management may not be convinced with the OSS. Thus, extra efforts are necessary to show them the positive impact and possibilities with the OSS. Then, the chances would normally be good for getting encouragement and support of the management. In our case, the head of IGIT has been proactively helpful in the adoption of OSS in the LRC.

Migration to OSS platform would normally require considerable time and effort. As a rule of thumb, the time required to perform full transition to OSS may be considered to be comparable to that of introduction of a new library software from scratch. Thus, time effort should be planned accordingly.

In post migration effort, training for personnel and development of alternative resource persons are to be planned in order to keep the system effective. So, in the absence of a key person the system should not suffer.

There would normally be several hurdles in the execution of a migration, and some of those hurdles can be avoided easily by using simple practices. Some of the difficulties are really technical in nature and some of them are organizational. The organizational difficulties can be overcome with support from the top management. For tackling technical difficulties, some of the thumb rules are to be followed maintained while selecting an OSS. They include the following:-

- Select the OSS project which is “alive”, that is it does have an active development community.
- Study the user base and size of the developer community around the particular OSS project. An OSS with a lesser community size may lack peer review, have inadequate documentation and doubts on issues of future development efforts, compatibility with updated technology, new features and software quality. They may also have fewer resources to meet the demands of users.
- In most of the OSS projects, there are two distinct streams of development, one is the developer’s version and the other is stable version. If the library has dedicated IT expertise, and require

new functionalities or fixes, it may proceed with the developer's version. For day to day work, in general, among the potential candidate packages that satisfy the functional requirements for the migration the preference should be given to the one that is more stable, thus having a longer real-world usage.

- In many a OSS projects, the software is supported by commercial vendors for example, Koha by OSS Labs and OpenLx, and NewGenLib by Verus Solution. Their charges are often less than the AMC charges of commercial software packages. Thus, an organization with only a few computer specialists may work with an OSS supported by commercial vendors. Another advantage in using OSS that one can make AMC contract with different commercial vendors at different points of time keeping in view the quality and timeliness of service provided by the vendor which is in stark contrast with the proprietary software.
- Implementation of an ILS software needs data migration in many a cases. Thus, use of open standards at document exchange level, database and network protocol levels is essential for data interoperability. Thus, choose an ILS which is compliant to open standards like Z39.5, UNICODE 3.0, MARCXML, OAI-PMH etc.

Conclusion

Automation of library and setting up of a digital library using Open Source Software is a challenging job. It calls for a detailed planning and determination on the part of library staff to do the required experimentation and go through the required learning curve in understanding the software and the steps in implementation. Close and continued support of higher management would also be crucial for the success of the automation. Since vendor support is usually non-existent for OSS implementation, the library staff must have reasonably good exposure to

IT or close support from the software specialist of their institution. Also, good IT infrastructure with high-speed internet connectivity is essential. Using the right hardware and Operating system are also very important. While choosing an OSS, the software that has large user base and that has been stabilized in its use at various libraries must be given top preference. Migration of the existing data to the OSS system also usually demands considerable effort. Working with OSS is no doubt is very engaging, but initially one may feel like a small boat in an ocean. Thus a lot of time is required to understand how the system works and trouble shooting, but gradually the system functions accordingly. Last but not least, working with OSS and contributing to the OSS user community by reporting bugs and their fixing and trouble shooting and by improving documentation or distributing training material gives a sense of achievement.

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