Library Automation through Open Source Library Management System: Status in National Agricultural Research and in Indian Education System

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***Abstract*—Revolutionary advancements in the network and communication tech have enabled the automation of digital library services, granting universal, real-time access to knowledge resources stored in libraries via cutting-edge Open Source Library Management Systems (LMS). These systems streamline workflow, reduce expenses, eliminate manual errors, provide uninterrupted service visibility, improve efficiency, ease resource sharing, enhance housekeeping, and generate new readers. The present "Systematic Review" focused on the state of library automation in India, particularly in National Agricultural Research institutions and the Indian Education System. Our article comprehensively covered and stressed the importance of the library automation in the Indian context with reference to National Agricultural Research and Education System (NARES). Further, we presented the overview of various open-source LMSs, a comparison of LMSs, implementation status in global and Indian libraries. In addition, we have detailed a recent information about user awareness and appraisal levels of Online Public Access Catalogue (OPAC) and Indian Digital Ensemble of Agricultural Libraries (IDEAL) platform services and their practical utility and the factors crippling their wide acceptability among the users. This article concludes by addressing the challenges of library automation in India and offering suggestions/recommendations for the successful implementation of Library Automation in India.**

***Index Terms*—Library Automation, Digital Library, Library Management, Open Source, Koha**

I. BACKGROUND

Library automation is crucial in the management of libraries. Digital libraries provide solutions to traditional libraries' main challenges, such as storage, ease of access, management, and so on. Traditional libraries place a premium on the storage and preservation of physical items, particularly books and periodicals, for which librarians serve as custodians. Because, the information is physically gathered in one location, users must travel to the library to learn and make use of it. A library is a collection of documents that are organised in the electronic form and are accessible via the Internet or other electronic means. A user may be able to access magazine articles, books, papers, images, sound files, and videos depending on the library. The quick development and expansion of information and communication technologies has resulted in substantial changes to the area of librarianship (ICT) (Hussain and Parveen., 2021). Automation is the use of a computer to carry out typical library tasks like cataloguing and circulation. Further it is also referred to as "the application of automatic control to any sector of industry or science by extension, the use of electrical or mechanical technologies to substitute human labour" in the Oxford English Dictionary (Simpson & Weiner, 1989). According to the ALA Dictionary of Library and Information Science, automation is described as "the performance of an activity, a set of operations, or a process by self-activating, self-controlling, or automatic methods". Using automated data processing tools, such as a computer or other labor-saving machinery, is referred to as automation. Although D. S. Harder coined the term "automation" in 1936, the phrase "library automation" has been used in literature for the last five decades.

During the library automation process, computers and other technological interventions are used to support a library's systems and services. It is the process of converting manual library procedures to computerised

procedures, such as switching from a card catalogue to an Online Public Access Catalogue (OPAC) or from manual circulation cards to an integrated library system. As a result, digital library management software is useful in the creation of digital libraries. Digital library management software aids in the organisation of circulation of library materials, cataloguing, asset management, reporting, serial management, acquisition etc. It is a computer-based system that controls all of the library's functions digitally and in a systematic manner. The generic term for ICT trends and techniques used to replace manual systems in the libraries is "library automation". The phrase "integrated library system" refers to the use of a shared database (for documents and users) to carry out all of a library's fundamental operations. The utilization of software in library automation was briefly examined by neighboring countries like Pakistan and Bangladesh (Iqbal et al., 2023; Islam et al., 2023; Rahman & Mamun, 2024). Furthermore, studies on the implementation of robotic process automation (RPA) in academic libraries in Hong Kong underscored the imperative for library automation (Lin et al., 2024).

Hence, the present “Systematic Review” briefly discusses about the history of library automation, need & purpose of library automation, various open source Library Management Systems (LMS) available, comparative analysis of different LMSs, status of implementation of LMS in Indian subcontinent and in the ICAR institutions. The role of University Grants Commission (UGC) in the library automation, problems of library automation in India was also discussed and further, this review also suggest some recommendations for the successful implementation of library automation and future of library automation in India.

II. HISTORY OF LIBRARY AUTOMATION

Library automation began in the 1930s with the introduction of punch card equipment for managing circulation and acquisitions. Progress stalled during the Great Depression and World War II but resumed with advancements in technology. Significant milestones include:

- In 1946-1947, John Mauchly and J. Presper Eckert developed the ENIAC I computer at the University of Pennsylvania.
- In 1947, Bell Laboratories invented the transistor, which improved computer speed and capacity while reducing size.
- In the 1960s, the Library of Congress started using computers for machine-readable catalog records.
- In the 1970s, the Online Computer Library Centre launched its first cooperative cataloging project.
- In 1993, the development of the Internet and World Wide Web ushered in a new era of library automation, with increased use of networks for email, FTP, Telnet, and online commercial systems.

III. NEED & PURPOSE OF LIBRARY AUTOMATION

Only computers are capable of managing vast amounts of information effectively and efficiently, and they also have the added benefit of being highly accurate and timely, which increases the value of information. For the following reasons, using computers to automate library procedures is especially beneficial.

- A large portion of the work done at a library is mechanical, repetitive, and requires proper updating of records in files. In a library, a single bibliographic record is utilised for a variety of tasks. Each operation may include different copies of a given title. A bibliographic record made when placing an order is used to acquire a document, process it technically, and then use it for library OPAC, circulation, binding, etc.
- Several people can access a bibliographic record independently thanks to automation. An employee in a branch library can check the status of an order without keeping duplicate files or calling for information. A user can check to see if a book is available on the library's shelves or out on loan;
- The application of information technology in libraries results in increased operational efficiency.
- The library staff, specially the younger ones, finds use of computers interesting and exciting.
- The use of Information Technology (IT) increases productivity of library staff. It relieves professional staff from clerical chores

so that they can be fruitfully used for user-oriented library services; and It improves quality of services rendered by the library

IV. VARIOUS OPEN SOURCE LMS AVAILABLE

Library automation was first mooted in 1940 (Kaul, 1999) and semi-mechanical applications were used to materialize this vision. Since then, we have covered a long distance in improving control over reference materials' collection in libraries. The popularity of open source LMS can be attributed to the availability of programmable source codes over internet on which different coders can collaborate to improve efficiency of information management and retrieval.
A brief overview of different open source LMS over here will help in comparing them later on.

4.1. Koha

Koha is an open source integrated library management system developed by Katipo Communications for the Horowhenua Library Trust in New Zealand in 1999 and it is used to automate library routines by various types of libraries around the world. It is the first free and open source library automation package that has been widely adopted by academic, social, and public libraries (Bilal, 2014). Users can navigate Koha in an intuitive manner, it assists in the management of fines, it automates notifications via email, it has a strong search capability and advanced matching, and it provides interfaces for self-checking out. The software was created in English with the PERL scripting language and the MySQL database and was later translated into other languages such as French, Arabic, and Chinese.

4.2. BiblioteQ

BiblioteQ is an open-source library management software for cataloguing and circulation. It supports various library types and integrates with external databases. Features include cataloguing diverse materials, circulation management with barcode support, and generating reports. It's known for its user-friendly interface and compatibility across Linux, macOS, and Windows platforms.

4.3. OpenBiblio

OpenBiblio is a library management system that is free and open source released in 2002 by Mr. Dave Stevens runs on a distributed computer network using the Windows and Linux operating systems. The software is also compatible with standalone machines as well as machines connected in a LAN that do not have Internet access. The OPAC interface is simple to use and navigate, and it includes a keyword search function and allows you to view and edit the Biblio. Accounts can be created and resources booked through the member interface. The software is browser agnostic and allows users to perform in-house operations as well as search and retrieval.

4.4. LibSys

LibSys, the brainchild of a Delhi based former employee of Tata Consultancy Services (TCS), is one of the most trusted LMS for libraries across India. LibSys is compatible with different platforms like Novell Lan, Unix, Windows 10 etc and scripted in C, Java and C++, LibSys has an easy to navigate user interface. The client can avail of a fully functional graphical user interface. The Google Web Tool Kit (GWT) based user interface offers multi-tasking capability and has complete support for Unicode with a provision of federated search whose looks can be tailored. Apart from providing RSS feeds, LibSys can be integrated with Book Finder, Google Books etc.

4.5. NewGenLib

New GenLib is a user-centric integrated library management system (LMS) for libraries of all sizes. It was the first free and open source ILMS to emerge from India, and it has since been adopted by academic, public, and library institutions throughout the Asian subcontinents. The software is also compatible with standalone and LAN machines. The user interface is simple to use and supports a wide range of metadata standards. The software is built with widely used open source software such as Java, PostgreSQL, Apache Tomcat, and others.

4.6. Evergreen

Evergreen is an open source ILMS that is used by libraries all over the world to automate their library procedures. In order to address the demand for a scalable catalogue shared by more than 275 public libraries in the state of Georgia, USA, the Georgia Public Library System initiated the Evergreen project in 2006. Many library consortia in North America, including those in the United States and Canada, as

well as a number of individual libraries both inside and outside of the continent, have since accepted it. A free and open source ILMS, the Evergreen is licenced under the GNU General Public License.

4.7. e-Granthalaya

The National Informatics Centre (NIC), under the Ministry of Electronics and Information Technology, Government of India, developed e-Granthalaya, a digital platform for Government Libraries. Initially launched by NIC Bangalore as an internal project in Karnataka State. e-Granthalaya transforms traditional libraries into e-Libraries, offering digital services like automated internal operations, digital library integration, and online member services through a Single Window Access System. Version 4.0, a "cloud ready application," offers a web-based enterprise solution with centralized database support for cluster libraries. It utilizes Postgre-SQL as an open-source Data Base Management System, enabling web-based data entry and Unicode compliance for local language input.

4.8. Troodon

Troodon, developed by Comtek Services Pvt Ltd, is an integrated library management system with five modules: administration, retro conversion and database maintenance, acquisition, circulation, and serials control. It supports online public access catalogues for both internet and intranet. Key features include a user-friendly graphical interface, report previews, export options to PDF, Excel, and Word, multilingual search with Unicode support, and 3D-bar and pie chart analysis of reports.

Table. 1. Comparative Analysis of Different LMSs

S No	Name of LMS	Year of Release	Supported / Available Features (Present (P) / Not Available (NA))						
			Circulation	Cataloguing	Asset Management	Reporting	OPAC	Serial Management	Acquisitions
1	Koha	2000	P	P	NA	P	P	P	P
2	BiblioteQ	2007	P	P	NA	P	NA	P	NA
3	NewGenLib	2005	P	P	NA	P	P	P	P
4	Evergreen	2006	P	P	P	P	P	P	P
5	OpenBiblio	2002	P	P	P	P	P	NA	NA
6	OPALS	2002	P	P	P	P	P	NA	NA
7	LibSys	1984	P	P	NA	P	P	P	P

V. STATUS OF IMPLEMENTATION OF LMS IN WORLDWIDE LIBRARIES

Libraries across the globe are increasingly implementing LMS, open source and commercial, to automate management of reading resources' collection and enable patrons to browse through collection seamlessly to discover the desired information. LMS is also being used by academic libraries for showcasing and offering simplified access to costlier range of electronic reference materials that are regularly deployed over huge consortia. Popular LMSs are deployed for storing the works of patrons in institutional repositories.

Libraries worldwide are using LMSs for flexibly and efficiently adapting to the present and projected requirements of patrons as well as streamline performance (Muller, 2011). The below table encapsulates the implementation status and purposes of LMS in libraries from a global perspective (Table. 2).

Table.2. Status and implementation of LMS in global perspective

S.No.	Details	Discussion
1	No. of Universities, colleges, organizations that have deployed LMS worldwide	Majority of academic and other institutions have implemented LMS; although an exact number is not available. Increasing number of libraries are embracing LMS.
2	Purpose of implementing LMS	Automating labour intensive and vital library related tasks, offering universal access of available resources to authorized users round the clock; bringing down cost of library management
3	Benefits accrued- Librarians	Can integrate book barcode with LMS to offer ease of access and retrieval of relevant items; Ability to manage large number of members and books in automated mode; Leverage various modules (acquisition, cataloguing, OPAC, administration, circulation, serials, inter library loan, stock verification, MIS reports, masters, administration acquisition) for efficiently managing library functionalities; Reports and publisher directory can be customized for viewing and record keeping; Account related reports and budget balance can be effectively tracked; Books can be classified based on Title, Author, ISBN, Class, Series etc. ;Duplicate records can be detected, various notice can be automatically sent to defaulting users; Stocks verification can be done very quickly
	Benefits accrued- Users	Uses can use online public catalogue to access and speedily retrieve any document in very less time; Real-time data of each user can be tracked very efficiently; Importable files can be directly downloaded from online database; Users can collaborate over a project online
	Benefits accrued- Organizations	Can link LMS with self-service Kiosk to promote online requisition and ease of search which will help roping in more users; Relevant statistics can be generated with ease whenever the organization needed; Enterprise learning, training can be implemented elegantly
4	Problems experienced by libraries which led to development of Open-source LMS	The prices of commercial LMS were steadily rising and smaller libraries were struggling hard to utilize features at affordable costs; High license prices and vendor lock-in were typical.

VI. STATUS OF IMPLEMENTATION OF LMS IN INDIA

A library's primary goal is to produce, store, process, and transmit knowledge on a local, regional, national, and international scale. Automation has enabled libraries to keep pace with the latest developments. Accuracy, adaptability, and dependability in the library and information centre have also been made possible by this. Automation of libraries decreases repetitive work, saves time, and increases speed and accuracy. Several library software programmes have been invented and developed locally in India and are currently being utilised in many libraries and information centres throughout the country. There are three different kinds of LMS software on the market: paid, open source, and free.

In India, LMS is being implemented by leading educational and other institutions since long. Indira Gandhi National Open University (IGNOU) had implemented integrated LMS LibSys way back in 1990 for automating the entire range housekeeping functions related to its extensive libraries. At that time, IGNOU had transported about 13K records prepared in Computerised Documentation Service / Integrated Set of Information Systems (CDS / ISIS) to LibSys hosted on XENIX OS. Other institutions including leading universities like IITs (Indian Institute of Technology), IIMs (Indian Institute of Management), UGC (University Grants Commission) affiliated colleges, and top schools across India have also implemented LMS to streamline automation and management of library functions. This has been revealed through research findings of Indian Library Online Study Circle (ILOSc) group, TISS Group and Bombay Science Library Association (BOSLA). According to a study on library automation in India it was reported that highest users (Automated Libraries) 1422 (46.93 percent) are made by free software called “eGranthalaya” following Troodon- ILMS commercial software with 10.69 percent. There are 173 installations by Koha the open source software and finally least one of two installations done by Libsuit, Ramlib and Softaid commercial softwares.

The states of Maharashtra (797), Tamilnadu (373), Karnataka (489), Delhi (279), and Telangana (189) have the most percentage of automated libraries using LMS supported cloud-enabled SAAS services. The

status of automation in India reflects on Libraries, librarians, and college administrations must initiate automation in order to provide effective and efficient services to users. Library professionals must upgrade their skills in order to meet the growing expectations of users from libraries. However, the challenges remain same over the last two-three decades' manpower requirements, preparation of machine-readable catalogues, free flow of funds, etc. Librarians have to overcome these challenges for a successful implementation of automation (Panda and Chakravarty, 2021).

The National Academy of Agricultural Research Management (NAARM), an institute under the Indian Council of Agricultural Research (ICAR), recently conducted a study to evaluate familiarity with library information systems across ICAR-affiliated deemed universities and research institutions. ICAR, an autonomous organization under the Department of Agricultural Research and Education (DARE), Ministry of Agriculture and Farmers Welfare, Government of India, found that 96% of respondents were familiar with online public access catalog (OPAC) services (Fig. 1). This underscores the growing demand for fast access to authentic and credible digital information sources in the agricultural sector.

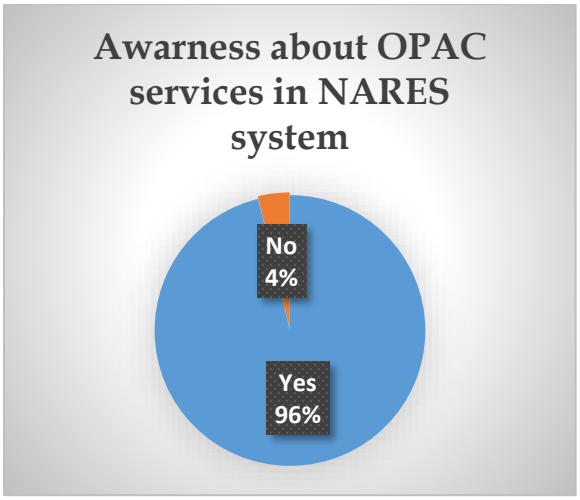

Fig.1 Status of awareness about OPAC services

However, the libraries registered with OPAC services is around 85 per cent, further only 53 per cent respondents expressed that they are highly satisfied, 37 per cent expressed their moderate level of satisfaction (Fig. 2) From the data obtained from the present study it may be ascertained that low level of satisfaction is due to its technical jargon to the concerned users coupled with low level of digital literacy might be one of the reason for lower adoption of OPAC services.

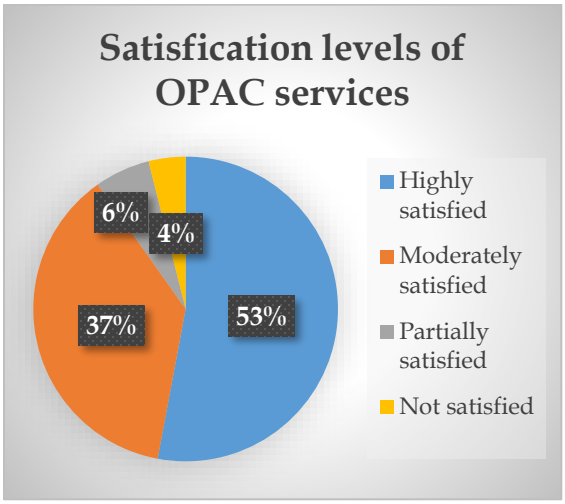

Fig.2 Appraisal levels of OPAC services by the users

Present study has also given idea about the status of awareness about library integrated management systems such as IDEAL (http://ideal.egranth.ac.in/), WorldCat (https://www.worldcat.org/) and National Digital Library of India (NDLI). Among the above integrated management systems, the NDLI needs much attention from the users that can be indicated with low level of registration i.e., 45-50 per cent during our study. It may ascertained due to lower awareness about the advantages of these services such as their vast network (https://www.worldcat.org/) and NDLI coupled with poor institutional support. In our study we observed that majority of users expressed high level of satisfaction and registered with IDEAL platform and a very few users expressed their partial level of satisfaction. (Fig. 3)

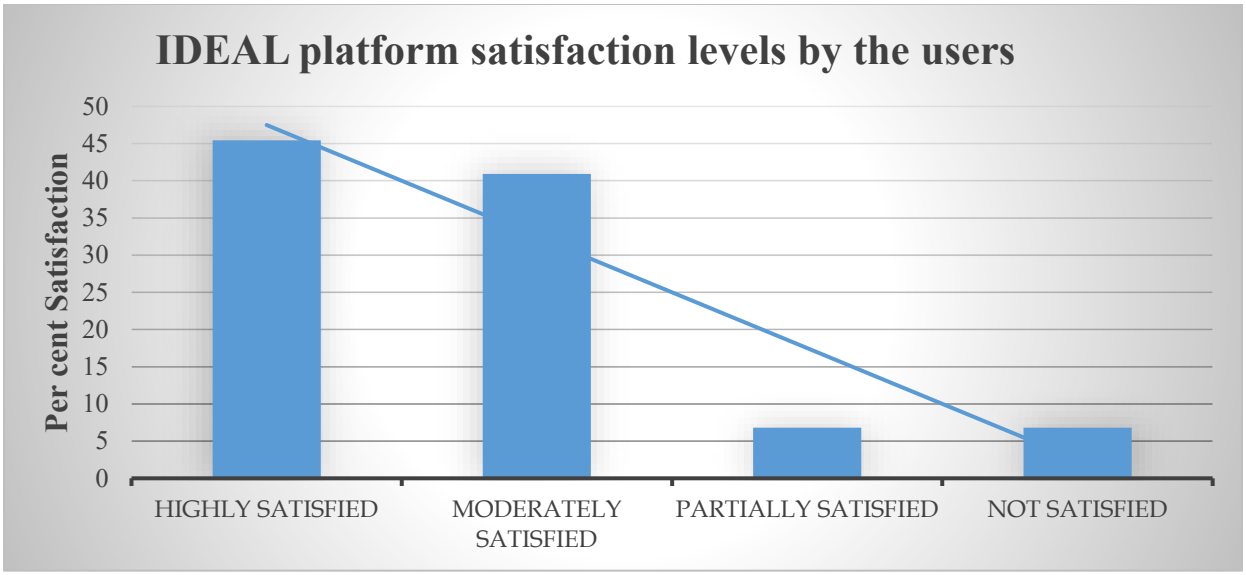

Fig. 3 Appraisal levels of IDEAL platform services by the users

Consortium for e-Resources in Agriculture (popularly known as CeRA) is an e-Consortium of Agricultural Libraries under the Indian Council of Agricultural Research for National Agricultural Research and Education System (NARES) Libraries. Established in November 2007, the Consortium for e-Resources in Agriculture (CeRA) is the first of its kind for facilitating 24x7 online accesses of select journals in agricultural and allied sciences to all researchers, teachers and students, policy planners, administrators and extension specialists in NARES through IP authentication. Out of 51 universities agricultural universities were assessed for the status of acquaintance with CeRA, almost 80 per cent of the universities were utilizing the services for online access of selected journals of agriculture and allied sciences with an overall satisfaction levels of 76.60 per cent.

VII. STATUS OF IMPLEMENTATION OF LMS IN ICAR INSTITUTIONS

ICAR, serves as the apex body for coordinating, guiding, and managing research and education in agriculture, including horticulture, fisheries, and animal sciences across the country. This is the one of the largest national agricultural system in the world with 117 ICAR institutes and 74 agricultural universities spread across the country.

For implementing LMS across ICAR institutes, agricultural universities and affiliated colleges, a subproject within National Agricultural Innovation Project (NAIP) component 1 was undertaken titled 'Strengthening of Digital Library and Information Management under NARES (eGranth)'. It is aimed at creating 'AgriCat', the union catalogue for providing digital access to resources from various research institutes as well as agricultural universities. Under this project, a successful attempt was made by ICAR to create a digital library e-Granth by connecting 37 libraries of the NARES to facilitate researchers, teachers, students and extension professionals. This was also provided uniform library management across the NARES libraries through an open source Library Management Software called Koha which also supports in integrating all libraries with standard protocols in a unified approach.

Status of Library automation and digitalization in Agricultural universities is always an important point discussion in the context of rapid increase of importance of agriculture education. Out of 60 agricultural universities responded for study 48 libraries are automated their libraries using Koha integrated Library management system, whereas 52 libraries (86.67%) are the members of krishikosh institutional repository of ICAR indication the positive sign of information sharing. It has been found that Radio Frequency Identification technology (RFID) implemented by only 35% of libraries while majority

i.e., 65% have not yet implemented (Veeranjaneyulu et al., 2017). A steep increase of automation in SAUs was noted in NAARM study indicating out of 63 universities participated in survey, a total of 99 per cent were automated when compared with 86.67 % in the previous study, it can be taken a yard stick for importance of automation given by agricultural universities.

A recent NAARM study revealed that the majority of national institutes and deemed universities are 99% automated, national agricultural research institutes are 81.63% automated, and animal science and fisheries institutes are over 75% automated (Fig. 4). It was further noted that majority of National Bureaus, Project directorates and National research centres automation is comparatively low i.e., 50 per cent, 45.45 per cent and 8.33 per cent respectively. A positive sign for the growth and quality of higher agriculture education was noted in present study that the 99 per cent of SAUs (State Agriculture Universities) were fully automated with the financial support of ICAR. The status of automation software's usage in the libraries of ICAR research institutes obtained in present study given us a conclusive idea about status of LMS in ICAR system. It reveals that Koha is the predominant choice, with 74% of the institutions using it. This is followed by Libsys at 9%, Soul at 5%, and other LMS solutions collectively accounting for 10% of usage. These results underscore Koha's significant lead in adoption among ICAR institutions (Fig.5).

Rise in concern and awareness about automation was observed in our present study can be attributed due to various factors. Our findings are in consonance with the report of Gunapala et al., (2020). Comprehensive account of various bottle necks of government in supporting higher education has clearly suggested that decline in government funding which have provided much of the inputs for profound change in libraries such as reduced staff number which in turn promoted the need of automation in the libraries. Further, rapid development in Information and communication technologies (ICT) which might have a decisive impact on automation implementation (Sorgo et al., 2017). Digital India policy of Indian government in the last decade has provide new opportunities in universities of Indian subcontinent. Broad band segment subscriber base increased to 801.6 million registering an annual growth of 8 per cent (Investment Information and Credit Rating Agency of India Limited). Covid-19 pandemic globally pushed all the sectors in a state of Lockdown however, the pandemic can stop schools, but it cannot stop education. In present study the steep rise in automation may be attributed to the above reasons

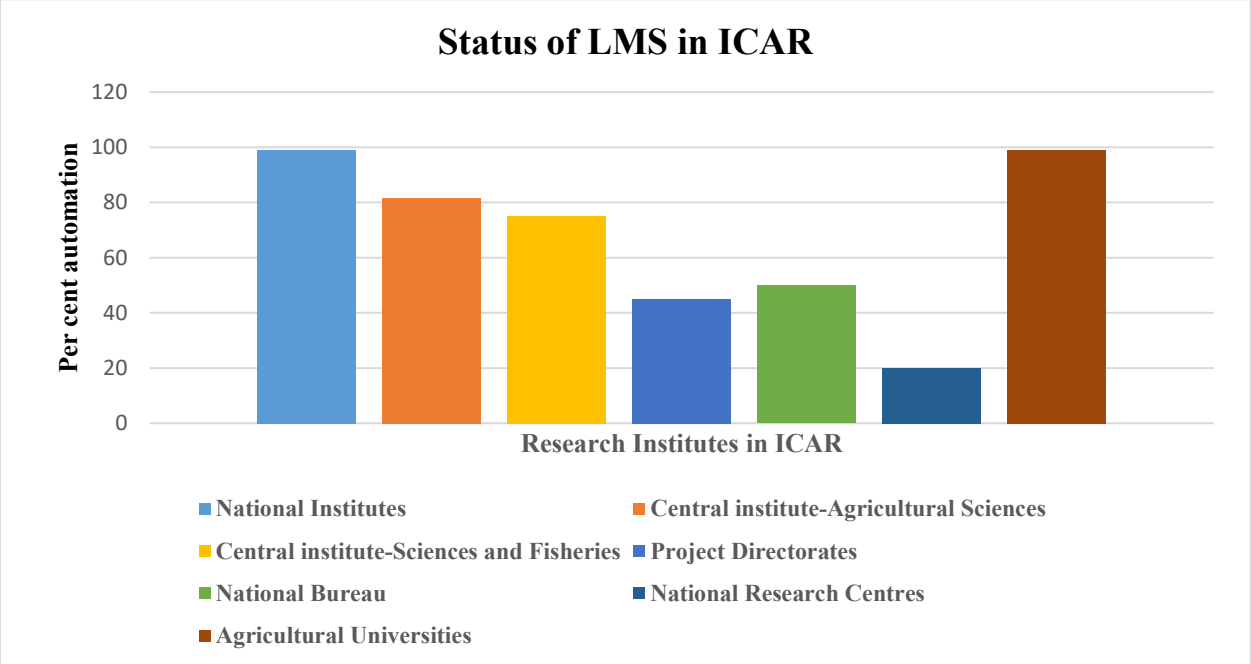

Fig.4 Status of LMS installation in ICAR institutions

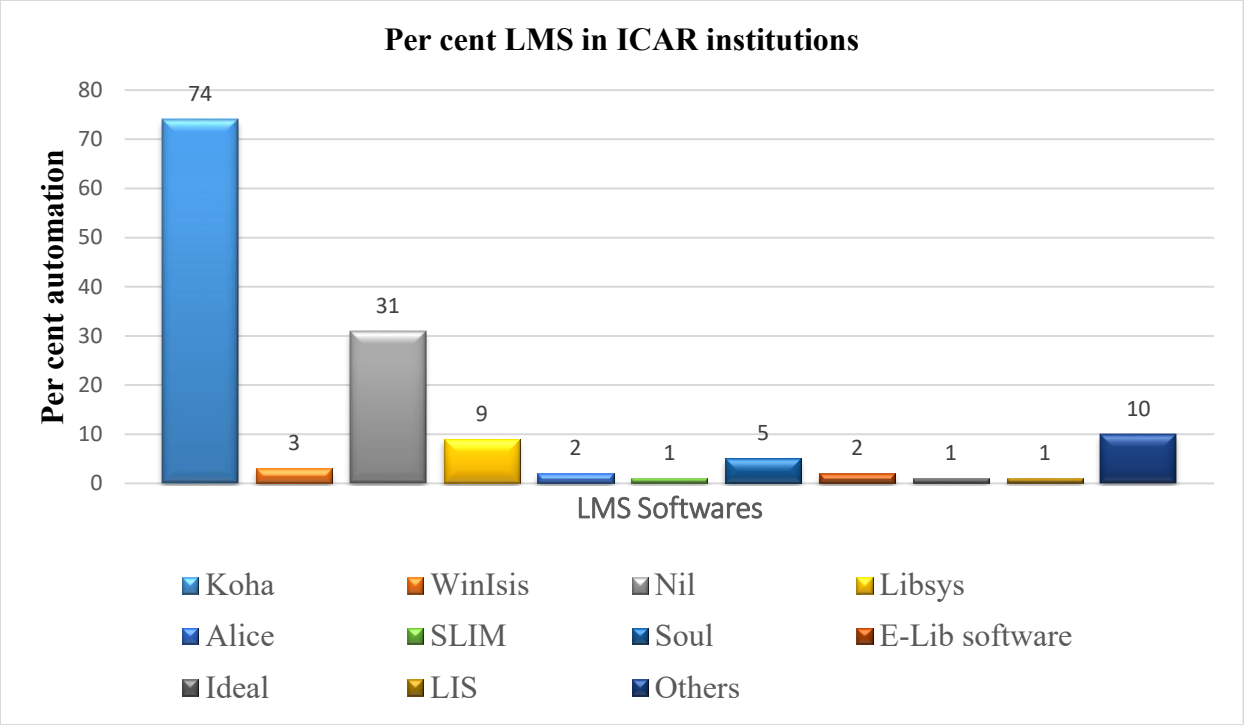

Fig. 5 Status of Koha and other LMS implementation in ICAR institutions

VIII. ROLE OF UNIVERSITY GRANTS COMMISSION (UGC) IN LIBRARY AUTOMATION

Books alone do not make a library. Similarly, a good collection of books also is not enough to ensure the successful working of a library. The success of a library depends in large measure upon the library staff who are responsible for its use and fulfilling the objectives of the library. The appointment of University Education Commission in 1948 under the Chairmanship of Dr. Radhakrishnan was the most significant action of Government of India towards the development of higher education in India. It is only after the appointment of this Commission that the actual process of the development of the University Libraries in India took place (Mohanty1993).

UGC from time to time has been constituting library review committees for reviewing various aspects of libraries so that necessary changes can be made. The Commission also imparts various types of training and developmental programme for the library personnel in order to enable them to cope with the fast changing environment. One of the major programmes that UGC launched was the establishment of the Academic Staff Colleges at various universities. UGC foresaw the need for professionalization of education and development of skills among library personnel to enable them to efficiently work in an ICT environment.

8.1. UGC- INFLIBNET Programme

INFLIBNET was first conceptualised in 1988, and the UGC launched it in April 1991. Its primary goals include computerising university libraries, developing union databases of their contents, facilitating resource sharing through networking, and granting quick access to data at the federal level. INFLIBNET has undertaken a number of initiatives to develop and train library personnel and library professionals. Indeed, INFLIBNET's cooperation has helped Indian university libraries develop an ICT culture (Salgar 1997).

8.2. Highlights of UGC-Infonet

1. It is a tool to distribute educational material and e-journals to all.

2. It is a resource for researchers and scholars for tapping the most up-to-date information.

3. It is an intranet for university automation.

4. The project will be funded by UGC with 90% capital investment and up to 100% of recurring cost.

5. INFLIBNET is the monitoring agency of this network and to provide assistance to universities for setting up IT infrastructure.

6. Universities are provided with high bandwidth Internet connectivity ranging from 64 kbps to 2 Mbps to connect to UGC-Infonet.

IX. PROBLEMS OF LIBRARY AUTOMATION IN INDIA

In our nation, the networking and computerization of university libraries has progressed quite slowly. By the time the Joint Academic Network (JANET) was launched in England in 1983, all of the participating libraries were prepared to connect to the network. However even ten years after INFLIBNET's founding, many university libraries in India have not yet been computerised. The following factors (Figure 6) were cited by different school of workers such as Suku and Pillai in 2005; Singh., 2003; Ansari et al., 2017 & Narayana J., 2019 as contributing to India's slow automation rate.

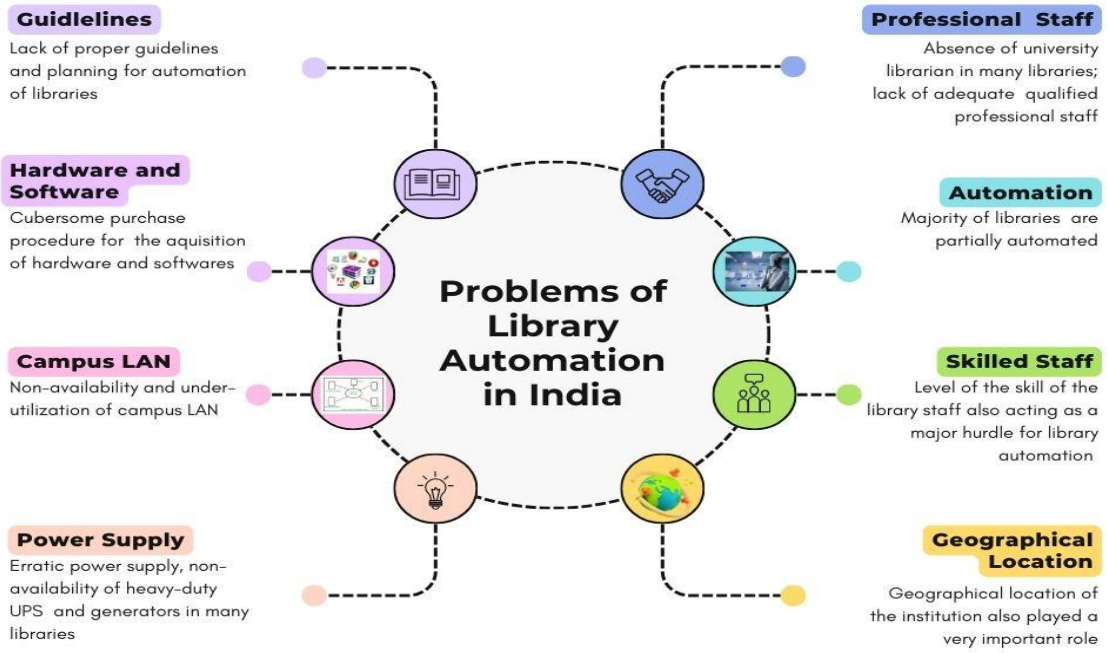

Fig. 6 Factors responsible for slow automation of library.

X. CONCLUSIONS AND RECOMMENDATIONS FOR THE SUCCESSFUL IMPLEMENTATION OF LIBRARY AUTOMATION AND FUTURE OF LIBRARY AUTOMATION

As we enter a fully digital era, library administration has not been unaffected. In order to more efficiently automate library management, present systematic review recommended that the deployment of LMS, particularly those supported by open-source technology, be widely pushed throughout India. To give users and librarians more control, an LMS mobile app needs to be created. The programming community should pay particular attention to adding more features to open source LMS so that even tiny libraries can benefit from this cutting-edge digital technology. Institutions need to organise more workshops on awareness for librarians, in an effort to make the open

source LMS bug-free, processes like the manufacturing of should also be given attention.

On the basis of the experience acquired during the implementation of automation of our library, the following suggestions are put forward which may improve the situation in the country.

1. The appointment of University Librarians should be done at once in all universities where that post is vacant and adequate funding and support should be allocated to improve library infrastructure, including hardware, software, and internet connectivity
2. Senior library professionals should visit computerized libraries to gather practical information about computerization of library operations and services
3. Erratic power supply should be corrected by installing high capacity UPS and power generator
4. Each university library should take initiative to digital library projects and e-learning projects and make it available to all libraries
5. Setup links between information networks of UGC, ICAR, CSIR, etc., for optimum use of resources
6. The value of library automation and its advantageous effects on education and research should be acknowledged by policymakers and government officials. To make the implementation of automated technologies in libraries easier, supportive policies, more money, and legal frameworks should be created.
7. Grants and financial possibilities targeted explicitly towards library automation initiatives should be aggressively sought after by libraries. The need for financing sources should be made more widely known, and help with the application procedure should be made available since majority of public funded universities are in a situation of crisis in funds
8. Periodical capacity building programmes should be organized for library staff to enhance their skills and knowledge in library automation systems, digitization techniques, and maintenance procedures
9. Awareness campaigns, workshops, and interactive sessions should be organized to educate library users about the benefits and usage of automated systems.
10. Collaboration with library associations and national bodies should be encouraged to establish guidelines and standards.

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