Data migration, RFID integration and implementation of Koha: a case study of NIT Rourkela

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The present case study discusses the implementation of Koha library management software at Biju Patnaik Central Library (BPCL) of the National Institute of Technology Rourkela. The paper describes the process of data migration from proprietary integrated library management software (ILMS) Libsys, implementation of Koha ILMS, integration of RFID devices, impact on existing library user services, and housekeeping operations. The study explores the issues with proprietary products such as vendor locking while migrating the data. The paper could be useful to libraries migrating from existing ILMS to open source solution Koha.

Keywords: MarcEdit; Koha; Debian; Library automation; Open Source Software; RFID

Introduction

Koha is the worldwide popular open-source ILMS, and Libsys is a popular proprietary ILMS mainly used in Indian libraries. Koha was first developed in 1999 by Katipo Communications. In January 2000, the first ever installation of Koha was done at the Horowhenua Library Trust in New Zealand. Ever since, Koha has become popular all of the world for library automation.

Koha is a Linux-based ILMS and compatible with MariaDB and MySQL database written in Perl, JavaScript, and HTML[1]. Many companies and developers worldwide, including library professionals, support the development of Koha. Koha community releases new major versions biannually under General Public Licence (GPL) Version 3 or later with monthly bug fixes.

Founded in 1984, LibSys is a Gurgaon-based software company that has developed and deploys ILMS, RFID, e-commerce platform software, etc. In 1995, British Council adopted LibSys for its libraries in India and South Asia[2]. LibSys is the most popular proprietary ILMS in India[3].

Data migration is the process of moving data from one location to another, one format to another, or one application to another. Data migration includes data profiling, data cleansing, data validation, and the ongoing data quality assurance process in the target system. There are three types of data migration.

Storage migration moves data to a modern system from outdated arrays to enhance performance, security, cost-effectiveness, etc. Cloud migration transfers data, application, or other business elements from either an on-premises data centre to a cloud or from one cloud to another. Application migration is moving an application program from one environment to another like one ILMS to another. It may carry an entire application system from an on premise IT centre to the cloud or between clouds[4].

There is no comprehensive manual for data migration from LibSys to Koha. Migrating bibliographic data is tricky, sometimes due to vendor locking and other software limitations. This case study attempts to explain migrating data from ILMS Libsys to Koha and to integrate RFID devices. The case study is about the BPCL using Libsys commercial software and its switching to Koha and integrating current RFID devices due to many limitations in the LibSys.

Review of literature

Data migration from legacy software is not an easy task due to vendor locking and data being in nonstandard forms[5]. While merging two unique catalogue records at Rutgers Law School, it was seen

that system migration resulted in some data being lost or incorrectly transferred. It was expected to minimize the data lose while fixing errors during migration[6]. Libraries employ expensive third-party contractors for data migration or rely heavily on institutional IT department[7].

Data migration can be done quickly if any support group is appropriately involved with the library staff. Still, it also has several critical issues and their available solutions which can be explored. It is emphasized that proper library staff training and experienced ILMS users' involvement may result in better and quick migration to Koha[8]. Methods and outcomes of the New York University Health Sciences Libraries' (NYUHSL) migration from their previous Integrated Library System (ILS), Innovative Interfaces, Inc.'s Millennium to the open-source ILS Koha has been explained. The paper identified several development areas for Koha, including electronic resource management, course reserves, and cataloguing client enhancements. It proves that migration from Millennium to Koha can be done very quickly if the library is adequately motivated[9].

In India, many libraries have migrated the data from free/open/proprietary software to Koha or other library solutions like TINMAN/TINLIB[10] to newly acquired CDS/ISIS. Many big libraries like IIM Ahmedabad, University of Mysore[3], Central University of Assam[11], IIT Bhubneswar[12], etc. have migrated their data from proprietary software to Koha.

Some studies explain the application of the XML[13] technologies for the conversion of bibliographic records. Koha's relevance in a case study of the Greater Western Area Health Service (GWAHS) library network explored the possibilities of Koha adoption in Australian special libraries[14]. It is also reported that library professionals should have necessary computer skills, if not high-level programming skills like C+, Java, etc.[15]. Paid and unpaid options for technical support for OSS ILS exist, and librarians are using them extensively[16].

Studies have been done in the Indian context to adopt Koha and compare various popular and open source solutions[17]. Some have also studied data migration from Libsys to Koha[18], but technical details have not been emphasized. One study explained how a beginner could start from scratch and learn the simple to complex data migration from Troodon ILMS to Koha. The paper also emphasizes learning some coding to customize Koha's OPAC page at IIT

Roorkee, Saharanpur Campus, with data migration from Troodon to Koha[19]. One of the blogs briefly mentioned the data migration from SOUL to Koha and provided screenshots and maps the data[20].

The selection process and criteria for the implementation of Koha (ILMS) in Royal London Homoeopathic Hospital is explained[21]. Another study shared the experience of data migration from LibSys to e-Granthalaya[22]. Apart from the above, many studies have been carried out, but most lack technical details of the migration.

There are very few reports of the detailed methodology of data migration from legacy software to Koha. Notably, in those that exist, the authors have not shared the post data migration issues, including device integration experiences like RFID. This paper attempts to share a more detailed account based on the implementation carried out.

Objectives of the study
- To explain the application of RFID devices in libraries and share the integration difficulties during migration;
- To present a model/methodology and data migration tools and techniques from the librarians' perspective;
- To identify the driving forces that encourage libraries to migrate from proprietary to open source ILMS and examine the experiences and difficulties faced during migration from proprietary to open source.
- To identify the level of satisfaction, issues, limitation etc. of data migration and investigate the quality of data and the state of library automation in India.

Methods
Reporting module of LibSys was used for retrieving the raw data in text format. Several difficulties were faced while extracting the data from LibSys due to limited bug reporting features and unstandardized format used. Several MS Excel functions like Ctrl+F and Ctrl+H with logics were applied to retrieve the desired data in MS Excel format and conversion into MARC21. Several Microsoft Excel formulas/functions were used to combine/refine the scattered raw data in various columns. MarcEdit software was used for the conversion of raw data refined with MS Excel. The available online documents were referred, and online community support helped during the entire process

of migration. Some of the main tools used are Notepad, MS Excel, and MarcEdit software.

Developed by Terry Reese, MarcEdit was conceived in the summer of 1999. MarcEdit is one of the best complete metadata edit suites available to librarians for various purposes. The literature review, online mailing forums and professional discussions revealed that many higher educational institutes like IIM Ahmedabad, IIT Bhubaneswar, University of Mysore, etc. migrated from proprietary ILMS to Koha.

Several studies have been carried out on data migration, but there is a lack of documents that reveal the entire data migration process by library professionals themselves. Hence, the current study is an example of a library professional's practical experience while migrating the propriety ILMS data to OSS Koha. The difficulties and technical solutions in recent research may motivate the other library professionals to switch to Koha ILMS. The various type of problems encountered and their answers during migration have been explained for consultations.

About Biju Patnaik Central Library, NIT Rourkela

Biju Patnaik Central Library (BPCL) of NIT Rourkela is functioning since 1965. It acts as the institute's main learning resource centre, which constitutes robust print and electronic resources. It presently holds over 85000 books, 90 print journals, and a 30 database, which provide access to over seven thousand serials titles, including archive collections and 18,000 bound volumes. The library is fully automated with Koha ILMS and modernized with an RFID system. BPCL also manages institutional repositories through ePrints and DSpace OSS. There are various open-source software used in the library such as Koha, Dspace, Eprint, Joomla, etc.[23]

Need for new ILMS at BPCL

The LibSys[24] software was implemented around 2006 along with RFID devices. The library housekeeping operations were not fully functional due to limitations in the LibSys software. Issues related to vendor support and considerable up-gradation cost required BPCL to switch from LibSys. Some of the major problems with existing ILMS which compel to migrate in Koha is discussed below:

Problems with LibSys

While working with LibSys, the library experienced several difficulties. Several pros and cons

of LibSys and Koha have been discussed in comparative studies[25]. Some routine housekeeping operations and services found wanting in LibSys software at BPCL are highlighted below:

- Lack of a relational database management system (RDBMS).
- Lack of robust circulation privileges features.
- Lack of library fine management options such as overdue, lost book processing fee, etc.
- Lack of copy catalogue feature through Z39.50 protocol.
- Limit of the only eight-digit member Identification number.
- Lack of Report options and their limitations.
- Increase of server downtime due to heavy traffic and server reboot.
- Lack of Light directory access protocol (LDAP) to integrate single sign-on facility.
- The automated email facility was missing for various modules, etc.

Selection of Koha

Koha[26] is the first open-source integrated library management software used in more than five thousand libraries worldwide or someway associated with it[27]. Koha was implemented in Biju Patnaik Central Library (BPCL) in May 2014 initially for the management of e-books; later, bound volumes data were also migrated, and videocassettes database were also developed. To switch from LibSys to Koha, the major challenge was to integrate existing Radio Frequency Identification (RFID) devices. Many vendors were contacted to integrate RFID and few customizations of Koha, but the charges were very high. An experienced scientist from Variable Energy Cyclone Centre (VECC) voluntarily agreed to integrate RFID. After developing confidence for the integration of RFID, the library started data migration in April 2017. Data on Koha users worldwide is given in Table 1.

Table 1 — Some Koha users from the worldwide libraries sharing data[28]		
	Total	Largest
Libraries	8,730	662
Biblios (No. of Records)	195,680,647	2,584,000
Authorities	183,376,838	8,449,498
Items (No. of Documents)	240,286,331	3,418,562
Patrons (No. of Users)	28,874,142	440,788
Issues (Total Book check-out)	607,207,924	14,663,490

Installation and integration of RFID devices

The Koha version 3.16 was initially installed in May 2013 on Ubuntu 14.04 to manage the e-book catalogue. But Debian[29] is mainly recommended as Koha is tested on it before any release. However, distributions based on Debian like Ubuntu, Lubuntu, etc. also supports Koha. Hence as per developers recommendations and the smooth functioning of system latest version of Koha 16.04 was decided to test on the Debian prototype server[30]. A prototype for testing Koha and migrated data was created on 4 GB RAM Personal computers for rigorous testing. The entire process took more than one month.

Several difficulties were encountered like limited knowledge of MySQL, Apache, Perl language, etc., and non-availability of the technical workforce during the implementation stage. The online community and the documentation available on the internet helped in overcoming the limitations. Sample data of all types of user categories and library materials created with existing library circulation rules were thoroughly tested in the RFID hardware and Koha software.

The methodology of LibSys data migration at BPCL

The trickiest and challenging part of the whole process was the migration of data from LibSys. The LibSys database was based on a text file system that is almost difficult to examine data from the backend. It was challenging to export bibliographic details in MARC format due to the disabled MARC export option. Therefore, the report modules of acquisition, cataloguing, and serial has been used to get the bibliographic data and item details. The steps followed at BPCL to get the data out of LibSys is given Figure 1.

LibSys modules used to migrate the bibliographic data

LibSys acquisition and cataloguing report options were used to migrate the existing book bibliographic details as described below:

Book Bibliographic records from Acquisition Module: Some of the book bibliographic data were retrieved from **Acquisition > Reports > Accession Register > My format > Formats.** Few data could not be retrieved as many options were not correctly working, or bad linking of report features from the database. Fig. 2 is the screen shot of the report feature that describes the options available to select the fields to export/print and assign Seq (column number/sequence in final excel) and size. One may enter the maximum size of the character length in the
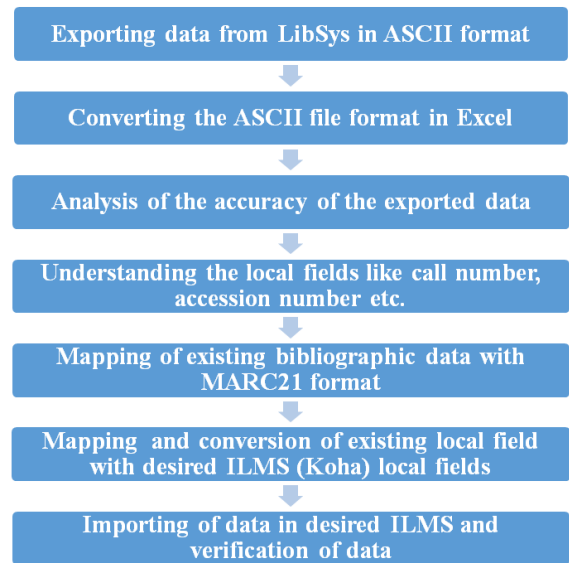

Fig. 1 — Data import steps followed at BPCL

Fig. 2 — Screenshot of the report taken from Accession module

field box-like author, titles, etc. However, it is limited to 99 characters. So the fields that are more than 99 characters in the LibSys database will be truncated that will result in data loss.

Books Bibliographic records from Cataloguing Module: Some of the book bibliographic data retrieved from **Cataloguing > Reports > Titles by Accn No. > Record Structure**. The related screenshot is given in Fig. 3. This option is needed to get the complete Title detail of books. The data obtained from the acquisition module has been truncated due to its limitation of 99 characters (practically, we observed the output is only 80 characters).

Bound Volumes Bibliographic records: The bound volumes bibliographic data retrieved from **Serials > Reports > Miscellaneous > Bound Volume/Issues > Record Structure**. The detailed screenshot is given in Fig. 4. The ASCII format and desired limited number of fields have been selected for the bound volumes' final report.

All the book and bound volumes data retrieved in ASCII files have been carefully converted into the MS Excel format by opening the LibSys original ASCII data files into the excel sheet.

Mapping and editing of Excel bibliographic data in the correct MARC framework

The Excel data of books has been mapped with standard MARC21 framework, and accordingly, the customized data entry worksheet was also designed for ease of entry[31] (Table 2).

As per instructions in Koha for various library reading materials, additional codes were added in the MARC21 format, as shown in Table 3.

Mapping with MARC21 tags was done for all the bibliographical data of library materials present in the Excel sheet migrated from LibSys. MarcEdit software was used to convert all excel data one by one into MARC tags. Converting the entire Excel data in MARC format involved inserting, replacing, deleting, editing, etc. jobs that were trickier and complex. Still, most of the required operations were carried out with the facilities available in MarcEditor software[32]. Almost all complex, nonstandard data were successfully converted into MARC format with extra fixed fields like 000, 005, 008, etc.

Migration of user's data in Koha

Member's data was retrieved from Libsys **Circulation > Reports > On Members > List by Alt Ids** and converted into the Koha prescribed CSV format to import into the ILMS. We did not import the member's transaction details due to many complexities and in-house technical limitations. The final migration was done during the summer vacation period when most of the books returned by the users. We operated the LiSys and Koha software parallelly for a few months to check-in the issued books through LibSys.

We have successfully migrated almost all data from Libsys to Koha, and later lot of new database

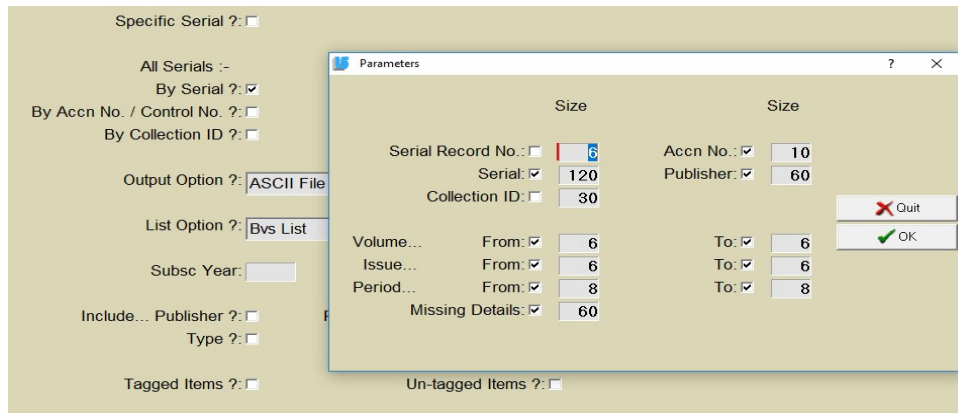Fig. 3 — Screenshot of the report taken from the cataloguing module

Fig. 4 — Screenshot of the report taken from the serial module

Table 2 — Data Mapping in MARC21 framework and related Koha database tables and columns

Libsys book data converted in Excel	MARC21 fields	MySQL Koha database table and columns name			
		Columns under "biblio" table	Columns under "biblio_metadada" table	Columns under "biblioitems" table	Columns under "Items" table
ISBN	020$a	-	-	Isbn	-
Language	041$a	-	metadata	-	-
Class Number	082$a	-	metadata	-	-
Book No	082$b	-	metadata	-	-
Author	100$a	Author	-	-	-
Title	245$a	Title	-	-	-
Edition	250$a	-	-	Editionstatement	-
Place	260$a	-	-	Place	-
Publisher	260$b	-	-	publishercode	-
Year of Publication	260$c	-	-	Publicationyear	-
Pages	300$a	-	-	Pages	-
Series	490$a	seriestitle	-	-	-
Item Type	942$c	-	metadata	-	-
Withdrawn Status	952$0	-	-	-	withdrawn
LOST status	952$1	-	-	-	itemlost
Damaged Status	952$4	-	-	-	damaged
Permanent Location	952$a	-	-	-	homebranch
Current Location	952$b	-	-	-	holdingbranch
Location	952$c	-	-	-	location
Date of Accession	952$d	-	-	-	dateaccessioned
vendor code	952$e	-	-	-	booksellerid
Amount in Rs.	952$g	-	-	-	price
Call Number	952$o	-	-	-	itemcallnumber
Acc. Number	952$p	-	-	-	barcode
item type	952$y	-	-	-	itype

was created like video cassettes and CDs. Record of total data migrated are:
➢ Print Books = Approx. 80000/-
➢ Bound Volumes = Approx. 18000/-
➢ Patron Data = Approx. 10000/-
➢ E-books = Approx. 15000/-

Limitations and post data migration difficulties
    Attempts have been made thoroughly for migrating all the bibliographic data of books and periodicals, but

Table 3 — Item types and their codes used in Koha for data conversion

Item Type	Codes Used in Koha	MARC21 Field used
Books	BK	952$yBK
Reference Books	REF	952$yREF
Book Bank	BB	952$yBB
Location of Items	Codes Used in Koha	MARC21 Field used
General Section	GEN	952$cGEN
Reference section	REF	952$cREF
Book Bank Section	BB	952$cBB

due to vendor locking, bug and limited reporting features in LibSys lead to failure in retrieving some data such as MARC 245$c (Title responsibility area), 700$a (added entry) and 650$a (Subject added entry). However, this problem was ignored as there was minimum data entry against those fields. However, subject added entry had been successfully fetched from the Library of Congress (LOC) against all those titles where International Standard Book Number (ISBN) were present. Library did not focus on Acquisition and serial data migration because it was hardly used and lacked uniformity in data.

The book transaction history was also ignored due to difficulties in getting the appropriate data in desired formats. Still, in the future, it may be tried and explored to migrate the transaction history too. We did not face any major post-implementation difficulties, and everything worked as per our expectations but few issues we noticed due to bugs in Koha software (16.11.07) and ignorance of few tests of RFID like:

➢ Tagging of member cards with more than 7-digit identification number (ID)
➢ The severe transaction-related issue because of MySQL database-related bug.
➢ Amount calculations in the acquisition module due to bug

All the above main issues were resolved with online solutions, modification in RFID middleware code. Ultimately, the Koha version was upgraded to 16.11.11, which was more stable and less buggy than previous.

Customization of Koha for BPCL to enhance services

Some of the customizations done at BPCL as per requirements to enhance the services and make the housekeeping operation easy for the staff and end-users are as follows:

- Incremental fine which is not available in Koha
- Koha OPAC homepage look and feel
- Cover flow for new arrivals[33] and tabular display with HTML codes[34]
- Cover flow for recent faculty publications
- Many SQL reports[35] written for the day to day requirements
- Design of data entry MARC21 frameworks for books, periodicals, CD's, etc.
- Data entry fields for patron entry
- Search filter by Item type on OPAC home page, etc.

RFID devices integration

BPCL has many RFID devices like electronic article surveillance gate (EAS), staff station, book drop, self-issue/return kiosk, etc. The integration of such old devices procured earlier from LibSys was one of the significant challenges. Some of the challenges faced before integration are:

- Some devices were non-functional
- RFID vendor demanded huge charge for integration with Koha
- Existing Middleware was not compatible with Koha
- The detail documents on RFID devices were also not available
- The RFID device manufacturer does not respond to the technical query, etc.

All the above challenges were resolved with the help of Scientist working at VECC, Kolkata. The middleware developed by him for his library during similar migration case was modified and integrated with Koha using SIP2 protocol. Some faulty RFID devices were also made functional by replacing power cables, battery etc. Some of our routine works which have been customized in RFID middleware are as follows:

- Staff login with their own ID/Password
- Tagging/retagging/untagging after proper online validation of the title and member records in the ILMS database.
- Tag monitoring by accessioned item record from the ILMS database.
- At a time, multiple books check out /check-in/ renewal.
- Provision for the display of member detail and photograph.
- Provision for the display of reservations done by a member along with sequence and date of collection.
- Provision for inquiry of transaction details.
- Provision for details of the fine against a member.
- Provision of slip printing check-out/check-in/renewal.
- Provisions to do transactions with barcode/manual on antenna/workstation.

Housekeeping and user services enhancement after migration to Koha

After migration, customization has been done to enhance library services, some of which are given in Table 4.

Table 4 — Enhancement of services after Koha implementations

Enhancement of User-Based Services	Enhancement in housekeeping
➢ Integration of light directory access protocol (LDAP) can be used login to Koha with users' institutional webmail credentials without remembering additional credentials for Koha.	➢ Standardized and corrected data entry errors like punctuations, capitalizations, etc. during data migrations
➢ Users have the opportunity to request/edit modification in membership data like correspondence address, mobile number, etc.	➢ Z.39.50 feature for copy cataloguing
➢ Integrated new additions book cover-flow on the OPAC and displayed faculty publications.	➢ Standard subject added entry fetched from the library of congress during migration.
➢ Dispatch of auto-email alerts for book acquisition and transactions.	➢ Various MySQL reports have been written as per library requirements in excel/CSV formats
➢ Better advanced customized OPAC searching featured.	➢ Acquisition modules are now used fully, and book requesters get auto-updates via email
➢ Web 2.0 based features such as star rating of books, user comments, etc.	➢ Better statistics about library
➢ Mobile compatible bootstrap web OPAC	➢ A lot of improvement in circulation management like bulk member import in CSV format, fine management, lost/damaged books management, book reservation management, vacation issue management, etc.
➢ Sharing interesting reading list and books on social media.	➢ User-friendly RFID middleware interface.

Conclusion

The migration of proprietary ILMS data, especially when there is no option to get the output in a standard format like MARC21, XML, Excel, etc. is complicated but possible with various tools and techniques. The study reveals some limitations of data migrations due to a lack of standards like MARC availability for bibliographic records. Further attempts will be made to design some standard framework for the migration of ILMS data like acquisitions, users, transaction details, etc., one ILMS to others. Data migration and Koha ILMS enhanced the user based services and housekeeping operations of the library

Acknowledgement

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