
“SOFTWARE MIGRATION IN LIBRARY AUTOMATION: CONCEPTS, PROBLEMS, AND SOLUTIONS.”

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ABSTRACT

In the journey of library computerization, many libraries are required to migrate from one Library Management System (LMS) to another. Technological advancements, changing user needs, financial constraints, and limitations of existing software are the major reasons behind such migration. This research paper presents a detailed review of the concept of library command/instruction migration, its nature, the problems encountered during the process, and possible solutions to address those challenges.

Keywords

Library Computerization, Library Management System (LMS), Data Migration, Library Software.

Received: 06-10-2022

Accepted: 13-11-2022

Published: 20-11-2022

1. INTRODUCTION

Library computerization is a continuous and evolving process. Many libraries in India are functioning at different stages of computerization. Although computerization is initially adopted, over time the selected software or system becomes outdated or proves inadequate to meet emerging requirements. In such situations, migration from one Library Management System (LMS) to another becomes inevitable. However, this process creates several challenges at technical, administrative, and human levels.

Based on discussions with librarians on the subject of library computerization and professional experience with computerized libraries, it is observed that the process of library computerization progresses through multiple stages across different libraries. For example:

- **Level 1:** Library computerization is approved, but no decision is taken due to lack of funds.
- **Level 2:** Limited computerization of selected functions due to financial constraints.
- **Level 3:** The computerization process is in progress.

- **Level 4:** The computerization process has been completed.
- **Level 5:** Upgradation and improvement of the existing library software is underway.
- **Level 6:** A decision has been taken to migrate from one library software system to another.

Considering the overall scenario, it is evident that the number of libraries at the first three levels is large. However, it is equally noticeable that the number of libraries at the remaining levels is not insignificant. This raises an important question: *What will be the key issue in the future of library computerization?* The answer lies in the problems associated with migration from one library software system to another.

Today, many libraries—including well-established and reputed ones—are facing challenges related to software migration. One of the main reasons for these problems is the lack of foresight during the initial adoption of a specific library software system. Often, libraries do not anticipate or plan for the possibility that migration to another system may be required in the future.

Library software migration refers to the secure transfer of complete or partial data, processes, and operational workflows from an existing LMS to a new LMS. This includes database structures, data formats, metadata standards, and workflows.

A **Library Management System (LMS)** is a computer-based software application used to automate routine library operations such as cataloguing, circulation, acquisitions, serials control, and user management.

In library computerization, **software migration** is a highly technical and crucial process. When a library shifts from an old or legacy system to a more advanced or modern software system—such as a Modern Integrated Library Management System (ILMS)—this transition process is referred to as migration.

2. Library Software Migration: Concept and Nature

Software migration does not merely mean installing new software; rather, it involves the secure and accurate transfer of all data from the old software—such as bibliographic records, member registrations, and circulation history—into the new system.

Library computerization is a continuous process. With time, technology evolves and library requirements expand. In such circumstances, moving from an old system to a newer and more efficient one becomes unavoidable. This process is referred to as **software migration**.

2.1 Concept of Library Management System (LMS)

A **Library Management System (LMS)** or **Integrated Library Management System (ILMS)** forms the backbone of a library. It is not merely a software application but an integrated system that connects various departments and functions of a library.

- **Cataloguing:** Storing bibliographic information (author, title, subject, etc.) in accordance with international standards (e.g., MARC21).

- **Circulation:** Facilitating issue/return transactions, fine calculation, and reservation processes.
- **Acquisition:** Recording requests for new books, processing bills, and updating the accession register.
- **Serials Control:** Managing periodicals, issues, and their subscriptions.
- **User Management:** Managing member details, access rights, and reading history.

2.2 Concept of Software Migration (Detailed Analysis)

Software migration is not simply a change of software; it is a highly complex technical process. Its nature depends on the following four key components:

1. Database Structure

Each software system has a different data storage structure. For example, in older software, an author's name may be stored in a single field, whereas in newer software, it may be divided into separate fields such as first name and last name. During migration, these structural differences must be carefully mapped and aligned.

2. Format and Metadata Standards

The format in which data is stored plays a crucial role during migration.

- The use of international standards such as **ISO 2709** or **MARC21** facilitates smoother migration.
- If legacy data does not follow standard formats, data conversion becomes a major challenge.

3. Data Security and Integrity

Maintaining data integrity during migration is essential.

- **Lossless Migration:** No record from the old system should be lost.
- **Accuracy:** Data must be transferred to the new system exactly as it exists, without any alteration.

4. Workflow

Each software system follows a different operational logic. While adopting a new LMS, libraries may need to modify their existing workflows. This includes staff training and adapting to the new system.

2.3 Nature of Migration

Migration can be carried out in two ways:

1. **Total Migration:** Transferring all data and all library modules to the new software simultaneously.
2. **Phased Migration:** Migrating modules step by step, such as cataloguing first, followed by circulation.

Software migration is not merely a technical process; it is an investment that determines the future quality of library services. Accuracy of data and adherence to standards are the key factors for successful migration.

3.Problems and Examples of Library Software Migration

A review of the current state of library computerization reveals that many libraries are fundamentally entangled in problems related to the computerization process itself. For such libraries, the stage of library software migration is still far in the future. The following examples illustrate common problems encountered during library computerization:

1. A library has adopted a library automation software, and the work of creating databases for books, periodicals, and non-book materials is in progress. However, even after several years, this work remains incomplete. As a result, the computerization of circulation services is delayed. Users do not experience any visible benefits of computerization, and neither readers nor library staff gain its advantages.
2. A library has implemented library software, and work in most departments has begun. However,

computerized operations and traditional manual operations are running in parallel for many years due to a lack of confidence in the efficiency of the software. While users may benefit to some extent, library staff are required to perform double work, leading to dissatisfaction.

3. A library has adopted a low-cost, basic software system. Although the bibliographic database has been created and circulation transactions are being handled in batch mode, related modules such as acquisitions and cataloguing have not been computerized or integrated. Repeated data entry is required at multiple points. The computerized catalogue is not available to users, and the current circulation status cannot be viewed.
4. Similar to the above example, the library has adopted a basic software system. Initially, circulation transactions and access to the computerized catalogue functioned for a few months, but over time, all operations ceased. The individual or company that developed the software has discontinued its sale and maintenance services.
5. Some librarians and library science professionals create library databases using Windows applications such as MS Access, Excel, or Word. Circulation status is recorded in batch mode, but other library functions are not computerized. Users do not have access to an Online Public Access Catalogue (OPAC), and the database created in this manner cannot be utilized for migration to a new library software system due to a lack of technical expertise.
6. A library has implemented software and completed computerization of most departments, but no secure data

backup has been maintained. Suddenly, the software server's hard disk crashes completely, making data recovery nearly impossible. Consequently, all software operations come to a halt. The software developer refuses to take responsibility, leaving the library with no option but to restart computerization from scratch.

7. Library computerization has been initiated using a particular software system, but data entry has been carried out only from a specific date onward. All transactions prior to that date continue to be handled using the old manual system.
8. Data entry is ongoing in the library software, but barcode generation based on chronological entries is not possible. Barcodes can be generated only after all records have been completed and accession numbers finalized. This adversely affects circulation operations.
9. Library software data and circulation transactions are not secure, and unauthorized alterations are being made.
10. Users do not trust library computerization and are unwilling to accept the discipline it imposes. Records of materials issued to users before computerization have gone missing. As a result, the library incurs losses due to untraceable items, and the responsibility for such losses falls on the librarian.

Numerous examples of problem clusters in library computerization can be cited as above. However, not all these issues fall within the scope of library software migration. In many cases, the only viable option is to restart the computerization process from the beginning.

4. Reasons for Library Software Migration

Libraries primarily decide to migrate their software systems for the following reasons:

1. The software development company discontinues the older version of the software and makes it mandatory to purchase a newer version. Such decisions by the software vendor disrupt the ongoing process of library computerization.
2. The company that developed the library software shuts down its business. In such situations, software maintenance and further development or upgrades come to a complete halt.
3. The absence of high-quality and standardized data formats in the software leads to multiple problems in computerization activities, information presentation, and report generation.
4. The cost of software maintenance becomes unaffordable for the library. Typically, maintenance charges amount to 8–10 percent of the original purchase cost of the software. When the parent institution does not approve this recurring expenditure, maintenance services are discontinued.
5. The library wishes to adopt new computer technologies and make significant changes to its technological infrastructure, but the existing software lacks the capability to support such changes.
6. The library intends to implement RFID or self check-out/check-in systems.
7. The library aims to introduce innovative features, ensure up-to-date functionality, and achieve international standards in its library software.

5. Problems Encountered During the Migration Process

Migration is not merely the act of moving from one software system to another; it involves several challenges at technical, administrative, and human levels.

5.1 Technical Problems

Technical problems are primarily related to data structure and system compatibility:

- **Lack of Data Format Compatibility:**
The data storage methods used in older software (e.g., MS Access, FoxPro, Excel) differ from those used in modern systems (e.g., MySQL, PostgreSQL). Due to these differences, data cannot be directly accepted into the new software without proper conversion.
- **Differences in Metadata Standards (MARC, Dublin Core):**
If international standards (such as MARC21) were not followed in the legacy system but are mandatory in the new system, serious difficulties arise during data mapping. Accurate field-by-field conversion becomes a complex and time-consuming task.
- **Risk of Data Loss:**
During migration, special characters, older records, or circulation history may be lost due to technical errors. This can raise concerns about the reliability and authenticity of library data.

5.2 Administrative Problems

Without clear policies and planning at the administrative level, migration efforts may fail:

- **Lack of Proper Planning:**
Inadequate planning regarding timelines, data prioritization, and continuity of library services during migration leads to confusion and operational disruption.
- **Insufficient Funding:**
Migration requires significant financial investment for new software acquisition, data conversion, server upgrades, and staff training. Due to financial constraints, the migration process may remain incomplete.

- **Limited Management Involvement:**

When senior library management or institutional authorities show limited interest, delays occur in obtaining necessary approvals, resources, and support.

5.3 Human Problems

The most critical factor in any technological change is the human element:

- **Inadequate Staff Training:**
Regardless of how advanced a new software system may be, its effectiveness depends on the proficiency of the staff operating it. Lack of proper training prevents optimal utilization.
- **Resistance to Change:**
Library staff accustomed to legacy systems may resist adopting new technologies due to fear of learning new skills or increased workload.
- **Lack of Technical Skills:**
Many library professionals lack the necessary skills to manage modern digital systems. This “digital divide” becomes a major obstacle in the migration process.

These issues clearly indicate that successful migration requires not only the selection of good software but also technical accuracy, strong administrative support, and both psychological and technical empowerment of staff.

6. Need for Software Migration

To maintain its relevance and quality of services, a library must undertake software migration for the following reasons:

6.1 Technical Obsolescence of Legacy LMS

Many libraries continue to use software based on outdated programming languages (e.g., FoxPro, Visual Basic 6.0).

- **Limitations:**
Such systems are incompatible with modern operating systems (e.g., Windows 11).

- **Risk:**
Software vendors often discontinue support for older versions, which can completely disrupt library operations during technical failures.

6.2 Lack of Compatibility with New Technologies

Modern library services extend beyond desktop-based operations:

- **Cloud and Mobile Technologies:**
Legacy software is not cloud-based and cannot be integrated with mobile applications.
- **Integration:**
Older systems are incompatible with emerging technologies such as RFID (Radio Frequency Identification), self-service kiosks, and digital library platforms (e.g., DSpace). Migration becomes necessary to bridge this gap.

6.3 Rising User Expectations

Today's users are technologically savvy and expect advanced library services:

- **Remote Access:**
Users expect to access the library catalogue (OPAC) remotely and place reservations online.
- **Interactive Services:**
Notifications via email or SMS regarding circulation activities have become essential. Older systems often lack such features, necessitating migration to modern LMS platforms.

6.4 Shift Towards Open Source LMS

There is a growing trend among libraries to move from proprietary software to open-source systems such as **Koha** or **Evergreen**:

- **Flexibility:**
Open-source systems allow customization of software code according to library requirements.
- **Global Community Support:**
These systems are supported by a global community of experts, making them more secure, robust, and innovative.

6.5 Rising Maintenance and Licensing Costs

Annual Maintenance Charges (AMC) and licensing fees of proprietary software are often high:

- **Financial Burden:**
Regular license renewals are unaffordable for smaller libraries.
- **Sustainable Alternatives:**
Migration to open-source or cost-effective modern systems reduces long-term operational costs.

In brief, for a library to function effectively as an "information center," it must remain technologically competent. Obsolete systems hinder progress; therefore, timely migration helps libraries save time, money, and human effort.

7. Solutions and Strategies for Library Software Migration Problems

There are numerous problems associated with library software migration, and it is difficult to suggest solutions on a case-by-case basis. However, some general strategies and preventive measures can be proposed as follows:

1. If adequate preparation and careful planning are undertaken at the time of initially adopting a library automation system, the need for future software migration may be significantly reduced. In this context, the following precautions should be considered:

2. **Quality and Technology Assessment of the Software**

The overall quality of the software should be thoroughly evaluated. It should comply with recognized software development standards. The underlying technology must be advanced, particularly web-compatible and adaptable to emerging technologies. The software should be flexible enough to accommodate future changes in infrastructure.

3. **Database Design and Database Management System (DBMS)**

The database used in the library software should have an internationally acceptable structure and support modern markup formats. The MARC framework should be updated and advanced (e.g., MARC21, MARC-SGML). The Database Management System acting as the link between the software and the database should also be modern and robust.

4. **Provision for Adoption of Innovative Features**

The software should allow the incorporation of innovative and emerging features over time. The associated costs should be clearly defined and reasonable, rather than being determined solely on commercial considerations.

5. **Capability to Support New Interfaces**

It should be ensured that the software has the capability to support SIP2 servers and necessary interfaces required for RFID or self check-out/check-in systems. Such provisions should be included in the purchase agreement at the initial stage itself.

6. **Preference for Open-Source Database-Based Software**

If the software uses an open-source database system and limited access to source code is provided to in-house programmers, routine maintenance and troubleshooting can be handled locally, reducing dependence on the vendor.

7. **Affordable Software Maintenance Costs**

Maintenance charges should be affordable for the library. At the time of purchase, the estimated cost of routine maintenance for the next 3–5 years should be included in the overall pricing, so that the library does not

need to make recurring financial provisions.

8. **Cost of Software Upgradation and Enhancements**

After software adoption, enhancements, upgrades, and advanced features required during the first year should be provided free of cost. Thereafter, the vendor should declare a transparent list of charges for future upgrades in advance.

9. **Post-Purchase Support and Service Assurance**

The software purchase agreement should include provisions for imposing penalties and legal recovery if the vendor fails to respond to complaints, discontinues support, or ceases operations.

10. **Availability of Future Software Versions**

Subsequent versions of the software should be made available to the library within the maintenance cost. The library should have the right to receive periodic updates (e.g., quarterly) to prevent premature obsolescence of the initially purchased version.

11. **Ownership Rights of the Library Database**

Ownership of the library's bibliographic and holdings database must remain entirely with the library. The purchase agreement should ensure that future versions of the software are made available at nominal cost under maintenance provisions.

Most of the above points—except a few—can be incorporated into the software purchase agreement at the initial stage. Librarians should study literature related to software modernization, analyze the capabilities of internationally accepted library software, and prepare a prioritized list of desired innovative features. This list should be periodically

reviewed and explicitly included in the purchase contract.

Before deciding on migration, the software should be critically evaluated in terms of the scope, quality, and metadata standards of the library collection database. If librarians utilize their professional skills and available software tools to create a high-quality, standardized database before migration, the migration process can be smooth and successful.

7.1 Essential Measures for Successful Migration



- **Data Cleaning:** Correcting errors in legacy data and removing redundant or incorrect records before migration.
- **Data Mapping:** Precisely defining how fields (e.g., “Author”) in the old software will correspond to fields in the new software.
- **Use of Standards:** Ensuring that the new software complies with international standards such as MARC21 and ISO 2709.
- **Pilot / Trial Migration:** Migrating a small sample of data (e.g., 500 records) to test accuracy before full-scale migration.
- **Backup:** Taking a secure backup of the original data before initiating migration is mandatory.
- **Staff Training:** Providing comprehensive training to staff on the new software to ensure uninterrupted library operations

8. Conclusion

- In the next phase of library computerization, **LMS migration** will emerge as a crucial issue. With proper planning, technical compatibility, and effective management of human

resources, this process can be made smooth and successful. The present research paper will help librarians understand the challenges involved in the software migration process and assist them in identifying appropriate solutions.

- The most critical factor in the success of migration is **data**. If the data in the legacy system is accurate, standardized (MARC21 / ISO 2709), and well-organized, the migration process becomes significantly easier. Even a minor error in data cleaning or data mapping can have serious long-term consequences for the library’s information repository.
- Merely purchasing advanced software does not ensure successful migration. The staff who operate the system must be technically competent and adequately trained. Ultimately, the greatest benefit of successful migration is realized by the **end user (the reader)**.
- Library software migration can be compared to moving from an old house to a new one equipped with modern amenities. When the three key elements—**proper planning, accurate implementation, and staff training**—are effectively applied, software migration can become a boon for the library rather than a challenge.

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