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Design of Theoretical Framework: Global and Local Parameters Requirements for Libraries

Sukumar Mandal

Department of Library and Information Science, The University of Burdwan, sukumar.mandal5@gmail.com

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Dr. Sukumar Mandal
Assistant Professor, Department of Library and Information Science
The University of Burdwan, Burdwan – 713 104
Email: sukumar.mandal5@gmail.com

Abstract

Library is one of the important aspect in modern reading environment. Theoretical framework is an inevitable and indispensable for each and every library in the field of automated and digital library system. In this original research paper all the parameters have selected on the basis of global recommendations and local requirements for libraries in six theoretical sections. Designing the theoretical framework in the following areas such as (i) Theoretical framework of integrated library system cluster (ii) Theoretical framework of community communication and interaction (iii) Theoretical framework of digital media archiving cluster (iv) Theoretical framework of content management system (v) Theoretical framework of learning content management system (vi) Theoretical framework of federated search system. Integrated library system cluster two things are more important development of ILS and open source ILS software. On the other hand it also crafted the requirement of parameters selection and it can be developed in three ways such as basic parameters settings, theoretical framework for housekeeping operations, and theoretical framework for information retrieval system. Software selection and parameter selection is also an pivotal tasks in the field or theoretical framework of community communication and interaction. Theoretical framework of digital media archiving cluster can be developed in three sections such as selection of software, selection of standards, and metadata selection for all the libraries. Content management system can be developed in three ways such as workflow of content management system, software selection in CMS cluster, and parameters selection in CMS cluster. Development of theoretical framework of learning content management system for libraries in three sections such as Components of Learning Content Management System , Software selection in LCMS cluster, and Parameters selection in LCMS cluster. Software selection and parameters selection is also an important components in the federated search system theoretical framework for the development of single window based interface.

Keywords : Theoretical framework, Global recommendations, integrated library system, digital media archiving, workflow of content management system, learning content management system, federated search system, community communication and interaction.

1.0   Introduction

> *"Libraries are starting places for the adventure of learning that can go on whatever one's vocation and location in life. Reading is an adventure like that of discovery itself. Libraries are our base camp."*

> ---James H. Billington

Computer has an outstanding efficiency, performance and ability to handle large volumes of data and for this reason it is gaining popularity in the fields of automated and digital library system. Many library and information centers' routine works are being proficiently performed by the computers. The computer has able to attract attention and impressed the society as well as in the fields of library and library personnel have been using in library management jobs, such as cataloguing, circulation, acquisition, classification, serials control, bibliographic control and information storage and retrieval etc. Many innovative services, like SDI, CAS and current content analysis etc. can also being render easily possible by the computer. Computerization in Library management system has become a vital things among librarians throughout the world. The library automation runs from trumpeting automation as the beginning of a new age era of universal access and librarians become the gateway of the information age (Mendelsohn, 1997). This is the era of 'information' and knowledge' and the traditional method of the academic library knowledge management have been proved inadequate and insufficient to meet the needs of the users of present days. The new trends (use of computer as a helping devices and related parts) are being slowly effects in the library field, because of the increases in information, requirements, and awareness of computer by the users (Haridasan, 1998). Academic library is information organization and to manage information requires four main components such as structure, goal/objectives, technology and library personnel. These components act as a key factors and worked together. Among these four factors, library personnel play the significant role in library organization and dissemination of information in the skillfully. The need of effectiveness information management is mainly depends on the attitude of the library personnel and combination of technology, objectives of the organization and infrustructure. The library personnel tried to maintain objectives of the organization and on that basis required for information management of the library for smooth handling (Banerjee, 2010). The application of computer in library management and services can be fulfil these needs and upgrade with the present days situation. Still there are many academic libraries in this colleges which are running with the traditional (manual) or partial automation systems to cater information to the users. The development of academic libraries acclimatized to computer environment in their housekeeping operations and information retrieval systems (Vasishta, 2007). A computer is capable enough in reducing the storage space and helpful in finding information in less time and which can not be possible in traditional systems and storage and retrieve information so quickly from its memory (Neelameghan, 1996). The automation of acedemic library helps to enhance the development of library services and creation of database systems much easier and for selecting, acquiring, and processing of library materials also done scrupulously (Joshi & Singh, 2008). Basically in ILMS four requirements are important for modern college library

automation (Clinkenbeard, 2002). These four requirements are general, functional, critical and technical towards next level automated system. Requirements for integrated library management systems are presents in the Figure-1.1. The fourth stage, according to Borgman, involves a) enhanced facilities for identifying, locating and obtaining documents (Chias & Abad, 2009); b) import and export of bibliographic data, and c) merging and integrating the different items on local collections with other types of information resources (Clarke, 2000). OLE is a framework and platform that transcends the monolithic LMS through its facility to utilize other systems and distribute valuable incipient accommodations.
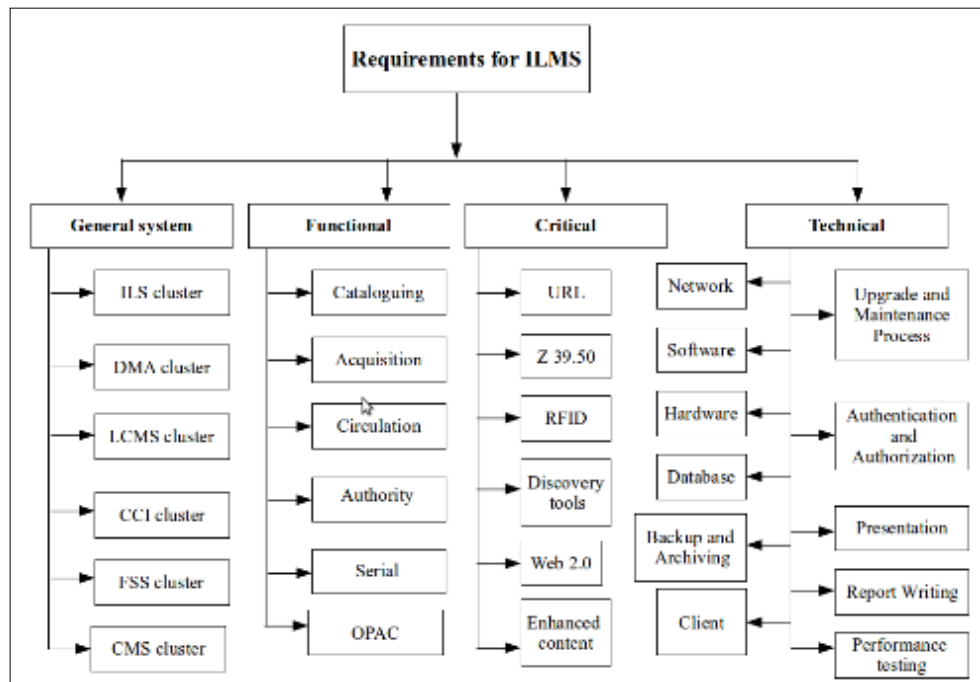

Figure – 1.1: Library management system requirement for CLBU

This framework has to logical clusters of which basic cluster is providing the backbone support. The other six domain specific clusters requirements are discussed.

1.1 ILS-DI Recommendations for CLBU

The ILS-DI group is intended to be a small group working over a short duration: eight library professionals from various research libraries across the US, working from mid-2007 to early 2008. We aim to move quickly and work with the resources available to the library community to produce simple, effective, and practical recommendations. Improve discovery and use of library resources via an open-ended variety of external applications that build on the data and services of the ILS (Cousins, 2006). Our goal is not to specify or implement the applications themselves, but to specify interfaces that the applications can use (Dubois, 1979). These applications may be local or remote, and may interact with more than just a single ILS. Articulate a clear set of expectations so that ILS and discovery application developers know what services to provide and how they will interact (Ehikhamenor, 1990). This includes describing specific functions and including their requirements, inputs, and outputs at a level detailed enough that implementers understand what to implement and clients understand what to expect (Geleijnse & Williams, 2007). The ILS-DI provides two types of standards are as follows:

A. **Standards based on ILS-DI of Metadata for CLBU**

The most comprehensive metadata standards are Dublin core, VRA core, EAD and protocol for metadata harvesting (Mandal, 2018). The following standards are requirement in automated and digital library system and it also emphasizes that two ILS software is selected on the basis of global recommendations and local requirement see table-1.1.

Metadata	Parameters
Dublin Core	ANSI/NISO Z39.85
	Referenced metadata
	Fifteen elements
	XML syntax
	Cross- domain searches
	DCMI
VRA Core	Mapped to the MARC format
	Viewing on or offline
EAD (Encoded Archival Description)	Optional and repeatable
	Linked to one or more cognate image records
	SGML
	MARC equivalency
	ISO 8879
Protocol for Metadata Harvesting	OAI- PMH

Table – 1.1: Metadata standards based on ILS-DI

B.   Standards of ILS Cluster based on ILS-DI for CLBU

Bibliographic data is the core component of an automated library system. It composes the substratum of all online catalogs and shared cataloging processes. All the functional modules of an integrated library system utilize with the bibliographic data in some way. Bibliographic standards (Table – 1.2) are necessary for setting up the single set of parameters for the integrated library system cluster in the college libraries affiliated to the University of Burdwan.

ILS-DI based standards for CLBU				
1st Level	2nd Level	3rd Level	4th Level	5th Level
9XX or X9X locally defined tags	Control of authorized names	Editing, delete and download	Displays the items and copies	85X/86X paired fields
Import and export	Generate cross references	Limit searches	Serials check-in	863 field update automatically
Content designators	Generate see and see also	Linkages to an authority file	Integrated acquisitions	Library of Congress Classification

	references			
Pickup list	Display in OPAC	Z39.50 server	Linking bibliographic record	Dewey Decimal Classification.
MARC-XML	ISO-2709	Phrase searching	ANSI/NISO Z39.71	Linking to MARC authority records

Table – 1.2 : Standards of ILS cluster based on ILS-DI for CLBU

1.2 Designing Theoretical Framework for CLBU

Selection of relevant parameters and standards is very difficult tasks. This research work select the parameters on the basis of global recommendations and local requirements in the domain specific cluster. Designing the theoretical framework for the college libraries affiliated to the University of Burdwan are to be described in the following ways :

1.2.1 Theoretical framework of integrated library system cluster for CLBU

According to UNESCO ILS is "an automated library system that is capable of managing the operations of more than one basic library functions" Integrated library management system is a system which can keep all tracks of a library operation such as items, billing, tracking various items owned by library like books, journals, magazines, dvds & so on, orders made by various faculty stuff & students and also even patron management. But, as the internet is getting stronger & libraries are demanding more and more automated facilities, new and powerful ILSs started developing by various companies. These new ILSs are consists of many functionality based on internet. In any Integrated library system there are generally two interfaces, one is for patrons and another is for administrators. A map of academic libraries using a FOSS ILS. Integrated Library System map is an important for academic library and most of the countries are used in Koha (Figure-1.2) http://www.Library technology.org/libwebcats/). Whereas Yellow means Koha, green means Evergreen, purple means OPALS and red means NewGenLib.

Figure – 1.2: ILS Map in Academic Libraries
(http://www.Library technology.org/libwebcats/)

Integrated Library system cluster consists of two important aspects like housekeeping operations and information retrieval. Housekeeping operation in ILS includes like acquisition, cataloguing, circulation, serial control, report generation and authority control. On the other hand information retrieval in ILS includes like online public access catalogue and management of information system. These are the important elements of integrated library system. An integrated library system enables the library to link circulation activities with cataloging, serials management etc. at any given time. It makes use of a file server and clients in a local area network. (see fig-1.3).
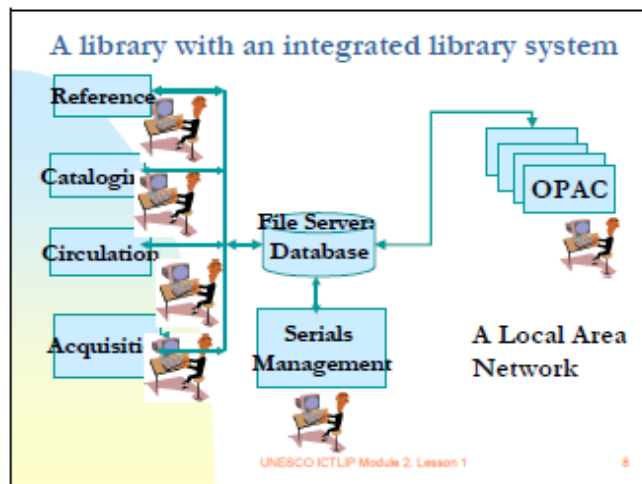

Figure-1.3: Integrated Library System for CLBU

1.2.1.1 Development of Integrated Library System for CLBU

Automated libraries everywhere are now in the process of changing to an advance process that is digitization. To change from automation to digitization is not as simple as we think. In fact it is a long process again. The first step to take is the data conversion that is to convert the database which they have in any software they had used earlier. But there is a big problem here because if that earlier software does not have a standard format which is followed by the digitized software then there will be a loss of data which is not less than a nightmare to the Librarians. Development of integrated library system are described as follows:

- The first generation integrated library management systems were module-predicated systems with no or very little integration between modules. Circulation module and cataloguing module was the priority issue for these systems and were developed to run on categorical hardware platform and proprietary operating systems.

- The second generation ILMSs become portable between sundry platforms with the exordium of UNIX and DOS predicated systems. The ILMSs of this generation offer links between systems for categorical function and are command driven or menue driven systems.

- The third generation ILMSs are plenarily integrated systems predicated upon relational database structures. They embodied a range of standards which were a paramount step towards open system interconnection. Colour and GUI features, such as windows, icons, menus and direct manipulation have become standards and norms in this generation. They operate in client-server architecture setup.

- The fourth generation ILMSs systems are predicated on web architecture and facilitate access to other servers over the Internet. These systems sanction accessing multiple information sources from single window utilizer interface and support digital archiving.

- The fifth generation ILMSs are based on Web 2.0 and information mashup facilities available with automation packages. The most of the important concept is widget code this will generate and access the open access journal and other digital resources from the Internet. Discovery tools are also an important approach in integrated library management systems due to it can create and snatch the data from the other library OPAC.

Thus the progress of ILMSs through the generation provides us an efficacious and straightforward utilizer interface, which fortification access to multiple sources and accommodations from one multimedia interface. Moreover the ILMSs sanction customizing report generation and to manipulate data and investigate sundry scenarios, and ergo they have all the potential to be a decision support implement. The fifth generation of ILMSs are represents in table 1.3.

SL	Parameters	1st Generation	2nd Generation	3rd Generation	4th Generation	5th Generation
1	Discovery tools	None	None	None	Non standards	SOPAC, VuFind , Encore and Summon etc.
2	Backup and restoration	None	Limited	Standards	Standards and integrated	Fully integrated and seamless
3	Integration	None	Bridge	Seamless	Seamless	Seamless and and widget
4	Federated searching	None	None	None	Non standards	Standards through Java and perl laguages
5	Unicode	None	Limited	Standards	Standards	Unicode plus OCR
6	Web 2.0 and Information mashup	None	None	None	Non standards	Standards
7	Import/export	None	Limited	Standards	Standards	Fully standards and customized
8	Operating system	In house	Vendor specific	UNIX, DOS, Windows	Unices, windows	Fedora, Redhat, Ubuntu
9	Report generation	Fixed formats and limited fields	Fixed formats and unlimited fields	Customized report generation	Customized report generation with email	Customized report generation with email and guided with statistical reports
10	Capacity of record holding	Limited	Improved	Unlimited	Unlimited	Unlimited
11	Tools of maintenance	None	None	Limited	Standards	PHP, easy-php, phpmyadmin, perl, java
12	Indexing	None	Limited	Limited	Standards	Lucene, Zebra, MGPP, Apache-solr

Table-1.3: Generation of ILMSs

1.2.1.2 Open source Integrated Library System Software for CLBU

Open source software means whose source code is available in the library environment and it can socially and legally accepted. It is also possible to installation, configuration, customization and deleted in unnecessary fields from the databases. Libraries and open source software are a natural fit (Mandal, 2017). Both promote learning and understanding through the dissemination of information. Open source software use has since the last decade gained momentum in both public and private organizations (Weber, 2004) partly due to the rapid revolution in internet technology which is fundamentally made up of open source software technologies. Besides, nowadays budgets are tight and since open source software is free and the most of the software is to be made by the eminent team in matured level which reduce the error of open source tools and standards. Moreover, open source software is the most comprehensive module solutions that reflects the positive attitude in library management system (Discini, 2006). Libraries and open source softwares are a natural fit. Both promote learning and understanding through the dissemination of information. One of the Keystone Principles (Association of Research Libraries, 2004) of Association of Research Libraries (ARL) states, information retrieved, access, dissemination and management of information is also possible by using the interoperability standards in modern library both for integrated library system and digital library. According to Eric Lease Morgan (2002), author of MyLibrary portal

software :

"In many ways I believe OSS development, as articulated by Raymond is very similar to the principles of librarianship. First and foremost with the idea of sharing information – both camps put a premium on open access. Both camps gain reputation by the amount of "stuff" they give away. What people do with the information, whether it is source code or journal articles, is up to them. Both camps hope the shared information will be used to improve our place in the world. Just as Jefferson's informed public is a necessity for a democracy, OSS is necessary for the improvement of computer applications."

There are many good integrated library system software are available in the library environment which includes like BiblioteQ, Emilda, Evergreen, Koha, NewGenLib, OPALS, OpenBiblio, PMB, PhpMyLibrary etc. This are the important ILS software because it can easily managed the housekeeping operation and information retrieval. Integrated library system are classified in three ways like matured level, middle level and infancy level. This can be expressed in the following way.

A - :Matured level ILS

Matured level integrated library system are consists of different elements like high level operating system, multilingual retrieval system, transliteration in different languages through machine, high level languages and database management system (Mandal, 2018). It can support both Linux/Unix and windows environment. These software are possible to integrate on Ubuntu linux/unix operating system to managed the digital resources. This research work matured level ILS software this can be expressed in the following way:

Emilda

Emilda is a open source software and developed by Realnode Ltd in cooperation with SDU relinquished under the GNU General Public License. It support the full featured web enabled architecture and important features like library management software, cataloguing and circulation. Template predicated layout sanctioning anyone to alter the visual appearance of Emilda. 100% MARC compatibility utilizing the Zebra Server from Indexdata as backend server. Extensive configuration made facile with the Emilda Configurator, sanctioning full customization of the system. (http://www.emilda.org/).

Evergreen

Evergreen is open source integrated library management system software developed by the George Public Library Accommodation. It is written in C++ and Perl programming language and its covered 252 public libraries. It also support the cross platform including Windows and Ubuntu operating system. The source code is available in online for installation and configuration of different library related modules. Global MARC standard is support for data entry in cataloging level. (http://evergreen-ils.org/).

Koha

Koha is open source integrated library management software developed by Katipo Communications Limited during 1999 and its source code available in online

environment. It written in perl language and it support the LAMP architechture both support the Windows and Ubuntu operating system. Housekeeping operations and information retrieval system is possible in staff-client interface as well as user interfaces. New innovative features in library services are to be easily solved through OPAC for the user management and sending the data both bibliographic as well as authority data to the patrons mobile (http://www.koha.org/).

NewGenLib

NewGenLib is a fourth-generation ILS developed by Verus Solutions Pvt Ltd. in collaboration with Kesavan Institute of Information and Knowledge Management in Hyderabad, India. It is an open source ILS based on open source companion software like PostGreSQL, Java Version 1.6 and Tomcat Web server. The current release is 3.0.6. NewGenLib provides a separate cataloguing interface for different types of authority records namely personal name, corporate name, topical terms, meeting name etc except chronological term. It means NewGenLib is as comprehensive as Koha in managing authority data except a few difference. In NewGenLib, cataloguers cannot view MARC 21 authority tags and/or subfields. It gives a Label based authority worksheet (http://www.verussolutions.biz).

OPALS (Open-source Automated Library System)

OPALS is open source automated library system and its web-enabled architechture. Cataloging module is available in this software but no OPAC interface and its using the different institutions like school, college, research and library union catalogs and it also managed the digital documents. (http://www.mediaflex.net/). All the modules are not available in housekeeping operations part but also absent the full fledged OPAC interfaces.

WEBLIS

WEBLIS is open source integrated library system software developed by the Institute for Computer and Information Engineering of Poland with support from UNESCO. The archietecture is web-based cataloguing, circulation for the users as well as library professionals in the library. The source code is available in their websites for the maintainnce of housekeeping operations and information retrieval system. It is a type of database management system as WWW-ISIS. (http://www.icie.com.pl/WEBLIS.htm).

List of open source software are represents in the table-1.4 on the basis of three levels like matured, middle and infancy levels and environment of development described in appendices-1.

Sl.	Name of OSS	Originated	Web address
Matured Level			
1	Koha	Originated in New Zealand	http://www.koha.org/
2	Evergreen	Originated in USA	http://www.open-ils.org/
3	OPALS	OPen-source Automation Library	http://www.mediaflex.net/

		System originated in USA	
4	NewGenLib	Originated in India	http://www.verussolutions.biz/
5	Emilda	Originated in Finland	http://www.emilda.org/
6	WEBLIS	Institute for Computer and Information Engineering (ICIE), Poland	http://portal.unesco.org/ci/en/ev.php-
Middle and infancy Level			
7	PhpMyLibrary	Polerio Babao	http://www.phpmylibrary.org/
8	OpenBiblio	Originated in Spain	http://obiblio.sourceforge.net/
9	PMB	François Lemarchand in October 2002, Director of the Public Library of Agneaux, French	http://www.pmbservices.fr/
10	Avanti	----	http://www.avantilibrarysystems.com/index.html
11	MyLibrary	Philippines in 2001	http://dewey.library.nd.edu/mylibrary/
12	Mylibrarian	SourceForge.net	http://sourceforge.net/projects/mylibrarian/

Table – 1.4 : Levels of ILS Software

1.2.2   Parameter requirement of Integrated Library System for CLBU

Parameters selections are important tasks in modern integrated library systems. Specially in Academic library parameters are essential elements to designing the College library Under the University of Burdwan. Most of the college libraries are suffering to managing the basic operations like housekeeping operations and information retrieval. Parameters are selected on the basis of global recommendations and local requirements for college library through two open source software namely Koha and NewGenLib. Among them this work select the one software which can easily manage the all types of services. Housekeeping operations includes like acquisition, cataloging, circulation, authority control, serial control and report generation. On the other hand information retrieval includes OPAC and management of information system.

1.2.2.1   Basic parameters settings of CLBU

After settings the global system preferences then setup the basic parameters in Koha administration including libraries and groups, funds and budgets, currencies and exchange rates and item types. These basic parameters are setting in four areas such as (i) Libraries and groups of CLBU ; (ii) Funds and budgets of CLBU ; (iii) Currencies and exchange rates of CLBU and (iv) Item types of CLBU.

This parameters tells Koha about the college libraries public service outlets.

Even if librarian have only one outlet, here need to give Koha some information about it. Librarian may find that some information about the primary outlet already exists, since the installation script gives the installing technician the options of setting some basic information as part of the installation process. That information can now be changed or refined, if necessary. Begin by defining the CLBU groups. If for example the college library has one group and library.

1.2.2.2 Theoretical Framework of Housekeeping Operations for CLBU

The housekeeping operations in a library consists of acquisition, cataloguing, circulation, member generation, serials control, authority control and report generation and etc. This theoretical framework select the matured level open source software in the domain of integrated library system and made a comparative study of each modules of housekeeping operations where as 1 represents the presence value, 0.5 is partial value and 0 presents the absence value. In this context select the highest rank software for the college libraries under the University of Burdwan. The activities related to acquisition of documents, technical processing of acquired documents, circulation and maintenance of processed documents are known as housekeeping operations. These activities are highly labour intensive and basically routine clerical chores performed slowly and expensively by human beings, until recently. With the advent of Information and Communication Technology, libraries are increasingly attempting to automate some of these activities for minimizing human clerical routines and thereby making library staff more productive. Automation of library housekeeping operations is considered as an especially critical area from which future benefits will emerge. Libraries deals essentially with record knowledge, which is expressed in terms of alphabetic and numeric characters indited on some congruous medium. The technology pertinent to library functions and development has consequently been that dealing with characters and their manipulation, their storage and transmission. ICT is an invention of direct pertinence to libraries prime concern – the acquisition, storage and exploitation of cognizance as recorded in documents of all kinds.

(i) Acquisition

These parameters (Table – 1.5) are essentially requirement in college library for acquisition and managing the documents in the library. Most of the comprehensive recommendations are considered for determining this types of parameters like printing, order, email-purchase and suggestion, selection of vendor, fund control, gist, manage suggestion, manage MARC order, rollback payment, report and statistics, duplicate checking etc. are needed in College library to manage the acquisition. If this parameters are integrated in a one single open source software so, it will help the library professionals in the college library to manage the large collection. Email-purchase suggestion and purchase through Z39.50 is the new concept in Integrated library and management system and it also manage the MARC records in the academic library like college library under the university of Burdwan.

Sl	Parameter	Emilda	Evergreen	Koha	NewGenLi	OPALS	WEBLIS

.		Support	Score	Support	Score	Support	Score	Support (b)	Score	Support	Score	Support	Score
1	Acquisition create item	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1
2	Currency Format	Yes	1	Yes	1	Yes	1	Partial	0.5	No	0	No	0
3	Gist	No	0	No	0	Yes	1	Yes	1	No	0	No	0
4	Printing	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1
5	Order Pdf format	No	0	No	0	Yes	1	No	0	No	0	No	0
6	Duplicate checking	Partial	0.5	Yes	1	Yes	1	Yes	1	Partial	0.5	Partial	0.5
7	Report and statistics	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1
8	Selection of vendor	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Partial	0.5
9	Fund Control	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1
10	Selection of item	Yes	1	Partial	0.5	Yes	1	Yes	1	Partial	0.5	No	0
11	Firm order	No	0	Yes	1	Yes	1	Yes	1	No	0	Yes	1
12	Receive order	Partial	0.5	No	0	Yes	1	Yes	1	No	0	No	0
13	Rollback payment	No	0	No	0	Yes	1	No	0	No	0	Partial	0.5
14	Claims for unsolicited items	No	0	Partial	0.5	Yes	1	Partial	0.5	No	0	No	0
15	Process quotation	No	0	No	0	Yes	1	Partial	0.5	Partial	0.5	Partial	0.5
16	Email Purchase Suggestions	No	0	Partial	0.5	Yes	1	No	0	Yes	1	Yes	1
17	Late order	No	0	Partial	0.5	Yes	1	Partial	0.5	Yes	1	No	0
18	Managed suggestion	Partial	0.5	No	0	Yes	1	No	0	Partial	0.5	Yes	1
19	Manage MARC records	Yes	1	No	0	Yes	1	Partial	0.5	Yes	1	No	0
20	Acquisition through Z39.50	No	0	Partial	0.5	Yes	1	No	0	No	0	No	0
Total Score (Out of 20)		Emilda Score : 9.5		Evergreen Score : 10.5		Koha Score : 20		NewGenLib Score : 12.5		OPALS Score : 10		WEBLIS Score : 9	

Table – 1.5 : Parameters requirement for acquisition

From the above table it is clear that in acquisition module is better in Koha as compared to other because the score of Koha gets highest. So, obviously, it can conclude that all the new features are available in Koha software on the basis of global recommendations and local requirements for the integrated library system in the college libraries under the University of Burdwan.

(ii)   Cataloguing

Cataloguing is possibly the most important task of integrated library system. It requires standardization and should be supported by carefully crafted decision. The cataloguing modules of ILS cluster give us freedom to choose MARC standards (UNIMARC and MARC21) or non-MARC standards (own standards). Here MARC 21 family of standards (a family of five co-ordinated standards such as authority standards, bibliographic standards, community information standards etc) is selected as content designated schemes. There are two reasons for it. First, MARC 21 standards are updated continuously, available through Web, and emerging as open standards. Secondly, these are now becoming almost the de facto global standards in the domain of ILS as these are adopted by the different global recommendation. Theoretically catalgoue development in the following way (year-wise) represented in the table- 1.6. **Year wise development of cataloguing rules:**

SL	Year	Event
1	1876	Cutter's Rules for a Printed Dictionary Catalogue, 1st ed.
2	1904	Cutter's Rules for a Dictionary Catalog, 4th ed.
3	1908	Catalog Rules: Author and Title Entries. (The Anglo-American Cataloging Code)
4	1941	Preliminary second edition by the ALA of the 1908 rules
5	1941	A.D. Osborn, "The Crisis in Cataloging"18
6	1942	ALA Rules for Filing Catalog Cards
7	1948	Rules for Descriptive Cataloging in the Library of Congress
8	1949	ALA Cataloging Rules for Author and Title Entries
9	1953	Seymour Lubetzky, Cataloging Rules and Principles: A Critique of the ALA Rules19
10	1956	Filing Rules for the Dictionary Catalogs in the Library of Congress
11	1961	International Conference on Cataloging Principles, Paris
12	1965	Draft of Machine-Readable Cataloging (MARC) format
13	1967	Anglo American Cataloging Rules (AACR)
14	1968	MARC II format
15	1969	International Meeting of Cataloging Experts, Copenhagen
16	1971	International Standard Bibliographic Description (ISBD)
17	1974	First meeting of Joint Steering Committee for Revision of AACR (JSC)
18	1978	Anglo-American Cataloging Rules, 2nd ed. (AACR 2)

19	1980	Library of Congress Filing Rules
20	1988	Anglo American Cataloging Rules, 2nd edition revised (AACR2 R)
21	1997	International conference on the principles and future of AACR, Toronto
22	1998	AACR2 (CD-ROM under constant revision by Joint Steering Committee)

Table – 1.6 : Development of cataloguing rules (Year-wise)

Now, in modern ILS system there are two types of cataloguing like bibliographic records through MARC and copy cataloguing through Z39.50 client server architecture (e.g LoC). In this respects requirement some important parameters to design the integrated library system for the better way of cataloguing. Actually cataloguing means preparing and maintenance of a catalogue in a library. So, obviously in academic library requirement of global cataloging parameters for designing the college libraries under the university of Burdwan. These parameters are requirement for College libraries because it can easily handle the documents and it facilitates like- FRBR, FRAD, FRSAD, pickup list, spine label, authorized value lists, standards lists and important parameters represented in the table-1.7 which emphasizes the academic library.

Sl.	Parameter	Score of open source software against in cataloguing					
		Emilda	Evergreen	Koha	NewGenLib	OPALS	WEBLIS
1	Import catalog records	1	0	1	1	0	0
2	MARC21 Templates	1	1	1	1	0.5	0
3	Spine label and barcode printing	0	0	1	1	0	0
4	Cataloguing from acquisitions	0	0	1	0	0	0.5
5	Re-index catalogue records	0	0	1	0	0.5	0
6	Copy cataloguing	0.5	0	1	1	0	0.5
7	Authority search	0.5	1	1	1	1	1
8	Custom indexes	1	0.5	1	0	0	0
9	RSS (Really Simple Syndication)	0	0	1	0	0	0.5
10	ISBD change	0	0	1	0	0	0
11	Authorized values	0	0.5	1	0	0.5	0
12	Add to list	0.5	0	1	0.5	0	0

13	Pickup list	0	0	1	0.5	0	0
14	Auto barcode	0	1	1	1	0.5	0
Total Score (Out of 14)		4.5	4	14	7	3	2.5

Table – 1.7 : Parameters requirement for cataloguing

From the above table – 1.7 in the module of cataloguing the Koha gives highest results as compared to other open source software. All the new innovative and traditional features are available in the Koha integrated library system software. So, obviously, it can conclude that the preparing and maintenance of a catalogue in the college library are to be performed efficiently and effectively because here all the parameters are to be selected on the basis of global recommendations and local requirement.

(iii) Authority Control

Lubetzky redefined the objectives of catalogue as proposed by Charles Cutter in 1876 and as modified by Paris Principles in 1961 (Svenonius, 2000). He categorized objectives of catalogue into two functional groups – I) the finding function (helps in directing users to the materials and location in the collection) and ii) the collocation function (helps users to find all the works of a given author; works on a specific subject and various editions of a work). Finding function of a catalogue hugely depends on consistency of access points in bibliographical records. But collocation function cannot work without consistency in naming author, edition or subject. Therefore, these two groups of function in library catalogue require control over access points. Authority control is an umbrella term for the technical processes related with authority works and aims to achieve control over the different forms of access points. Authority control in ILS are managed through global parameters which represents in the table-1.8. These important parameters and authority control tools (table-1.9) are indispensable in College library system to design and developing the integrated information management and retrieval system for college libraries under the university of Burdwan.

Sl.	Parameter	Score of open source software against in cataloguing					
		Emilda	Evergreen	Koha	NewGenLib	OPALS	WEBLIS
1	Record identifier/ record control number	0	0	1	1	0.5	0
2	International Standard Authority Data Number (ISADN)	0	0	0	0	0	0
3	Support for managing Leader and control fields	0.5	1	1	0	0	0
4	Powerful editor for managing authority records	0	0.5	1	0.5	0	0
5	Universal Character sets	0	0	1	1	0.5	0

6	Multiple script handling	0.5	0	1	0.5	0	0
7	Online record downloading	0	0.5	0	1	0	1
8	Offline import of records	0	0	1	0	0	0
9	Differentiated and undifferentiated personal name	1	1	1	1	0.5	1
10	Variant forms of the authorized heading ("see" references)	0.5	0	1	1	1	0
11	Related authorized heading ("see also" references)	0.5	0.5	1	0.5	0	0
12	Standard Model (e.g. FRAD) based authority framework	0	0	0	0	0	0
Total Score (Out of 12)		3	3.5	9	6.5	2.5	2

Table – 1.8 : Parameters requirement for authority control

From the above table -1.8 reveals that the Koha gives highest results in the domain of authority control as compared to other open source software. In this fields the relevant parameters are to be selected on the basis of global recommendations and local requirement and all these parameters included in the Koha software in the domain of integrated library system cluster for the college libraries under the University of Burdwan.

There are many authority control tools are available in the domain of integrated library system cluster. This research work select only the matured level authority control tools for developing the authority control in the field of integrated library system for the college libraries under the University of Burdwan. In this context this research work select five authority control toools including LoC, NACO, SACO, VIAF and MARS. The purpose of authority control in an automated library setup is to achieve consistency and uniformity in bibliographic files and to reduce divergence and diversity. In automated library system bibliographic records are generally linked with authority files as far as personal/corporate/meeting names (typically 1XX tags in MARC 21 bibliographic format) and subject access points (6XX tags in general and 650 tag in particular for MARC 21 bibliographic format). Authority control is an expensive and time-consuming process in libraries of any type or size (Maxwell, 2002; Garrison, 1994). Now, in College library are trying to solve the problem of authority control through open source integrated library system software . Here, required some important global parameters for managing the authority records. It also import the authority records from other library OPAC like LoC (Library of Congress). The comparative study of authority control tools represents in the Table 1.9.

Sl.	Parameter	LC		NACO		SACO		VIAF		MARS	
		Support	Score	Support	Score	Support	Score	Support	Score	Support	Score

1	Format of records (MARC/UNIMARC authority format)	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1
2	Full MARC Update processing (Local and Global updating of authority database)	Yes	1	Yes	1	Yes	1	Yes	1	Yes	1
3	Link with other controlled lists	No	0	No	0	No	0	No	0	No	0
4	Authority Change Report (Automatic reporting of changes)	Yes	1	Partial	0.5	Partial	0.5	No	0	No	0
5	All major forms of authorities	Yes	1	No	0	No	0	No	0	No	0
6	Collection of authority records from different libraries	No	0	No	0	No	0	Yes	1	N0	0
7	Provide authority records for all levels of hierarchy (General, Form etc.)	Yes	1	No	0	Partial	0.5	No	0	No	0
8	Authority Record Distribution (Individual record and batch processing)	No	0	Yes	1	Partial	0.5	Partial	0.5	Yes	1
9	Free access/use for everyone (No restriction for import)	Yes	1	No	0	No	0	Yes	1	No	0
10	Download format support	Comprehensive	1	Limited	0	Limited	0	Comprehensive	1	Limited	0
Total Score (Out of 10)		**7**		**3.5**		**3.5**		**5.5**		**3.5**	

Table – 1.9 : Tools requirement for authority control

From the above table -1.9 reveals that the LoC gives highest results in the domain of authority control tools as compared to other tools. Here, all the parameters are to be selected on the basis of global recommendations and local requirement in the college libraries under the University of Burdwan. This research research work tries to integrate the LoC authority control tools in the field of MARC 21 data entry under the field of 100 and 600 personal name and other authority records in the college libraries under the University of Burdwan.

(iv) Circulation

Now, in modern integrated library system circulation is divided in two ways like general circulation and offline circulation. In case of offline circulation needs extra circulation tools like firefox addin and bulk import records. Circulation work of a library involves a group of operations that are specific, repetitive and systematic. As

a result automated circulation systems have been fairly successful from early days of library automation. Such systems require minimum set of essential data for carrying out circulation activities and bibliographic data managed in different process. Circulation systems in ILS are designed to capture and manipulate three kinds of datasets like information about the borrower, information about the resource being borrowed and information about the loan itself. It also managed the patrons and items files, setting parameters (issue, return etc), fine and overdue notice, hold and recalls, reservations, renewal, short-term loans. Beside this there are also some important parameters required for integrated library system for managing the circulation through open source software on the basis of global parameters (Table-1.10) for designing and developing the college libraries under the university of Burdwan.

Sl.	Parameter	Score of open source software against in circulation					
		Emilda	Evergreen	Koha	NewGenLib	OPALS	WEBLIS
1	Borrower categories	1	1	1	1	0.5	0
2	Issuing Rules	0	1	1	0.5	0	0
3	Check - out (issue)	1	1	1	1	1	1
4	Check – in (return)	1	1	1	1	1	1
5	Renew loan	0	0	1	1	0	0
6	Binding management	0	0	1	1	0.5	0
7	Recall document	0	0.5	0.5	1	0	0
8	Weed out	0	0	1	1	0	0
9	Collect overdue	0.5	0	1	1	0	0
10	Inter library loans	0.5	0	1	0	0.5	1
11	Return before expiry	0	0.5	1	0	0.5	0.5
12	Maximum outstanding	0.5	0	1	0	0.5	0
14	Maximum reserves	0.5	0	1	0.5	0	0
15	Patron images	1	0	1	1	0	0
16	Print circulation slips	0.5	0	1	1	0	0
17	Notify Borrower Departure	0	0.5	1	0	1	0
18	Auto member num	0	0	1	0	0	0
19	Check-digit	0	0	1	0	0	0
20	RFID	0	0.5	1	0.5	0	0
21	Offline circulation	0	0	1	0	0	0
Total Score (Out of 21)		6.5	6	20.5	11.5	5.5	3.5

Table – 1.10 : Parameters requirement for Circulation

From the table 1.10 the highest results gives Koha in the domain of circulation for the integrated library system. This research work select all the parameters on the basis of global recommendations and local requirement in this domain. Other open

source softwares in the matured level are not comfortable in the domain of integrated library system cluster. But Koha is the most comprehensive in the module of circulation as compared to other software for the college libraries under the University of Burdwan.

(v)   Off-line Circulation

This is the new innovation in integrated library system. Basically its required extra toolkit for offline circulation. Off-line circulation is possible in two ways like bulk import and firefox addin. It can help the librarians as well as users. Save the time of the reader is an important approach in integrated library system. Now, in circulation there is a lot of problem for check out, check-in and renewed. This type of problem is solved by open source integrated library system software.

(vi)   Serials Control

As per the definition of International Serials Data System (ISDS), a serial is a publication issued in successive components and intended to be perpetuated indefinitely. Serials include journals, periodicals, magazines, almanacs, newspapers, transaction, proceedings, annual reports, numbered monographs, and supporting resources. The periodical is maintained and managed by some relevant open source software. Authoritatively mandating, Receipting, Accumulating, Claiming and Binding are included here. Here, Binding betokens, any library staff can bind the journal in a library to access facilely. Nowadays these type of resources are called Continuing Resources. Monographs are received, paid for, catalogued, shelved and there the matters ends. On the other hand serials continue to be received; they have to be ordered and paid for periodically; cataloging must include additional information, such as the frequency of publication and often the cataloging information must be changed; information on the library holdings must be constantly updated; and even binding must take place repeatedly and precisely. Serials management in integrated library system has to deal with the features unique in serials control. Now, in modern integrated library system some important parameters are considered on the basis of global recommendations and local recommendations. These types of parameter are expressed in the table-1.11. These parameters are necessary in College library for designing and developing the integrated library management and retrieval system under the university of Burdwan. It is possible through matured level open source software includes like Emilda, Evergreen, Koha, NewGenLib, OPALS and WEBLIS.

Sl.	Parameter	Score of open source software against in serials control					
		Emilda	Evergreen	Koha	NewGenLib	OPALS	WEBLIS
1	Bibliographic information	0	0.5	1	0	0	0
2	Display information about installments	0	0	1	0	0	0
3	Allow the librarian	1	0	1	1	0	1
4	Circulate issue to patrons	0	0	1	0	0	0
5	Add supplier	0	1	1	1	1	1
6	Add bibliographic data	0	1	1	1	0	1
7	Set serials subscription	0.5	0	1	1	1	0

8	Management of serials	0	0	1	0.5	0	0
9	Periodicity	1	0.5	0.5	0	0	0
10	Accessioning of bound volumes	0	0	1	0	1	0
11	Integration with article indexing	0.5	0	1	0	0	0
12	Request / Exchange	0	0.5	1	1	0	0
13	Payment forwarding note	0	0.5	1	1	1	0
14	New subscription	0.5	0	1	0.5	0	0
15	Serials binding management	0	0	1	0	0.5	0
16	Add to renewal list	0	0	1	0	0	0
17	Individual claims and support binding	0	0	1	0	0.5	0
Total Score (Out of 17)		3.5	4	16.5	7	5	3

Table – 1.11 : Parameters requirement for Serials control

From the table 1.11 it is clear that Koha gives highest results as compared to other open source softwares in the domain of integrated library system cluster. This research work are to be selected only the relevant parameters on the basis of global recommendations and local requirement. All these parameters are to be available in the Koha software for the college libraries affiliated to the University of Burdwan.

(vii)   Report Generation

Report generation is an important concept in integrated library system. This facility are include in open source software. There are two types of report in ILS namely guided report and statistical report. The main report generation interface of open source software may be accessed from the librarian interface by opening the report tag. The college libraries are suffering from the report generation in ILS. Most of the college libraries are facing this type of problem under the university of Burdwan. But this research work are trying to solve this problem through open source ILS software on the basis of global recommendation. Some important parameters (Table-1.12) are selected to manage the report generation in college libraries under the university of Burdwan.

Sl.	Parameter	Score of open source software against in report generation					
		Emilda	Evergreen	Koha	NewGenLib	OPALS	WEBLIS
1	Statistical report	0	0	1	1	0	0
2	Guided report	0	1	1	0	0	0
3	web-based and accessible via any standard web browser	0	0	1	0	0	1
4	Run at a date and time	0.5	0	1	0	0.5	0
5	Print or email reports	0.5	0	1	0	0	1

	automatically						
6	Formats including PDF, HTML, XML, CSV, and Excel.	0	0	1	0	0	0
7	Custom reports	0.5	0	1	1	0.5	0
8	View dictionary	0	0.5	0	0	0	0.5
9	Most circulated items	0.5	0	1	1	0	0
10	Patrons checking out the most	0	0	1	1	0.5	0
11	Average loan time	0	0.5	1	0.5	0	0.5
12	Catalogue by item type	0	0.5	1	0.5	0	0
Total Score (Out of 12)		**2**	**2.5**	**11**	**5**	**1.5**	**3**

Table – 1.12 : Parameters requirement for report generation

Report generation is very difficult tasks in the domain integrated library system cluster. But this research work solved this problem by using the Koha software and in the above table 1.12 reveals that the Koha gives highest results in the domain of report generation as compared to other open source softwares. All the parameters are to be selected on the basis of global recommendations and local requirement for the integrated library system cluster. These comprehensive parameters are to be included in the Koha software which can easily managed and generate the report both statistical and guided report for the college libraries under the University of Burdwan.

1.2.2.3   Theoretical framework on Information retrieval system for CLBU

This is the important aspects in integrated library system. Information retrieved is possible through opac, web opac and integrated access. Management of information system is also an comprehensive in ILS. Large amount of information are stored in the library but main objectives of the library to satisfy the users. In this way to retrieved right information at right time through open source software in ILS. Most of the college libraries are suffering in information retrievals at right time. This type of problem are solved by open source software on the basis of their global recommendation for fulfillment of user satisfaction in modern ILS.

(i)   Online Public Access Catalogue

Catalogue is one of the important concept in automated library system and its also known as mirror of library collection. In automated setup access to library collection is provided through Online Public Access Catalogue. Most online catalogues are searchable by author, denomination, subject, and keywords and sanction users to print, download, or export records to an electronic-mail account (ODLIS, 2011). the opportunities for extending Web 2.0 applications to the OPAC (Mukhopadhyay, 2000) to transform the user experience and improve the catalogue's usefulness and usability. OPAC of any modern ILS is fully integrated with other modules, accessible through LAN and WAN and it allows users:

To search either combined or specifically, for all formats (books, journals,

computer files, maps, sound recording, musical scores, visual materials, manuscripts and archival materials);

To find a range of levels of records (from full bibliographic records to brief, minimal level records);

To see standards and customized display of records in all status categories (fully catalogued, provisional records, confined copy, on order, in process, lost, withdrawn);

To know item level circulation status information in real time and note of items those have special locations (in transit, reserves etc.);

To search multiple words or phrases in one, more than one, or all fields;

To apply various search operations within and across all field such as Boolean operators (AND, OR, NOT), positional operators (SAME, WITH, NEAR, ADJ) and relational operators ('less than', 'greater than', 'equal to' etc.); and

To indicate which fields are to be displayed for a retrieved records at the time of display, printing and downloading.

Web-OPACs are next generation OPACs. Web-enabled OPACs allow users to probe library catalogues and access other accommodations from any client machine at anywhere at any time. It avails libraries to surmount space and time barrier in accessing accommodations. Any machine with a standard web browser can act as a client because the mechanism does not require installation of any supplemental client side software. Some important parameters are represents in the table-1.13 on the basis of global recommendation through open source software for designing and developing the college libraries under the university of Burdwan.

Sl.	Parameter	Score of open source software against in OPAC					
		Emilda	Evergreen	Koha	NewGenLib	OPALS	WEBLIS
1	RSS	0	0	1	0	0	0
2	Navigation	0	0	1	0	0.5	1
3	Display Records	1	1	1	1	1	1
4	Federated searching	0	0	1	0.5	0	0
5	Cart or list (Private/Public)	0	0	1	0	0	0
6	Linking to authority records	0	0	1	0	0	0
7	Integration	0	0.5	1	0	0.5	0.5
8	Searching and online access	0.5	0	1	0.5	0	0.5
9	Display multilingual records	0	0.5	1	1	0	0
10	Import other library documents	0.5	0	1	0	0	0
11	Smarter searching	0	0.5	1	1	0	0
12	Information mash-up	0	0	1	0	0	0
14	Did you mean	0	1	0.5	0	0.5	0

15	Enriched content	0	0	1	0	0	0
16	Persistent links	0.5	0	1	0	0	1
17	Relevancy	0	1	1	0	1	0
18	Web interface	0	0	1	0.5	0	1
19	Most popular	0	0	1	0	0	0
20	Tag cloud	0	0	1	0	0	0
21	Browse by subject	1	0.5	1	0	0.5	0.5
22	Advanced search	0	0	1	1	0	0
23	Normal search	1	0	1	1	0	0
24	Status inquiry	0	0	1	1	0	0
25	Print provision	0.5	0	1	1	0	0
26	Personal account	1	0	1	1	0	0
Total Score (Out of 26)		6	5	25.5	9.5	4	5.5

Table – 1.13 : Parameters requirement in OPAC interfaces for CLBU

The all the parameters are important in OPAC and Web OPAC interface of the college library. The table 1.13 reveals that the Koha is the highest results as compared to other open source software in the integrated library system cluster. This research work select the Koha software because most of the parameters are to be included in the Koha software and this interface is the most attractive for the patrons as well as staff-clients interface in college libraries under the University of Burdwan.

(ii)   Management Information System

Library is the store house of recorded knowledge and its included the information of resources in different item types. Many options are available In librarian interface to the users. Management of information is possible through tools under the matured level open source softwares like Emilda, Evergreen, Koha, NewGenLib, OPALS and WEBLIS. Information found about the different aspects like books, cataloguing, circulation, patrons and fund and budget status. Global set of parameters (Table-1.14) are setting through open source software on the basis of recommendation (global and local). These types of parameters are needed in academic library specially in college libraries under the university of Burdwan because they are suffering from information management both from staff-client and OPAC interface. So, obviously it can considered that the global parameters are helps in designing the ILS and retrieval system.

Sl.	Parameter	Score of open source software against in MIS					
		Emilda	Evergreen	Koha	NewGenLib	OPALS	WEBLIS
1	Stage MARC records for imports	1	0	1	0.5	0	0

2	Manage staged MARC records	1	0	1	0	0	0
3	Export bibliographic and holdings	0	1	1	1	0	0
4	Import patrons	0	0.5	1	0	0	0
5	Task scheduler	0	0	1	0	0.5	0
6	Comments	0	0	1	0.5	1	0.5
7	Tag moderates	0	0	1	0	0	0
8	Calendar	1	0	1	0.5	0.5	0
9	Label and patron card creators	0	0.5	1	1	0	0.5
10	Inventory/ stock tacking	0	0.5	1	1	0	0
11	Log viewer	0	0	1	0	0	0.5
12	Notices and record matching rules	1	1	1	0.5	0	0
Total Score (Out of 12)		4	3.5	12	5	2	1.5

Table – 1.14 : Parameters requirement for MIS

Tha table 1.14 reveals that the Koha is the highest results as compared to other open source softwares in the domain of integrated library system cluster and these parameters are to be selected on the basis of global recommendations and local requirement for the college libraries affiliated to the University of Burdwan

1.3   Theoretical framework of community communication and interaction for CLBU

Community development is the process of helping a community to strengthen itself and develop towards its full potential. Communica- tion is a key component of sustainable development. Mobilizing community members for com- munity development purpose is important but members of communities can only be mobilized when communication is effective. This research work selected the open source software for commnication and interaction between the college people these softwares are Facebook, Wiki, Blog, Twitter and Squirrelmail for the college libraries under the university of Burdwan. Social media is the collective of online communications channels dedicated to community-based input, interaction, content-sharing and collaboration. Websites and applications dedicated to forums, microblogging, social networking, social bookmarking, social curation, and wikis are among the different types of social media and here are some prominent examples of social media like blogs, mediawiki, facebook and etc.

1.3.1   Software selection for CLBU

In community communication and interaction framework the important open source softwares are to be selected for the college libraries under the University of Burdwan.

(i)   Blogging

Blog is a discussion or informational site published on the World Wide Web **(http://www.blog.org)** and consisting of discrete entries ("posts") typically displayed in reverse chronological order and blogs were usually the work of a single individual, occasionally of a small group, and often covered a single subject.

(ii)   Facebook

Facebook is an online social networking service headquartered in Menlo Park, California. Its website was launched on February 4, 2004, by Mark Zuckerberg at Harvard University for the community communication and interaction **(http:www.facebook.com)** and this tool is the most comprehensive as compared to other because its sharing and distributing the images and files (Carlson, 2010).

(iii)   MediaWiki

MediaWiki is a gratuitous software open source wiki package indited in PHP, pristinely for use on Wikipedia. It is now additionally utilized by several other projects of the non-profit Wikimedia Substructure and by many other wikis, including this website, the home of MediaWiki. Utilize the links below to explore the site contents (http://www.mediawiki.org).

(iv)   Skype

Skype is a telecommunications application software that specializes in providing video chat and voice calls from computers, tablets and mobile devices via the Internet to other devices or telephones/smartphones. Skype is based on a freemium model (http://en.wikipedia.org/wiki/Skype). Registered users of Skype are identified by a unique Skype Name, and may be listed in the Skype directory.

(v)   Twitter

Twitter is an online convivial networking accommodation that enables users to send and read short 140-character messages called "tweets". Registered users can read and   post   tweets,   but   unregistered   users   can   only   read   them (http://en.wikipedia.org/wiki/Twitter). Users access Twitter through the website interface, SMS, or mobile device app.

(vi)   Wordpress

WordPress is a free and open-source blogging implement and a content management system (CMS) predicated on PHP and structure query language. There are many features in blogging management software like architecture of plugin and software template both admin and user interface. (Coalo, 2012). WordPress also supports the Trackback and Pingback standards for displaying links to other sites that have   themselves   linked   to   a   post   or   an   article. (http://en.wikipedia.org/wiki/WordPress)

1.3.2 Parameters selection for CLBU

Group – A : Details of demand survey of basic requirements of college libraries by library professionals from different colleges as given in chapter-6 under section 6.8.1 – A.8.

Group – B : The important parameters of this cluster for the framework of integrated library system of college libraries under the University of Burdwan which given in chapter-6 under the remarks section.

Parameters selection is one of the important in theoretical framework for college communication and interaction. In this section the table 1.15 represents the parameters requirement for college libraries under the university of Burdwan.

Sl.	Parameters	Blog	Mediawiki	Atliasian confluence	Skype	Ekiga	Squirrelmail	Wordpress
1.	Content creation	1	1	1	1	1	0	1
2.	Webpage creation	1	1	0	1	1	0	1
3.	Article published	1	1	1	1	1	0	1
4.	Faceted navigation	1	1	0		0	0	1
5.	Content repository management	1	1	0.5	0	0	0.5	1
6.	Integration with ILS	1	1	0	0	0	1	1
7.	Access and download	1	1	1	0.5	1	1	1
8.	Different file format	1	1	1	0.5	1	1	1
9.	Offline mail	0	0	0	0	0	1	0
10.	Regional langage	1	1	0	1	1	1	1
	Total score	**9**	**9**	**4.5**	**5**	**6**	**5.5**	**9**

Table - 1.15 : Parameters selection in CCI cluster for CLBU

From the table 1.15 reveals that the Blog and MediaWiki gives the highest results in the domain of community communication and interaction cluster. College library staff, teachers and users communicate by using these softwares but here require only open the server machine in the college libraries under the University of

Burdwan.

1.4   Theoretical framework of digital media archiving cluster for CLBU

Most of the college libraries are suffering in the field of digital resource management. In this context this research work explores the software, standards and metadata related parameters to solved the problem of managing the digital resources in the college libraries affiliated to the university of Burdwan. The following steps are to be followed :

1.4.1   Selection of software for CLBU

In this section the matured level softwares are to be selected for managing the digital resources and also their indexing. Browsing classifier is possible through this software. In this stage the research work select the following softwares:

(i)   CONTENTdm

CONTENTdm is open source digital resource management software and source code available.
It was originally developed by CISO, the Center for Information Systems Optimization at the University of Washington. It supports standards including Unicode, Z39.50, Qualified Dublin Core, VRA, XML, JPEG2000 and OAI-PMH. It is mostly used by universities, libraries, archives, museums, government agencies and historical societies (http://en.wikipedia.org/wiki/CONTENTdm).

(ii)   Digital Commons

Digital commons is a institutional repository software. It supports OAI-PMH version 2.0. Metadata is exposed through the OAI. Content published to Digital Commons institutional repositories is optimized the different search engines and their indexing is measured through Google, Google Scholar, and other major search engines and institutions can collect, preserve, and make visible all of their intellectual output, including pre-prints, working papers, journal articles, dissertations, master's theses, conference proceedings, presentations, data sets, images, and a wide variety of other content types (http://en.wikipedia.org/wiki/Digital_commons).

(iii)   DSpace

DSpace is a well known repository software developed by MIT and HP Labs during 2002. With the advent of modern technologies and strategies the open access is the crucial elements in different areas for the scholarly and published digital content. It support the metadata encoding standards Dublin Core in access and configuration of information of resources in a relational database management system by PostgreSQL and Oracle database. There are three interfaces in DSpace including admin, user and XMLUI and these can be managed by the tomcat server (http://www.dspace.org/).

(iv)   Eprints

EPrints is a open source software in the area of digital resource management

based on LAMP architecture and retrieval of their different formats. Actually, it is created in 2000 by Santa Fe Meeting on the theme of open archive initiative for protocol metadata harvesting. It is support both the matadata and command-line application to managed the digital resource through configuration of admin interface (http://www.eprints.org/software/).

(v)   Greenstone

Greenstone is a suite of software implements for building and distributing digital library amassments on the Internet or CD-ROM and it support multilingual. Greenstone is engendered by the Incipient Zealand Digital Library Project developed by the University of Waikato, and distributed in cooperation with UNESCO and the Human Info NGO in Belgium. Greenstone may be habituated to engender immensely colossal, searchable amassments of digital documents. In integration to command line implements for digital accumulation building, Greenstone has a graphical Greenstone Librarians Interface (GLI) used to build accumulations and assign metadata and it additionally fortifies different file formats including PDF, text, MP3, html, jpg, tiff, video, and Word, among others (http://www.greenstone.org/).

(vi)   Fedora Commons

Fedora commons is a open source digital archiving software and its stands for Flexible Extensible Digital Object Repository Architecture developed by DuraSpace. It is easily managed the institutional digital repositories because written in Java programming language. Fedora is the underlying architecture for a digital repository, and is not a complete management, indexing, discovery, and delivery application (http://fedora-commons.org/).

Group – A : Details of demand survey of basic requirements of college libraries by library professionals from different colleges as given in chapter-6 under section A.7.

Group – B : The important parameters of this cluster for the framework of integrated library system of college libraries under the University of Burdwan which given under the remarks section.

1.4.2   Selection of standards for CLBU

Digital resource management is one of the important tasks in college libraries affiliated to the University of Burdwan. In this section required the essential and most comprehensive standards on the basis of global recommendations and local requirement of college libraries both Government and Government aided colleges. There are many standards are available in digital environment but this research work only select the comprehensive parameters with respective open source softwares. As with all matters to do with computers there are standards that impinge on the area of digital libraries. Unfortunately, since these libraries are at a cross-road, there are a number of standards which might be appropriate. Of course, some of these standards are mutually contradictory or even exclusive. The standards fall into three areas: material description, user access and systems architecture. Standards requirement for DMA cluster are described in the table – 1.16. Web enabled archietecture depends on the software programming language in different areas including indexing, searching,

browsing and uploading the full text documents. Apart from this it also managed the other file formats like doc, png, jpg and etc. for the users as well as library professionals. The quality of open source software depend on their comprehensive features in different levels such as input, processing and output.

Sl.	Standards	Parameter	Digital Media Archive Open Source Software							
			Dspace		Eprints		Fedora		GSDL	
			Support	Score	Support	Score	Support	Score	Support	Score
1	HTTP	Searching Web-enabled databases	Yes	1	Partial	0.5	Yes	1	Yes	1
2	XML	searching structured request	Partial	0.5	No	0	No	0	Yes	1
3	File type related standards	JPEG	Yes	1	Yes	1	Yes	1	Yes	1
4		TIFF	Yes	1	Partial	0.5	Partial	0.5	Yes	1
5		BMP	No	0	No	0	No	0	Yes	1
6		PNG	No	0	No	0	Partial	0.5	Partial	0.5
7		PDF	Yes	1	Yes	1	Yes	1	Yes	1
8		DOC	Yes	1	No	0	Partial	0.5	Yes	1
9		PPT	No	0	No	0	Yes	1	Partial	0.5
10		AVI	Partial	0.5	No	0	No	0	Yes	1
11	ADF	Document feeder	Yes	1	Partial	0.5	Yes	1	Yes	1
12	XML Harvester	Library defined filters	Yes	1	No	0	No	0	Yes	1
13		Create MARC records	Partial	0.5	No	0	Partial	0.5	Yes	1
14		Generic data	Yes	1	Partial	0.5	Partial	0.5	Yes	1
15		Advanced level data	Yes	1	No	0	No	0	Yes	1
16		OAI leverage standards	Yes	1	Partial	0.5	No	0	Yes	1
17	Metadata builder	Dublin Core	Yes	1	No	0	No	0	Yes	1
18		TEI	Partial	0.5	No	0	Yes	1	Yes	1
19		DRA	No	0	Partial	0.5	No	0	Partial	0.5
20		Full text aggregators	Yes	1	Partial	0.5	Yes	1	Yes	1
Total Score (Out of 20)			Dspace Score: 14		Eprints Score: 5.5		Fedora Score: 9.5		GSDL Score: 17.5	

Table – 1.16: Standards requirement for DMA cluster

Concretely cognate to web-predicated search, the challenge of interoperability stems from the fact designers of web resources typically have little or no desideratum to concern themselves with exchanging information with other web resources. Federated Search technology, which does not place format requirements on the data owner, has emerged as one solution to search interoperability challenges. In addition, standards, such as OAI-PMH, RDF, and SPARQL, have emerged recently that also help address the issue of search interoperability related to web resources. Such standards also address broader topics of interoperability, such as allowing data mining.GSDL scored 17.5 out of 20 whereas DSpace scored 14 out of 20 (Table 1.16) but both of these software are not yet compliant with emerging standards like MARC-XML and METS.

1.4.3   Metadata selection for CLBU

While there are different standards available, the Dublin Core Metadata Initiative is the most widely adopted and offers users the greatest flexibility. Temporal topic may be a designated period, date, or date range. A jurisdiction may be a designated administrative entity or a geographic place to which the resource applies. Recommended best practice is to utilize a controlled lexicon such as the Thesaurus of Geographic Names. Where suitable, designated places or time periods can be utilized in predilection to numeric identifiers such as sets of coordinates or date ranges. The metadata selection standards are represents in the table-1.17.

DC.Title	The term or terms which designates the particular resource
DC.Subject	The thought content or theme of the resource.
DC.Description	The statement of items which represents the individuality of a document regarding its different aspects of genesis, publication and characteristics.
DC.Creator	An entity primarily responsible for making the resource.
DC.Source	A related resource from which the described resource is derived.
DC.Publisher	An entity responsible for making the resource available.
DC.Date	A point or period of time associated with an event in the lifecycle of the resource.
DC.Contributor	An entity responsible for making contributions to the resource.
DC.Rights	Information about rights held in and over the resource.
DC.Relation	A related resource.
DC.Format	The file format, physical medium, or dimensions of the resource.
DC.Language	A language of the resource.
DC.Type	The nature or genre of the resource.
DC.Identifier	An unambiguous reference to the resource within a given context.
DC.Coverage	The spatial or temporal topic of the resource, the spatial applicability of the resource, or the jurisdiction under which the resource is relevant.

Table – 1.17: 15 Unqualified Dublin Core metadata elements and their description

1.5   Theoretical framework of content management system for CLBU

Content management system consists of many parameters, softwares, workflow and standards in the creation and managing the resources. Actually, each colleges required one standard websites to published their updated information. This is possible through open source content management software for the college libraries of the university of Burdwan. In this context the following theoretical framework are discussed as follows:

1.5.1 Workflow of content management system for CLBU

Content management system is a bundled or stand-alone application to create, deploy, manage and store content on Web pages (Fraser, 2002). Web content includes text and embedded graphics, photos, video, audio, and code (e.g., for applications) that displays content or interacts with the user. Content Management has many roles in today's market place and is an important base for any website blogging, articles, news, description of products etc. Such systems of content management provide procedures to manage workflow in a collaborative environment. Web Content Management System's usually allow client control over HyperText Markup Language - based content, files, documents, and Web hosting plans based on the system depth and the niche it serves. The workflow diagram of content management system (See Figure – 1.4) clearly represents the users both for general as well as advanced users and managed the Web documents. In a nutshell, the Content Management System (CMS) is a sophisticated tool for building websites and managing web content (Christianson; Cochran; Spohn & Ivan, 2009). It provides a set of integrated tools to help technical and non-technical web publishers in the University to manage, create and maintain websites and/or intranets and simply choose a pre-packaged theme for website, or create a theme that's completely customized to your own look and needs (Brampton, 2008). However, Editors cannot publish to the live site. They submit their changes to the Reviewer who either approves them for publication or rejects them and sends them for correction.
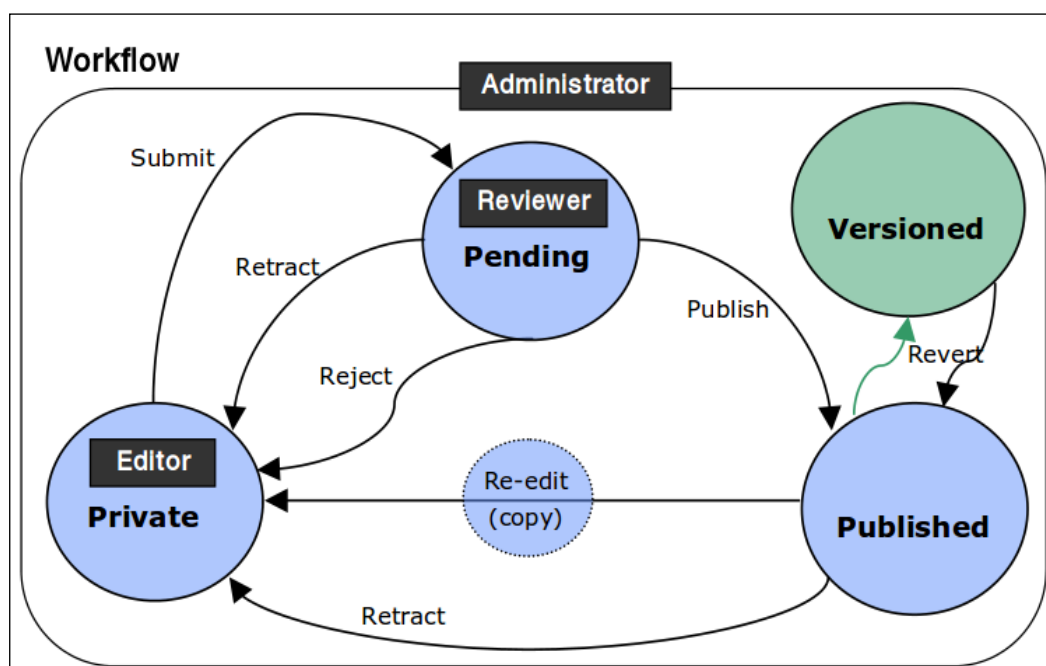

Figure – 1.4: Workflow of Content Management System

The following 16 item types (Table – 1.18) are to be required in content management system cluster for college libraries affiliated to the university of Burdwan.

Text	:	It consist of different types of documents including books, letters, dissertations, poems, newspapers, articles, archives of mailing lists.
Moving Image	:	A series of visual representations imparting an impression of motion when shown in succession. Examples include animations, movies, television programs, videos, visual output from a simulation.
Oral History	:	A resource containing historical information obtained in interviews with persons having firsthand knowledge.
Sound	:	A resource primarily intended to be heard. Examples include a music playback file format, an audio compact disc, and recorded speech or sounds.
Still Image	:	It managed the different images including paintings, drawings, graphic designs, plans and maps. Recommended best practice is to assign the type Text to images of textual materials.
Website	:	A resource comprising of a web page or web pages and all related assets (such as images, sound and video files, etc.).
Event	:	A non-persistent, time-based occurrence. Metadata for an event provides descriptive information that is the basis for discovery of the purpose, location, duration, and responsible agents associated with an event. Examples include an exhibition, webcast, conference, workshop, open day, performance, battle, trial, wedding, tea party, conflagration.
Email	:	A resource containing textual messages and binary annexations sent electronically from one person to another or one person to many people.
Lesson Plan	:	A resource that gives a detailed description of a course of instruction.
Hyperlink	:	A link, or reference, to another resource on the Internet.
Person	:	An individual.
Interactive Resource	:	A resource requiring interaction from the utilizer to be understood, executed, or experienced and its including forms of Web pages, applets, multimedia learning objects, chat accommodations, or virtual authenticity environments.
Dataset	:	Data encoded in a defined structure including lists, tables, and databases. A dataset may be useful for direct machine processing.
Physical Object	:	An inanimate, three-dimensional object or substance and that digital representations of, or surrogates for, these objects should utilize Moving Image, Still Image, Text or one of the other types.
Service	:	A system that provides one or more functions including a photocopying service, a banking service, an authentication service, interlibrary loans, a Z39.50 or Web server.
Software	:	A computer program in source or compiled form including a source file, MS-Windows .exe executable, or Perl script.

Table – 1.18: Default 16 item types in CMS

1.5.2   Software selection in CMS cluster for CLBU

Software selection is to be required in the field of content management system cluster for the college libraries under the University of Burdwan. This software helps the colleges to create and managed their college websites in different aspects including college admission, news, events, conference and etc. The following content management system softwares is to be selected for the college libraries affiliated to the university of Burdwan.

(i) Concrete5

Concrete5 is also as designated an open source content management system (CMS) for publishing content on the World Wide Web and intranets. It provides version management for every page, homogeneous to wiki software, another type of web site development software. concrete5 sanctions users to edit images through an embedded editor on the page. Concrete5 code is predicated on Model-View-Controller architecture and object-oriented programming (http://www.concrete5.org/).

(ii) Drupal

Drupal is well known content management system software and its written in PHP. The standard relinquishment of Drupal, kenned as Drupal core, contains rudimentary features prevalent to content management systems. These include utilizer account registration and maintenance, menu management, RSS aliments, taxonomy, page layout customization, and system administration (https://www.drupal.org/).

(iii) Frog CMS

Frog CMS is also content management system software for managing the web resources and also offering an elegant utilizer interface, flexible templating per page, simple utilizer management and sanctions, as well as the implements indispensable for file management. This approach has two main advantages: Mundanely, PHP is not utilized in article pages (http://www.madebyfrog.com/about.html).

(iv) Joomla

Joomla is a well known content management system software for college libraries and it written in PHP programming language for publishing web content. It is built on a model–view–controller web application framework that can be used independently of the CMS. Indited in php and database support MySQL. Engender and published the content in Joomla admin interface (http://www.joomla.org/).

(v) MODx

MODX is a free web enabled open source content management system software for publishing content on the world wide web and intranets because its written in PHP programming language. It also support the MySQL database structure for connectivity and database backup (http://modx.com/).

(vi) SilverStripe

SilverStripe is a content management system software and written in PHP programming language support both the operating system such as Windows as well as Linux. It provides an out of the box web-predicated administration panel that enables users to make modifications to components of the website, which includes a WYSIWYG website editor (http://silverstripe.org/).

1.5.3 Parameters selection in CMS cluster for CLBU

Group – A : Details of demand survey of basic requirements of college libraries by library professionals from different colleges as given in chapter-6 under section 6.8.1 – A.8.

Group – B : The important parameters of this cluster for the framework of integrated library system of college libraries under the University of Burdwan which given in chapter-6 under the remarks section.

Content management system cluster create and published the college Websites. In this context this research work select the content management software in the Table – 1.19 for the college libraries affiliated to the university of Burdwan.

| Sl. | Level | Parameter | Open Source Content Management Software | | | | | | | |
| | | | Drupal | | Joomla | | SilverStripe | | Wordpress | |
			Support	Score	Support	Score	Support	Score	Support	Score
1	Built-in	Dashboard	Yes	1	Yes	1	No	0	No	0
2		Image Editing	Yes	1	Yes	1	Partial	0.5	Yes	1
3		Multi Language	Yes	1	Yes	1	No	0	No	0
4		Contact Form	Yes	1	Yes	1	Yes	1	Yes	1
5		Search	Yes	1	Yes	1	Yes	1	Yes	1
6		Blogging	Yes	1	Yes	1	Partial	0.5	Yes	1
7		Open Source Coding	Yes	1	Yes	1	No	0	Partial	0.5
8		WYSIWYG Editor	Yes	1	Yes	1	No	0	No	0
9	Add-on	Free Add-ons	Yes	1	Yes	1	Partial	0.5	Yes	1
10		Social Media	Yes	1	Yes	1	No	0	Partial	0.5
11		Administration	Yes	1	Yes	1	Partial	0.5	Partial	0.5
12		Multimedia	Yes	1	Yes	1	No	0	No	0
13		Site Management	Yes	1	Yes	1	Partial	0.5	Yes	1
14		Navigation	Yes	1	Yes	1	No	0	No	0
15		Themes	Yes	1	Yes	1	No	0	Partial	0.5
16	Manage	Image Manager	Yes	1	Yes	1	Partial	0.5	Partial	0.5
17		Content	Yes	1	Partial	0.5	No	0	No	0

			Drupal		Joomla		SilverStripe		Wordpress	
	ment	Manager								
18		Add-on Manager	Yes	1	Yes	1	No	0	No	0
19		User Manager	Yes	1	Yes	1	Partial	0.5	Yes	1
20	**Security**	Login History	Yes	1	Partial	0.5	Yes	1	Partial	0.5
21		Content Approval	Yes	1	Yes	1	No	0	No	0
22		Sandbox Testing	Partial	0.5	N0	0	Partial	0.5	No	0
Total Score (Out of 22)			**Drupal Score: 21.5**		**Joomla Score: 20**		**SilverStripe Score: 7**		**Wordpress Score: 10**	

Table – 1.19 : Content management parameters in different levels

The table 3.19 reveals that the highest results gives the Drupal in the domain of content management system cluster. Apart from this Joomla and Wordpress are also select and configure in this domain. Website creation and maintenance are to be well performed by using these software for the college libraries affiliated to the University of Burdwan. But this research work is select the Joomla because its very user friendly and easy to configure in different modules with the contents. Now, in modern college libraries required to prepared and published the websites for information retrieval and dissemination to the users as well as advanced users for the college libraries.

1.6   Theoretical framework of learning content management system for CLBU

The authenticity is that each application has very concrete strengths and facilities that may complement each other; but one often is the best fit. Organizations need to designate their business requisites and then meticulously consider the functionality of each of the enterprise applications afore making the investment. In general, the average organization can meet its eLearning management requisites with an LMS which will withal provide robust classroom and learner management functionality. An organization fascinated with peregrinating to a cognition object approach or one withal intrigued with capturing astute capital through erudition management should consider an LCMS which will provide the required content management and storag capabilities. Recollect that the goal of an LMS is to avail administer learning-cognate activities and is fixated on the course.

"For contribution-based reusability to grow in an institution, specific technical tools and user interface functionalities are critical" (Collis & Strijker, 2002).

Learning content management systems (LCMS) sanction online content to be stored, managed, and reused through integrated database functionality. The LCMS is a "complex piece of software that labels learning objects metadata then organizes and delivers them in infinite combinations" (Jones, 2001, p. 21). The core components of a LCMS are 1) an authoring implement opportune for non-programmers; 2) a

dynamic distribution interface that distributes content; 3) The components of administrative resources can easily managed the different aspects like learner records, launches courses, and tracks progress; 4) a cognition object repository that is a central database that houses and manages content (Donello, 2002, p. 1).

1.6.1 Components of Learning Content Management System for CLBU

LCMS captures information in a variety of pristine formats and packages it in a way that facilitates modularizing, elaborating upon, sharing, re-utilizing, managing and presenting it in the context of training courses, an online reference library, online job avails, presentations and other forms of business communications (Williams, 2002, para 4). The following figure represents the elements that comprise a typical LCMS. The content is engendered and stored in a repository that is accessed by the cognition management system and distributed to the users. The individual learner data is withal managed by the system and is accessible to the individual utilizer. So one commences to comprehend the different content integration, managing the content for distribution, and managing learner data. The essential components of learning content management system represents in the figure 1.5.
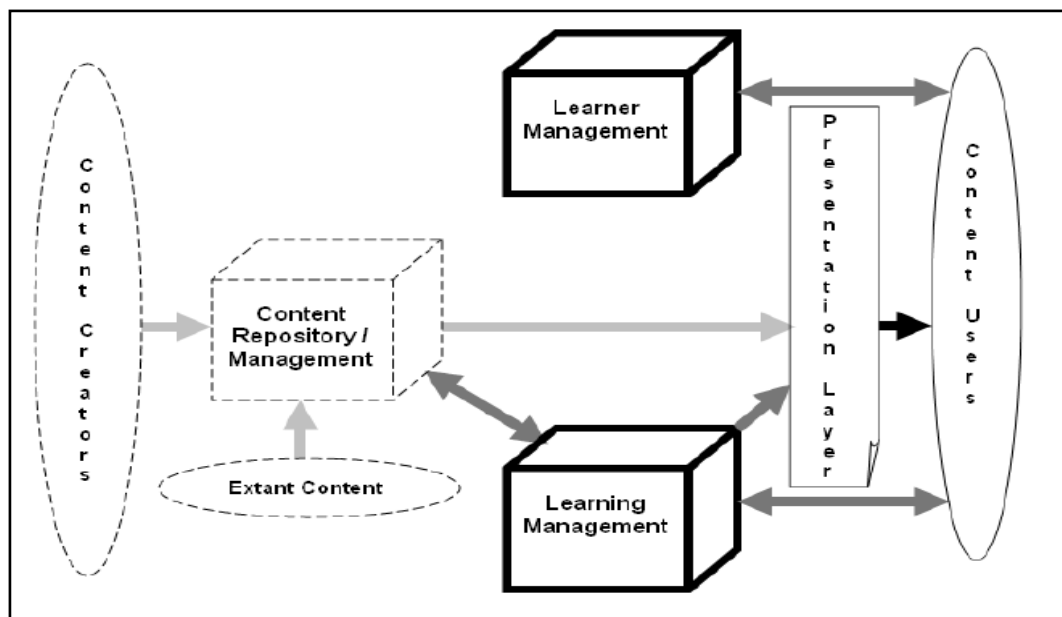

Figure – 1.5: Components of LCMS for CLBU

Precision and recall is also an important concept in content management system for information storage and retrieval to the users in virtual classroom both the inside and outside. It also applicable in virtual learning environment .

In a corporate setting, a LCMS "supports the engenderment, management, distribution, publishing and revelation of corporate information" (Robertson, June 2003, p. 1). The LCMS can streamline the authoring process, provide consistency, support decentralized authoring, and reduce duplication of information, which is homogeneous to a LCMS. The difference is that the LCMS manages learning through a robust set of implements while the CMS manages discrete pieces of information.

1.6.2 Software selection in LCMS cluster for CLBU

LMS can manage communities of users, sanctioning each of them to launch the opportune objects stored and managed by the LCMS and the essential softwares culled predicated on learning content management system for college libraries under the university of Burdwan. These software are as follows:

(i)   Atutor
ATutor is learning content management open source software in web-enabled architecture developed by inclusive design research centre, OCAD University. ATutor is used in various contexts, including online course management, continuing professional development for teachers, career development, and academic research (http://www.atutor.ca/).

(ii)   Canvas
Canvas is a learning management system that helps busy teachers and administrators save hours in their classes and institutions. It helps create amazing course content with a rich content editor, speed up grading, track learning outcomes, and can send notifications via email, facebook and text notifications. CMS Canvas provides a clean and powerful interface to manage any type of site. (http://cmscanvas.com/).

(iii)   eFront
eFront is a robust learning platform, bundled with key enterprise functionality ranging from branch management to tailor-made reports. Organize lessons using hierarchical categories. Bundle several lessons into a course and treat it as one entity. Share lessons among different courses. (http://www.efrontlearning.net/tour).

(iv)   Moodle
Moodle is a highly flexible, free software, open source learning platform and developed by Martin Dougiamas. Moodle can be used to create a private website for dynamic online courses. Moodle (acronym for modular object-oriented dynamic learning environment), (stylized in lower-case as moodle) is a also known as a learning management system, or virtual learning environment. (https://moodle.org/).

3.6.3   Parameters selection in LCMS cluster for CLBU

Group – A : Details of demand survey of basic requirements of college libraries by library professionals from different colleges.

Group – B : The important parameters of this cluster for the framework of integrated library system of college libraries under the University of Burdwan which given in chapter-6 under the remarks section.

There are lot of parameters available in learning content management environment. This research work select and made comparative study of relevant parameters in the table-1.20 and the following parameters are to be required in LCMS cluster for the college libraries affiliated to the university of Burdwan.

Sl.	Parameters	ATutor	Canvas	eFront	Moodle
1.	Course management	1	0.5	0	1
2.	Questions and answer system	1	0.5	0	1
3.	Templates	1	0	0.5	1
4.	Plug in	0.5	0	1	1
5.	Admin and user interfaces	1	1	1	1
6.	Searchable Library of Reusable Content	1	0	0	1
7.	Course catalogue	0.5	1	0	1
8.	Registration system	1	0.5	0.5	1
9.	Locate and Deliver Specific Content to a Learner	0.5	0	0	1
10.	Integration with Human Resources Applications	0.5	0	0	1
	Total score	**8**	**3.5**	**3**	**10**

Table – 1.20: Learning content management system softwares for CLBU

The Table 1.20 reveals that the highest results gives Moodle software in the domain of learning content management system. Appart from this Atutor gives results second is 8 in this domain. So, this research work selected the two learning content management system software for the college libraries affiliated to the University of Burdwan. Now, here all the parameters are to be selected on the basis of global recommendations and local requirement in the college library.

1.7   Theoretical framework of federated search system for CLBU

This section highlighting the Federated Search System Cluster and it belongs to domain specific cluster (Figure – 1.6). How to develop the federated search system in the college library affiliated under the university of Burdwan. Mainly it can help the searching facilities both for staff-client and OPAC interface through new innovative parameter like FSS tools, search indexing tools, discovery tools and twelve check list in library OPAC on the basis of global recommendation for developing the federated search system. Also develop the federated search provider including Google scholar, Scopus and Liberty within the library OPAC search and it also facilitate the searching from WorldCat local. This research work develop the easy searching and retrieved the document for the users and researchers and it also develop the import the bibliographic and authority records from the other library OPAC. The four federated search system tools are CUFTS, Dbwiz, GODOT and Open KB for the college libraries under the university of Burdwan and in OAI-PMH harvesting level this research work also selected the open source softwares like OHS, OCS, OMP and OJS for the users. Now, in modern age the most of College libraries are facing the problem of federated searching due to rapid growth of online resources.
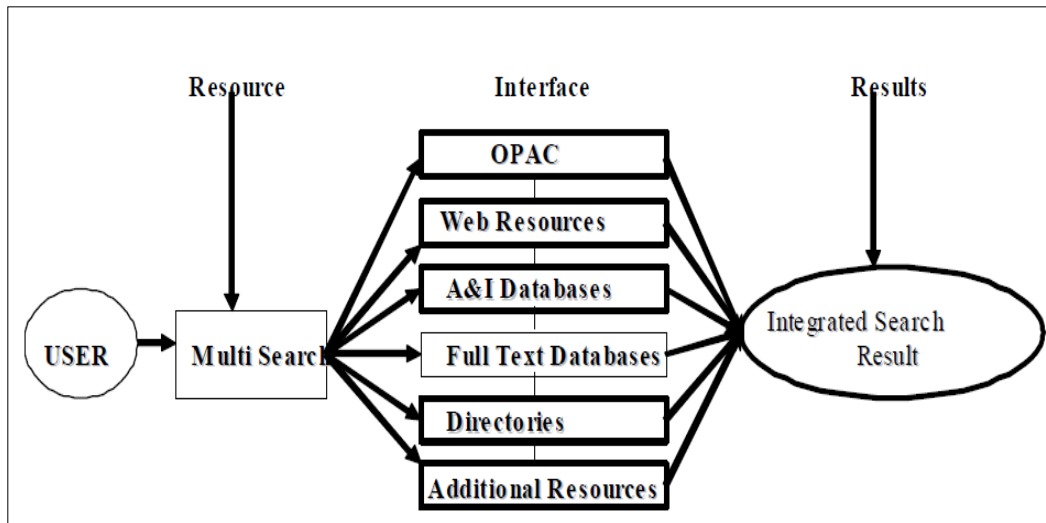
Figure -1.6: Diagrammatic presentation of FSS for CLBU

1.7.1   Software selection in FSS cluster for CLBU

The following softwares are to be select in this research work for the college libraries affiliated to the university of Burdwan.

Group – A : Discovery tools for CLBU

(i)   DbWiz

DbWiz is the federated search system related discovery tools originally developed by the Council of Prairie and Pacific University Library (COPPUL) consortium to help students determine the best starting point for their research. Many educational institutions are to be usde this tool for the better management and organizing the online resources due to prolifereation and increasing the web resources in discovery services. It also helpful to the college users as well as researchers in different subject areas (http://researcher.sfu.ca/about).

(ii)   CUFTS

CUFTS provides Electronic Resource Management accommodations, an integrated journal A-Z database, link resolving, and MARC records for the college library and it additionally provides some potent publicly-accessible accommodations utilized by libraries around the world including resource comparison and journal search (http://researcher.sfu.ca/cufts).

(iii)   GODOT

Launched from a link embedded in college library's citation databases or other resources, GODOT provides direct links to your fulltext amassments, utilizing the CUFTS cognizance base, and withal reveals holdings in library catalogue or in other locations. GODOT withal works proximately with Interlibrary Loan systems and Integrated Library Systems for the better management of web resources like books,

journals, monographs and etc (http://researcher.sfu.ca/godot).

(iv)   VuFind

VuFind is a discovery tools in integrated library management and retrieval system. Data integration is possible by using this software. Support the different format including MARC, Dublin core, UNIMARC and etc. Multilingual document can be managed through Unicode for the users as well as library professionals (http://www.vufind.org).

Group – B: OAI/PMH based federated search system tools for CLBU

(i)   ODL

This is one of the OAI-PMH based open source software written in perl programming language.
Searching, arranging and downloads the data which available in repositories but its very difficult to download the data with no error message.

(ii)   UIUC Java Harvester

It is java related harvesting software and here requires JDBC connectivity. This is based on the client server architecture to editing the server and its configuration. There are many servers configured in successfully because its support more than one server.

(iii)   UIUC VB Harvester

This is also an open source harvester software written in visual basic program. Access and maintain the database from one place place to another with MSXML format.

(iii)   OHS

Open harvester system is a OAI-PMH based software developed by the Public Knowledge Project and written in PHP programming language. Harvest the metadata from the institutional repositories (e.g OpenDOAR) and here find all the information related on title, URL and OAI based URL for accessing the web resources to expand and improve the researcher. It support the different metadata standards like Dublin Core, MODS, MARCXML and Dublin core extension. User interface is flexible that easily managed and maintained the searching both simple as well as advanced searching and crosswalked fields (https://pkp.sfu.ca/ohs/).

Group – C: Client server archietecture related tools for CLBU

In this tools used in integrated library system for import the data from the other library. The research work select some popular software for managing the federated search system in the college libraries affiliated to the university of Burdwan. The softwares in FSS cluster including HTTP, Z39.50, ZING-SRW and XML

Gateway.

1.7.2   Parameters selection in FSS cluster for CLBU

Group – A : Details of demand survey of basic requirements of college libraries by library professionals from different colleges as given in chapter-6 under section 6.8.1 – A.6 (Because the objectives of federated search system is to explore the integration of VuFind with Koha and harvesting the records from the other institutional repositories by open harvester system)

Group – B : The important parameters of this cluster for the framework of integrated library system of college libraries under the University of Burdwan which given in chapter-6 under the remarks section.

There are many parameters available in federated search system cluster. This research work select the parameters in three levels such as discovery related tools, OAI/PMH harvesting related tools and client server archietecture related tools for the college libraries affiliated to the university of Burdwan.

Results of Group – A: Discovery related tools for CLBU

VuFind gives highest results (Table – 1.21) in discovery tools as compared to other. So, obviously it can says that the this discovery tools is the more comprehensive rather than other.

Sl.	Parameters	CUFTS	Dbwiz	GODOT	VuFind
1.	Bibliographic records	0	1	0	1
2.	Authority records	0	1	0	1
3.	Citation management	0	0	0	1
4.	Tagging	1	1	0	1
5.	Folkshonomy	1	1	0	1
6.	Web 2.0	1	1	1	1
7.	Image sharing	1	1	1	0
8.	Harvest records	1	1	1	0
9.	Social networking	0	0	1	0.5
10.	SMS service	0	0	0	1
	Total score	**5**	**7**	**4**	**7.5**

Table – 1.21: Comparison of federated search system tools for CLBU

The Table 1.21 reveals that the highest score gives VuFind discovery tools i.e 7.5 out of 10 as compared to other discovery tools in the federated search system cluster. All the parameters are to be selected on the basis of global recommendations and local requirement in the college library. So, obviously, it can says that the VuFind is the most comprehensive open source discovery tools in developing the federated

search system for the college libraries under the University of Burdwan.

Results of Group – B: OAI/PMH based federated search system for CLBU

OHS gives highest results (table-1.22) in the federated search system cluster as compared to other. This research work select the OHS based software for the college libraries to managed their OAI/PMH compliant resources.

Sl.	Parameters	ODL	OHS	UIUC VB Harvester	UIUC Java Harvester
1.	Data providers and service providers	0.5	1	1	0.5
2.	Harvest records	0.5	1	0.5	0
3.	Open data	1	1	0.5	1
4.	Data link	1	1	1	1
5.	Download all file formats	1	1	1	1
6.	Manage open access resources	1	1	1	0
7.	Citation and bibliographic management	1	1	1	1
8.	Searching and browsing facilities	1	1	1	1
9.	Retrieved multilingual documents	1	1	1	0
10.	Download plugin	0.5	1	0	0
	Total score	**8.5**	**10**	**8**	**5.5**

Table – 1.22: PKP harvester tools in FSS cluster for CLBU

Table 1.22 reveals that the OHS gives the highest results in the domain of federated search system cluster. The OHS score is 10 out 10 where as the lowest score UIUC i.e 5.5 and here all the parameters are to be selected on the basis of global recommendations and local requirement in the college library. So, obviously, it can conclude that the open harvester system is more comprehensive in developing the federated search system for the college libraries affiliated to the University of Burdwan.

Results of Group – C: Client server archietecture related tools for CLBU

Z39.50 server gives the highest results in the clinet server archietecture related tools. In this context this research work only select the Z39.50 server as compared to other (Table – 1.23) for the federated search system in the college libraries under the university of Burdwan.

Sl.	Parameters	HTTP	Z39.50	ZING - SRW	XML gateway
1.	Data import	0.5	1	1	0

2.	MARC 21 format	0.5	1	1	1
3.	Metadata format	1	1	1	1
4.	URI	1	1	1	1
5.	OpenURL	1	1	0.5	1
6.	Search results	1	1	0.5	1
7.	ISBN searching	0	1	1	1
8.	Multilingual	0	1	0.5	0
9.	Thesaurus construction	0	1	0.5	1
10.	Subject headings list	0	1	1	0
Total score		**5**	**10**	**8**	**7**

Table – 1.23: Client server supporting tools for CLBU

Development of a client server architecture is also the important in the domain of federated search system. The table 1.23 reveals that Z39.50 server gives the highest results as compared to other softwares in this field. It can helps the data import from the other library OPAC e.g Library of Congress. This research work select the Z39.50 server in the Koha software for the data import from the other library OPAC and Z39.50 server details found in the Website (http//irspy.indexdata.com/).

Other document management software :

(i)   OCS

Open Conference Systems (OCS) is an open source harvesting related software written in PHP and web-enabled architecture. It manages the important elements for the web publication like full paper, abstract, citation styles, author name and etc. Apart from this it also managed the results of submission paper in conference, online discussions, paper editing, awaiting assignment and its helpful to the users as well as researchers in college libraries affiliated to the University of Burdwan. (https://pkp.sfu.ca/ocs/).

(ii)   OJS

OJS stands for open journal system developed by Public Knowledge Project and written in PHP programming language. The main tasks of this software is to journal management and publishing the article in a specific journal. It uses the many users like researchers, scholars, teachers and etc. The process of submission and awaiting assignment is very easy to online publication, searching and indexing (https://pkp.sfu.ca/ojs/).

(iv)   OMP

Open Monograph Press is an open source software for managing and editing the editorial workflow required to optically discern monographs, edited volumes and,

scholarly editions through internal and external review, editing, cataloguing, engenderment, and publication (https://pkp.sfu.ca/omp/).

1.8   Conclusion

The software framework is an essential in domain specific clusters. This chapter design the cluster framework of college libraries with suitable parameters and open source software for the target libraries. This is the final theoretical framework (Table-1.24) for college libraries under the university of Burdwan in different domain specific clusters. This research work is successfully design the theoretical framework in different aspects including library management system both the housekeeping operations and information retrieval system. Content management is also possible by using the open source software and this can be developed for the college students and teachers also. Design the structure sets of questions of different subjects through learning content management system. Data export and import is executed by using the open source software from one system to another. Most of the parameters are highly acceptable in college libraries for easy installation and configuration on Ubuntu operating system. Federated search system is also possible in three different sectors like OAI-PMH, discovery tools and client server archietecture. In this section also select the parameters and suitable softwares including VuFind discovery tool, open harvester system and Z 39.50 server for college libraries under the University of Burdwan.

Six domain specific cluster in a single window interface				
Sl.	Domain specific cluster	Software name		
1.	Integrated Library System Cluster	1.	Koha	
2.	Digital media archiving cluster	1.	DSpace	
		2.	Eprints	
		3.	Greenstone	
3.	Federated Search System Cluster	1.	VuFind	
		2.	OHS	
4.	College Communication and Interaction Cluster	1.	MediaWiki	
		2.	Blog	
5.	Content management system cluster	1.	Drupal	
		2.	Joomla	
6.	Learning content management system cluster	1.	ATutor	
		2.	Moodle	

Table – 1.24 : Final theoretical framework for CLBU

These six domain specific cluster is developed in a single Window based interfaces. Users and library staff can access their resources both full text and bibliographic information. Apart from this they also access their college website and maintain it proper way by using the content management system software. Questions and quiz can be maintained through the learning content management system software in the college library. Federated search system is also possible through the discovery tools.

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Appendix – I

Environment and developments

Environment requirements for ILS, DMA and other open source software are represents in the table.

Le ve	Software	Environment	Requirement	Language
Matured	Koha	OS independent both linux, unix and windows	Apache, MySQL	Perl
	Evergreen	Linux	PostgreSQL	C, Perl, Python
	OPALS	Red Hat, CentOS	Apache, MySQL, Zebra	Perl
	Emilda	Windows and linux	a Web server, SQL database server, Zebra	PHP
	NewGenLi	Both windows and linux	PostgreSQL, JBoss	JAVA

	b		Application Server	
	WEBLIS	Windows	WWW-ISIS engine	C, C++

Matured and DLMS	Dspace	UNIX-type OS	PostgreSQL, Oracle, JSP, Java Servlet API, Apache Cocoon.	JAVA
	Greenstone	OS independent	JRE, Lucene, MGPP,	C++, Perl
	Eprints	UNIX-type OS, Windows XP, Vista, OS-X	Linux, Apache, MySQL, Perl, Solaris.	Perl and PHP

Middle Level	OpenBiblio	Windows, Linux	Apache, MySQL	PHP
	PhpMyLibrary	Windows and linux	MySQL	PHP
	PMB	OS independent	HTTP server, MySQL	PHP
	FireFly	Windows	Apache	Python, Perl,
	Avanti	Linux	Apache Jserv servlet engine	JAVA
	MyLibrary	Windows	MySQL	PHP
	Mylibrarian	Windows	Microsoft SQL 2000 server.	Microsoft Visual BASIC 6.0
	Glibms	Windows	PostgreSQL	PHP
	PhpMyadmin	Windows/Unix	PostgreSQL	PHP

Infancy level software	iVia	Linux	Apache, MySQL	C++, JAVA
	Invenio	Unix-like OS	Apache, MySQL	Python
	BiblioteQ	OS independent	PostgreSQL	C++
	MicroLCS	UNIX, Windows	a Web server	JAVA
	Refbase	Windows	MySQL backend	PHP

Environment and development of ILS Software