

# APPLICATION OF FREE AND OPEN SOURCES SOFTWARES IN ACADEMIC AND RESEARCH LIBRARIES IN NIGERIA – AN OVERVIEW

EDIDIONG AKPAN-ATATA, Ph.D

*Akwa Ibom State University,  
Ikot Akpaden,  
Akwa Ibom State.*

## **Abstract**

*Library manages and disseminates a wide variety of information resources most of which are created outside the walls of their institutions. The management of information resources created by the institution itself, staff of the institutions and other user communities has remained a challenge. This paper examines the application of free and open sources softwares in academic and research libraries and how institutional repositories such as: Koha, and Greenstone, can be used to effectively manage information resources created within and without the four walls of their institutions. The paper concludes that the use of free and open softwares make it easy to upload materials quickly and facilitate its access through the web. Its adoption by Nigerian Libraries for management of local and global created information resources for the optimum benefit of the institutions, faculty members, students and the world at large is recommended.*

The digital age has resulted in the growth of digital resources in different formats, some digital born formats while some are digitized. These digital resources encompass scientific, technological, cultural, artistic, and historical materials generally unavailable to searches and the public. Institutional repositories are now being created to manage, preserve, and maintain the digital assets, intellectual output, and histories (Drake, 2004). Librarians in this digital era must content with how to manage this resources for optimum use to the benefit of their institutions and in fulfilling their roles as experts in collecting, describing, preserving, and providing stewardship for information resources. Management of library information resources include the process of acquisition, organisation, dissemination, accessibility, storage and preservation, (Gbaje, 2012).

Gbaje also argued that most of the information resources managed by the libraries are created outside the walls of their parent institutions, with the following objectives:

- i. Facilitate access to information for research, knowledge, education, and learning

- ii. Support research activities and programs of the parent institution by offering proactive information resources.
- iii. Offer proactive services for effective use of all types of library materials
- iv. Store and preserve information of information resources.

However, in the digital era where institutions create their own information resources as research output, conference papers, technical etc, libraries are also expected to play a vital role in the management of these digital information resources.

### **Concept**

As the name implies free software or open source – software is software that is both free and open source. According to Lawal (2012), the concept of library licensed to grant users the right to use, copy, study, change and improve its design through the availability of its source code. The source code (sd) constitutes a program which is usually held in one or more text files stored in the computer hard disk. These files are carefully arranged into a directory known as a source tree. It can also be stored in data base or elsewhere.

It should however be noted that in the context of foss, free refers to the freedom to copy and reuse the software rather than the cost (price) of the software. The originators of the free software foundations, an organization that advocates the free software model suggests that to understand the concept one should think of free as a free speech not free bear. Thus, free software is defined as a matter of liberty not price. Consequently Lawal (2012) posited that FS program have four essential freedoms of:-  
FO – the freedom to run the program in any purpose  
F1 – the freedom to study how the program works and change it to your computing as one wishes, note access to the code is precondition  
F2 – the freedom of redistribution of copies so as to help your neighbour or colleague  
F3 – the freedom to distribute copies of your modified version to others. Again access to such code is a precondition.

Foss is therefore an inclusive term that covers both free software and open software which despite describing similar development models have differing cultures and philosophies, (Lawal 2012). Arguably free software focuses on the fundamental freedom it gives to users whereas open source software focuses on the perceived strength of its peer to peer development models.

### **Benefits**

Benefits of applying OSS include: reliability, Audit ability (source code is published) cost: free of royalties and fees, flexibility and freedom to modify software. Again in a depressed economy like ours, if the cost is next to nothing it is still considered advantageous and it allows change of code source for individual needs in any organization.

### **Types:**

1. Koha
2. Greenstone

### **What is KOHA**

- i. Koha is an open source integrated library system (ILS) for automating a library of any type.
- ii. Koha has its beginning 12 years ago in New Zealand, specifically by the Horowhenua Library Trust
- iii. Koha means “free gift” in the Maori language
- iv. Koha is the very first “Open Source” Library Management Software in the world

### **Who Uses KOHA**

- i. Query on <http://www.librarytechnology.org> says 1,906 libraries using Koha all over the world. (compare with 119 for library3, 106 for CDS/ISIS)
- ii. Largest Koha Library is Grand Library of Near East University in Cyprus (<http://library.neu.kedu.tr>)
- iii. Well over 20 libraries currently using Koha in Nigeria

### **Features of KOHA**

According to Adepeju and Adara (2012), Koha is noted for the following:

- i. Koha has all of the basic features needed to turn a library, holdings:
- ii. MARC based Cataloguing of Library’s holdings
- iii. Online Public Access catalogue (OPAC) of the Library’s holdings
- iv. A Database of Library Users (Patron Management)
- v. Circulation
- vi. Serials
- vii. Acquisitions and book budgets
- viii. Reports

### **Some other Notable Features**

- i. Integration with Google Scholar, Library thing, Amazon, OCLC, Syndetics and Open Library
- ii. Support for Images (a great feature for all sorts including cataloguing Newspaper Cuttings)
- iii. Supports for Barcodes and NFID
- iv. Support for Union Catalogues (Multiple Libraries)
- v. Supports for self check out (if needed)

### **Features in Details – Catalogue**

- i. MARC based, fully compliant cataloguing module
- ii. Fully customizable – allows you to catalogue according to your worksheet
- iii. Complete MARC record loading via the z39.50 client interface
- iv. Authorities Management
- v. Logging of catalogue edit, create and delete
- vi. Serials management

### **Features in Details – Circulation**

#### **1. Full support of all circulation features, including**

- i. Check out (charge)
- ii. Check in (discharge)
- iii. Renewals
- iv. Patron blocks
- v. Fines
- vi. Overdue notices

#### **2. Flexible Loan and Fines Parameters**

#### **3. Full Integration with OPAC Including**

- i. Patron self service features (reserve, renew, view fines, view reading history, make purchase suggestion)

### **Features in Details – OPAC**

- i. Web based, on need to install on client computers
- ii. Offers full search capabilities by author, title, subject, keyword etc.
- iii. Empower your patrons – to make reserves, self-renewal, view fines & charges due, make book purchase suggestions and view their reading history and make comments.
- iv. Multi – language
- v. Integration with social networking sites like Facebook, Twitter, LinkedIn
- vi. Votes/ranking of items

**i. Features in Details – Acquisition**

- ii. Financial accounting including book budgets, invoicing, orders, receiving orders etc.
- iii. Creation of circulation records at point of receipt
- iv. Handles all types of materials including Journals, Books, Multimedia etc.

**Features in Details – Reports**

**1. Patron Circulation Statistics**

**2. Statistics Wizards, including**

- i. Acquisitions
- ii. Borrowers
- iii. Catalogue
- iv. Circulation

**3. Daily Till Reconciliation Report**

**4. Top lists**

- i. Most issued items
- ii. Most issuing borrowers

**5. Integration with Excel (and other ODBC Compliant Applications) – Easily use Excel to Directly view your data and get more Report**

**Requirement to Install/Run KOHA (Production)**

- i. LAMP – Linux, Apache, MySQL, Perl
- ii. A Server with 2GB RAM Minimum
- iii. Ubuntu or Debian Linux preferred
- iv. Koha updated every six months
- v. Current version is 3.08.06
- vi. Internet Access (Optional)

**Some Issues/Facts to Recognize**

- i. Koha requires a server running Linux. Currently does not run in a Windows environment
- ii. Managing the server, once installed, does not need more than a basic Linux skills
- iii. To get the best of Koha you will need to customise the user interfaces
- iv. New versions come out every six months, but you don't need to upgrade.
- v. Best to plan for upgrade at 2 years interval.
- vi. Koha has two versions,
- vii. Community Koha and
- viii. Liblime Koha
- ix. Best to stick with the community version

### **Few Users of KOHA**

- i. Bowen University, Iwo
- ii. Forestry Research Institute of Nigeria, Ibadan
- iii. National Mathematical Centre, Sheda, FCT
- iv. Government House Library, Ilorin
- v. Federal Polytechnic, Ado-Ekiti.
- vi. Osun State University, Osogbo
- vii. Abia State University, Uturu, Abia State
- viii. Katsina State University
- ix. Nigerian Baptist Theological Seminary, Ogbomoso
- x. Sickle Cell Foundation, Lagos.
- xi. Babcock University, Ilishan-Remo
- xii. Redeemers University, Mowe, Ogun State
- xiii. Kwara State University, Malate, Ilorin
- xiv. Standard Organisation kof Nigeria, Abuja/Lagos
- xv. Sickle Cell Foundation, Lagos.
- xvi. Babcock University, Ilishan-Remo
- xvii. Ekiti State College of Education, Ikere-Ekiti
- xviii. Emmanuel Alayande College of Education, Oyo
- xix. Ladoke Akintola University of Technology, Ogbomoso
- xx. National Institute of Education Planning and Administration (NIEPA), Ondo
- xxi. Federal School of Surveying, Oyo
- xxii. Forestry Research Institute Of Nigeria

### **KOHA Users Forum**

- i. Koha Community**
- ii. Koha Users Forum in Nigeria**
- iii. Initiated by Projeklink
- iv. Coordinator – National Mathematics Centre
- v. Secretary – Bowen University, Iwo

### **Inter-User Cooperation**

- i. Bowen University – the Flagship – assists all
- ii. Alayande College of Education (Special) Oyo (August 2012)

### **Support**

- i. Online/Phone Support
- ii. Koha Open Day
- iii. Contributions Discussions
- iv. Response to Enquiries

## **Greenstone**

### **What is Greenstone Digital Library Software (GSDL)?**

Greenstone is a comprehensive open source software suitable for building, maintaining and distributing digital library collections. It provides a new way of organizing information and publishing it on the internet or on CD-ROM in the form of a fully-searchable, metadata-driven digital library. It is multilingual, under GNU General Public License, produced by the New Zealand Digital Library (NSDL) Project, University of Waikato and Promoted by NZDL, UNESCO & Human Info NGO in Belgium. (Abdulraheem, 2012).

### **Aims of GSDL**

The aim of the software is to empower users, particularly in Universities, Libraries, and other public service institutions, to build their own digital libraries. Digital Libraries are radically reforming how information is disseminated and acquired in UNESCO's partner communities and institutions in the field of education, science and culture around the world, and particularly in developing countries. From: [www.greenstone.org](http://www.greenstone.org)

### **Features of GSDL**

1. It can be accessed and distributed through the web and CD-ROMs
2. Multi-platform available: Greenstone runs on all versions of windows, Unix/Linux, and Mac OS-X.
3. Options for greenstone Librarian Interface (GLI) and command-based collection building – it is easy for collection building
4. Powerful indexing i.e. full-text, documents, sectional indexing
5. Metadata-based including field-based and automatic indexing.
6. Support for Dublin Core and other popular metadata
7. Powerful search and browsing functions including full-text field search, Boolean and ranked retrieval
8. Cross-collection searches are enabled
9. Support for several document formats such as text, html, word, pdf, email etc., enabled by plug-ins.
10. Homepage customization and browsing with logos
11. Configurability, multilingual and enrichment with metadata and classifiers
12. Advanced compression for text, indexes, data compression and conversion to GAF (Greenstone Archive Format)
13. Support: Users' List & Developments' List
14. Respect for Copyright.

### **Greenstone Languages**

Greenstone is multilingual

1. Reader's Interface in thirty-five languages
2. Librarian Interface in four languages: English, French, Spanish & Russian languages.

### **Interoperability**

1. Greenstone is highly interoperable using contemporary standards
2. Serves and harvests any collection over Metadata Harvesting (OAI-PMH).
3. Any collection can be exported & ingested to greenstone in METS form

### **Greenstone Interface**

Greenstone has two separate interactive interfaces:

1. Reader Interface
2. Librarian Interface

### **Metadata Formats**

1. Dublin Core
2. RFC 1807
3. NZGLS (New Zealand Government Locator Service)
4. AGLS (Australian Government Locator Service)
5. New metadata sets can be defined using Greenstone's Metadata Set editor.

### **Document Formats: Plug-ins**

1. Textual Documents: PDF, PostScript, Word, RTF, HTML, plain text Latex, ZIP archives, Excel, PPT, etc
2. Multimedia Documents: Images (e.g. GIF, JIF, JPEG, TIFF), Mp3 audio, MPEG, MIDI, etc
3. Unknown plug-in can be configured in greenstone.

### **Minimum Requirement for Greenstone Software Installation-Hardware**

1. Disk space 50MB for binary installation
2. 55MB for compiling Greenstone from source code
3. 200MB for optional Greenstone demo collection
4. 4MB for online documentation
5. 24MB for Greenstone's CD exporting functions

### **Minimum Requirement for Greenstone Software Installation-Software**

1. Java Runtime Environment (JRE)
2. Web Server (Apache recommended)
3. Practical Extraction and Report Language (PERL) for collection building
4. C++ compiler for source codes
5. Web browser (Netscape or Internet Explorer recommended)
6. Optional Software e.g. Image Magick, Acrobat Suit, Nero, Window Media Player, Audio-city

### **Potentials of Greenstone Software in Nigerian Libraries**

1. Digitization of books, Journals, Newsletters, Pamphlets, Monographs, Newspapers.
2. Digitization of Reports: Annual reports, Management and Committee's reports.
3. Digitization of important documentaries such as old and new Laws of the Federation
4. Digitization of various forms of local contents, cultural resources and festivities for availability over the internet
5. Nigerian Constitution, Conference Proceedings, etc
6. Development of local Music and Video Libraries
7. Digitization of theses, Dissertation, past questions papers and Institutional Repositories for Nigerian Higher Education institutions (HEI).
8. Images of Nigerian physical features, tourist attractions, artefacts, resources of Indigenous Knowledge etc
9. Above all, appropriate application of the Greenstone will improve the web ranking of Nigerian HEI

### **Various Ways of Getting Greenstone**

1. UNESCO CD-ROM.
2. Institute for Information Technology in Education (IITE) Digital Libraries in Education CD-ROM.
3. Greenstone Workshop CD-ROM.
4. Internet: [www.greenstone.org](http://www.greenstone.org) – sourceforge.

### **Installation of the Greenstone Digital Library Software (Version 2.83) Via CD-ROM**

1. Inserting your greenstone CD into your CD drive (the GSDL CD can be self-installing, depending on its initial configuration)
2. Otherwise, double click on the Greenstone (2.83) setup of the CD
3. Choose preferred language (English) – default
4. Accept the software license to lead you to the installation folder
5. When prompted (the software does not exist) create it, [ click yes

6. Click next on default components: Core system, ImageMagick, GhostsScript & Start Menu shortcut
7. Check enable box & click next to enable Administration pages
8. For admin password, type <admin> and click next
9. Click install to continue: Installation Progress – initializing & configuring...
10. Then click exit when finished message appears.

### **Installation of the Greenstone Digital Library Software via the Internet**

1. Visit Greenstone Site [www.greenstone.org](http://www.greenstone.org)
2. Select download menu to lead you to <http://sourceforge.net/> (a home page for downloading free source software)
3. Select the appropriate software for your operating system and ensure that you download a stable version of the greenstone. You have three options to select, depending on your operating system: Latest Distribution (Greenstone3) or older versions:
  - i. Windows: Greenstone-2.85-win32.exe (70.7MB)
  - ii. MacOS: Greenstone-2.85-MacOS-intel.dmg (44.2MB)
  - iii. GN U/Linux: Greenstone12.85-Linux (70.5MB)

### **Accessing GSDL Local Library**

1. Click on start button
2. Point to programs or All Programs
3. Point to Greenstone Digital Library Software (server)
4. Click on “Greenstone Digital Library” A pop-up window appears
5. Click on “Enter Library” in the dialog box and your browser should display the GSDL homepage environment.

### **Accessing Greenstone Librarian Interface**

1. To access Greenstone Librarian Interface (GLI), you need to launch your Reader Interface and then
2. Click on start button
3. Point to Programs or All Programs
4. Point to Greenstone Digital Library
5. Click on Greenstone Librarian Interface

### **CDS/ISIS**

#### **Overview**

The CDS/ISIS (Computerized Data System/Integrated System for Information Services) is an information retrieval package developed by the United Nation Educational Scientific and Cultural Organization UNESCO). It runs under a Microsoft

windows and its known as CDS/ISIS Mini-Micro version in official circle, although popularly referred to as CDS/ISIS.

The CDS/ISIS is developed to handle bibliographic information that is documentations relating to books, journal articles, proceedings, etc. each record in the database contains information about one document.

### **Features**

- i. It has variable length text fields unlike other database management system that are fixed. Bibliographic record may be of any length, from one word to many. The generalized nature of CDS/ISIS allows you to define data bases according to you specific requirement
- ii. Bibliographic data has repeatable fields. One book may have a number of authors with each having equal status and field capable of being repeated up to 999 times
- iii. Bibliographic data may make extensive use of subfields. Subfields is useful for example in “Imprint” where place of publication, publisher and data of publication can be separately manipulated. In data entry in CDS/ISIS the subfield are prefix with a circumflex ^. E.g. ^a Abuja ^b LRCN ^c 2012.
- iv. CDS/ISIS uses inverted files to enable faster searching of the database. An inverted file is just another name for an index.
- v. The program is multi-lingual, with English, French, Spanish, Arab languages the main
- vi. CDS/ISIS can be obtained on request, free-of-charge, by institution in developing countries.
- vii. CDS/ISIS is protected by copyright; hence can be used legally only by license holders. Once a license is obtained, it is valid for all versions, so new versions may legally be obtained from any source.
- viii. Creation of database requires specialized training. The CDS/ISIS may be likened to an open cheque, which must have date, amount to withdrawn, mailing list, etc. because of its high sorting capability.

### **Loading the Package (Installation)**

The package may be distributed on CD-ROM. If you are installing from CD-ROM, place the CD in your drive and it should load automatically. (If not, run the program kintallation.exe in its root directory.) Then choose CDS/ISIS Version 1.4 from the menu.

You will be asked various questions about the installation: just click continue if you are happy with the defaults.

When all the files have been copied, click ok to accept the license conditions. Hopefully you will be told “the setup process was successfully!” and you can click on to finish. Now you can try starting CD/ISIS.

## **Database Creation**

Before you create a data base with CDS/ISIS you need to decide on a format, that is what fields and how record the in them. The choice of fields is not final, it can be modify letter. That is, planning is required before a database is created. Also the audience, the availability of data and the form in which the report will be presented is important. In other words, planning stage is very essential for meaningful database creation.

If you are setting up a database for the first time, it is a good idea to use a very simple format to gain familiarity. For example, with a bibliographic database you could use nothing more than Author, Title and year.

To create a database you are required to complete four forms

### **The Field Definition Table (FDT)**

Database creation Using CDS/ISIS

- i. The Data worksheet
- ii. The Display Format
- iii. The Field Selection Table (FST).

Fortunately you can summon an assistant to help you with some of these – especially if you are new to CDS/ISIS.

You have to go through these four forms one after the other. It is compulsory to complete these 4 forms before you put off your system. If there is power failure during the process, and your UPS is not functioning. You have to start afresh.

#### **1. Field Definition Table (FDT)**

The FDT defines the field which may be present in the database and certain parameters for each field. It provides information on the contents of the master records in a given database.

#### **2. Data Entry Worksheet**

This is an input form or worksheet where data is entered.

#### **3. Display Format**

The display format means the way the record will appear when:

- i. Browsing through the records

- ii. Display search result
- iii. Print output

This display format means the way that the records will appear when you use browser the database or display search results. Display formats can also be used in producing printed output. There must be at least one display format for the database and that must have the same filename as the database. You can always create more formats, or modify existing ones, later.

### **Field select Table (FDT)**

- a. Which fields of the record are to be indexed, for example, author is more important to be indexed than publisher.
- b. How the index terms are to be constructed from the data in these fields. This is called indexing techniques.

### **Data Entry**

When you have set up your database, or if you have been given a database, you will be eager to try it out by entering some records. Incidentally, it is best to put in say six records and check that they can be searched and displayed as you would like staring on full scale data entry.

### **D-SPACE**

D-Space is a product, of MIT, it was expressly created as a digital repository to capture the intellectual output of multidisciplinary research organizations. MIT designed the system in collaboration with the Hewlett-Packard Company between March 200 and November 2002.

Version 1.2 of the software was released in April 2004, under an open-source license and available for download([dspace.org](http://dspace.org)). The software is designed more for community-based organization than discipline-base organizations and so it is better suited for an institution-based application. DSpace is one of the most popular institutional repository software, with over 1,200 known installations in over 100 countries. The most common use of Dspace software is by libraries as an open access repository to manage and provide access to scholars, researchers and institutional output. Other types of organizations using Dspace includes National Libraries, Archival Centres etc. Institutional Repositories have features and tools to manage, preserve and provide access to content on the Web.

### **System Architecture of Dspace**

The main code of Dspace is implemented in Java, and runs on any UNIX – like Systems and Windows base system. It makes use of several third – part open source systems:

- i. PostgreSQL, an open source relational database system, available for download from [www.postgresql.org](http://www.postgresql.org)
- ii. Jakarta Tomcat Java Servlet container
- iii. Apache HTTPD serve.

The main Dspace system is organized into application layer, business logic layer and storage layer, each of which consists of number of components.

#### **Hardware Requirement**

HP server re2600, powered by dual 64 – bit intel itanium

Dual Core Processor Speed 3.0GHZ

### **Dspace Integrates a User Community Orientation into the System’s Structure**

This design supports the participation of the schools, departments, research centres, and other units typical of a large research institution. As the requirements of these communities might vary, DSpace allows the workflow and other policy related aspects of the system to be customized to serve the content, authorization, and intellectual property issues of each. DSpace can store any of digital content, offers built-in-workflows for submission an review.

### **Institutional Repository like Dspace Have Been Design to Achieve the Following in Long Term**

- i. Capture and describe digital material using a workflow. Provide interface for online submission of research Material (intranet)
- ii. Maintained digital information in the repository without being damaged lost or maliciously altered.
- iii. Enable digital information to be extracted from the archive and served to a usher (internet & internet).
- iv. Make digital information to be available and accessible in the face hardware and software obsolescence.  
Provide access to this material over the web (metadata and/or full public)
- v. Expose metadata through OAI-PMH protocol  
Some examples of repository services provided by research libraries include long-term archiving and migration of content, dissemination and management, metadata and format management. Repository services can also deployed across a nearly unlimited diversity of content ranging from preprints of articles to born

digital primary source to born digital primary source materials, research data to technical reports and video.

### **Advantages**

According to Gbaje (2012) the Advantages of using: IR as a tool for management of Library information resources can be viewed from different perspective as listed below:

- i. As a means to expand on the amount diversity of scholarly material that is collected and preserved to enhance teaching, learning and research of the host institution and beyond (McCord, 2003)
- ii. As a way to enhance an institution's prestige or branding by showcasing its researcher's output (Crow, 2002)
- iii. As an essential infrastructure for the reform of the entire enterprise of scholarly communication and publishing (Guedon, 2003).
- iv. Increase exposure and use of an institution's intellectual capital  
Swan and Chan (2009), posit that an institutional repository is a tool for research managers to monitor, manage and assess research activities within an Random Access memory (RAM) 8GB  
Storage Harddrive (HDD)-8 Terabytes (Additional Terabytes can be added as amount of digital objects grow.

### **Limitation of DSpace**

Dspace runs on a web server platform. To be effective as a tool for management of library information resources it must be connect to the internet.

Dspace also must be migrate to a new hardware platform in the event of hardware obsolesce.

### **Conclusion and Recommendation**

FOSS, OSS and other Institutional output and locally created information resources can best be managed using institution repository. Institutional repository service provide for long-term archiving and migration of content, dissemination and access management, metadata and format management. The adoption of institutional repositories for the management of library resources will ensure that Nigerian libraries play a vital role in maximizing the value of institution output.

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