STATUS OF LIBRARY AUTOMATION SOFTWARE FACILITIES AND SERVICES IN TECHNICAL INFORMATION CENTRE'S (TICS) OF DRDO LABORATORIES IN INDIA: A STUDY

Dr Shivakumar T C
University Librarian
St Joseph's University, Bengaluru
E-Mail: shivulis82@gmail.com

Dr D V Nagesh
Technical Officer "C", CEMILAC, DRDO,
Ministry of Defence, Marathahalli, Bangalore.
E-mail: nageshdvphd09@rediffmail.com

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Abstract: The purpose of this paper is to examine the present status of library automation, extent of automation, areas of automation, types of software used, provision of OPAC and WEBOPAC and also usage of barcode/RFID technology to effective information delivery to the users . The present study highlights the effectiveness use of library automation software facilities and services in TIC of DRDO laboratories in India.

Keywords: Library Automation, Library Software, Areas of software, Types of Library Software, Library Consortia, WEBOPAC, RFID, Barcode.

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1.0 Introduction

The advances in Information Technology (IT) and Information Communication Technology (ICT) over the years have rapidly revolutionized to access information, delivery of information, dissemination of information from various methods and techniques adopted to effective use of information sources to the users.

Recent strides in information technology have prompted libraries to wholeheartedly embrace automation. The benefits offered by automated libraries transcend the scope of traditional library activities. Computers are now integral to library operations, enhancing efficiency and effectiveness while facilitating information management for informed decision-making. The advent and integration of information and communication technology (ICT) empower libraries not only to provide their patrons with the wealth of information within their own collections but also grant access to catalogues from a network of libraries, both local and beyond (Anil Singh, 2003).

The journey of library automation in India, which commenced in the late 1970s in a few specialized libraries, has now expanded to encompass the majority of academic libraries. Presently, there exists a heightened responsibility for libraries and information centers to deliver the most up-to-date and relevant information to users, thereby contributing to the enhancement of educational quality.

Library automation not only alleviates job-related stress for library staff but also facilitates the seamless and timely delivery of current information to users, enhancing the overall experience for both the users.

However the proper and adequate library automation software facilities and services the institution level in general and libraries in particular becomes a prerequisite and it should be prerogative of the management in charge of the library and information services in particular. So the study has therefore intended to make an objective assessment of library automation software facilities available in the TICs/Libraries attached to 25 DRDO Laboratories selected for this study (Table -1).

Table-1: List of Selected 25 DRDO Labs/Establishments in India for the study

S. No.	Name of the Labs & Location	Abbreviation	Year of Estd.
1	Laser Science And Technology Centre , Delhi	LASTEC	1950
2	Defence Scientific Information & Documentation Centre . Delhi	DESIDOC	1958

3	Naval Physical Oceanographic Laboratory . Kochi	NPOL	1958
4	Institute for Systems Studies and Analyses	ISSA	1959
5	Aeronautical Development Establishment , Bangalore	ADE	1959
6	Gas Turbine Research Establishment , Bangalore	GTRE	1959
7	Solid State Physics Laboratory , DELHI	SSPL	1960
8	Defence Electronics Research Laboratory, Hyderabad	DLRL	1961
9	Defence Food Research Laboratory , Mysore	DFRL	1961
10	Electronics & Radar Development Establishment , Banglore	LRDE	1962
11	Defence Metallurgical Research Laboratory, Hyderabad	DMRL	1963
12	Aeronautic Development Agency , Bangalore	ADA	1980
13	Defence Research &Development Laboratory, Hyderabad	DRDL	1980
14	Integrated Test Range , Balasore, Orissa	ITR	1982
15	Defence Bioenginering &Electromedical Laboratory, Bangalore	DEBEL	1982
16	Microwave Tube Research & Development Center, Bangalore	MTRDC	1984
17	Centre for Airborne Systems (CABS), Bangalore	CABS	1985
18	Centre for Artificial Intelligence and Robotics, Bangalore	CAIR	1986
19	Defence Avionics Research Establishment, Bangalore	DARE	1986
20	Advanced Numerical Research &Analysis Group , Hyderabad	ANURAG	1988
21	Research Centre Imarat, Hyderabad	RCI	1989
22	Centre of Fire, Explosive & Environmental Safety	CFEES	1992
23	Centre for Military Airworthiness & Certification , Bangalore	CEMILAC	1994
24	Proof & Experimental Establishment, Balasore, Orissa	PXE	1995
25	Advanced Systems Laboratory, Hyderabad	ASL	2001

Now a day, library collections are not limited to printed document only but also electronic resources. The value of information resources increase by their use and therefore it is important to know the utilization of the library resources. In this context the library automation software facilities and services are sought to access and utilize the library resources and services.

2.0 A Brief Review of Related Studies

To gain a comprehensive understanding of the subject, it is crucial and beneficial to survey pertinent literature and studies associated with the topic. However, to understand status and awareness of library automation facilities and services and effectiveness implementation of good numbers of studies have been undertaken and the number is quite large. In this context a report of related studies was presented.

Automation in modern libraries is not just economically viable but also technologically imperative to meet the demands of evolving knowledge landscapes. The exponential growth in material collections poses challenges in acquisition, storage, processing, and the dissemination of information (Bhardwaj & Shukla, 2000). The integration of computer-associated peripheral media has brought about a substantial quantitative and qualitative enhancement, particularly in the realm of online technology.

In their article "A Practical Approach to Library Automation," Bhardwaj and Shukla (2000) delve into the aims, objectives, and the necessity for a paradigm shift in library tools and techniques. Embracing the concept of library automation, the article explores various facets such as acquisition, database management, classification and cataloging, circulation, serial control, information retrieval, communication networks, and documentation services.

Sinha and Satpathy (2004) provide a concise history of library automation and networking in their work, "Library Automation and Networking for Managing Library and Information Services." The article traces the evolution of networks and the incorporation of information technology in Indian library services. It scrutinizes the essence of library automation, its necessity, and the areas where automation and networking play a crucial role. The conclusion emphasizes that the success of such endeavors relies heavily on proper planning and timely decisions by authorities.

In "Evaluating Library Software and Its Fitness for Purpose," Joint (2006) presents a conceptual paper based on existing software evaluation models. The article adapts general principles for evaluating software quality to the specific requirements characteristic of information retrieval and educational applications in library environments. The proposed model encompasses top-level factors such as functionality, reliability, usability, efficiency, maintainability, and portability.

Muir (2005), in his article "An Introduction to the Open-Source Software Issue," explores the landscape of Open-Source Software (OSS). Detailing the features and utilization of OSS, the article examines the status of OSS applications in universities and libraries across the Western world, including the USA, Canada, and New Zealand. Notably, OSS allows programmers to modify and redistribute the software, with the stipulation that these changes be made available to other developers.

3.0 Objectives of the Study:
Objectives of the study are as follows

- To identify different library automation software packages being used in Technical Information Centre(TIC) of DRDO Laboratories in India for library management systems.
- To identify the influence factor for selection of library software packages and to find out reasons behind not automating library housekeeping operations.
- To examine and investigates the Library Automation status in various TICs/libraries in DRDO Laboratories in India
- To know about the computerization process.
- To study the status of library automation, areas of automation, software used and use of technology in various TICs/libraries in DRDO Laboratories in India.

4.0 Methodology
The current research employs a survey methodology, utilizing both primary and secondary information sources. The survey primarily relies on the widely adopted 'Questionnaire method.' A structured questionnaire is employed to gather the perspectives of Librarians/Heads of TICs regarding library software, supplemented by subsequent interviews. The study seeks opinions on various issues related to library housekeeping operations from the participating TICs/libraries. Out of over 50 DRDO Laboratories, 25 were selected for the study, as outlined in Table -1. The questionnaire is meticulously designed to align with the study's objectives, covering all relevant aspects. Additionally, the researcher incorporates interview, onsite inspection, and observation methods for comprehensive data collection.

The title of the research area is 'status of library automation software facilities and services in Technical Information Centres (TICs) of DRDO Laboratories in India: A Study. This study is confined to the availability of library automation software, types of software used, areas of automation, RFID and barcode etc., in DRDO laboratories in India.

### 5.0 Data Analysis and Interpretation
The data were collected using structured questionnaire from 25 TICs/Libraries' heads on the core objectives of the study, is presented and analysed.

5.1 Status of Library Automation:
The following section shows that the details of status of library automation among the TICs of DRDO laboratories.

Table-2: Status of Automation

| Automation	Name of TICs	No. of TICs
Yes	LASTEC, DESIDOC, ISSA, ADE, GTRE, SSPL, DLRL, LRDE, ADA, DRDL, ITR, MTRDC, CABS, CAIR, DARE, ANURAG, RCI, CEMILAC, PXE, ASL, DMRL, NPOL, DFRL	23 (92%)
No	DEBEL, CFEES	2 (08%)
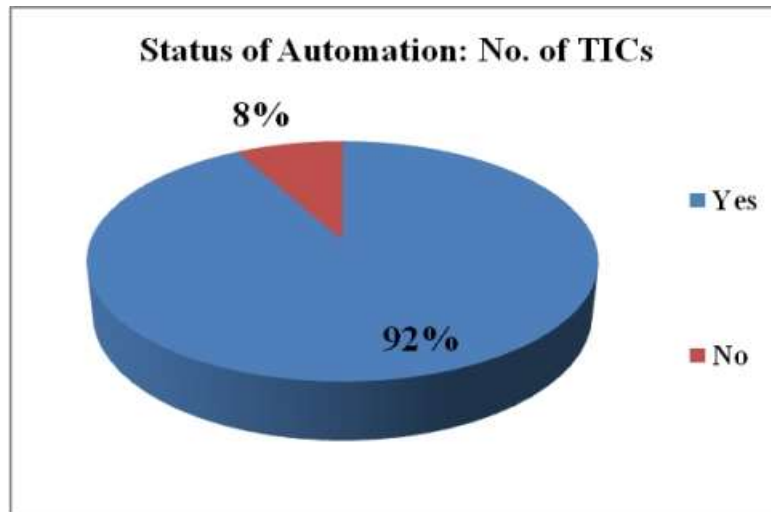
Figure-1: Status of Automation

It is found from the Table-2 that 92% of TICs have automated their library and information work. Only 02(08%) TICs namely DEBEL and CFEES are yet to automate their library functions and services. Further, an opinion of librarians about the status/extent of automation process undertaken is examined through the process of data collection on library automation and the kinds of services and activities automated.

5.2 Extent of Automation

Table-3:   Extent of Automation

Extent of Automation	Name of TICs	No. of TICs
Fully Automated	SSPL, LASTEC, GTRE, LRDE, CAIR, DLRL, MTRDC, DARE, DESIDOC, ADE, CABS, ADA, DRDL, RCI, PXE, NPOL, DMRL	17 (68%)
Partially Automated	CEMILAC, ITR, ASL, ANURAG, ISSA, DFRL	06 (24%)
Not Automated	DEBEL, CFEES,	02 (08%)
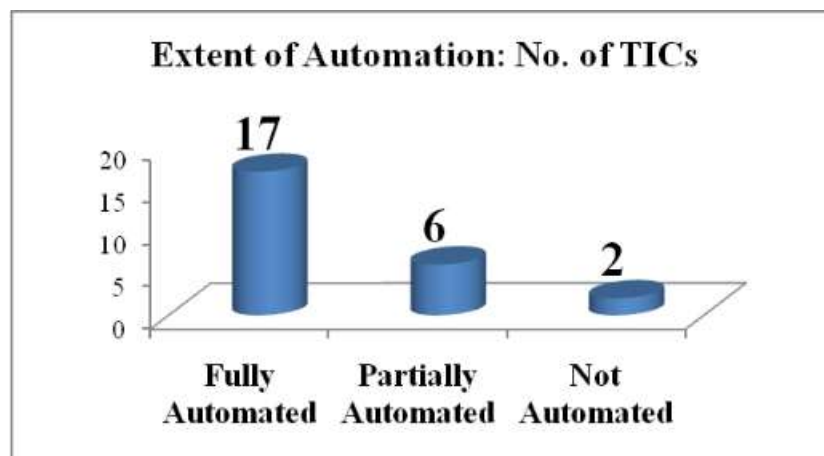
Figure-2: Extent of Automation

The data given in the Table-3 shows that 17(68%) TICs of DRDO laboratories have fully automated their TICs and 06 TICs attached to CEMILAC, ITR, ASL, ANURAG, DFRL and ISSA have automated their TICs partially.

Lastly 02(08%) TICs namely DEBEL and CFEES have expressed that they have not initiated the process yet and the reasons for the same are not known.

5.3 Areas of Automation

Table-4: Areas of Automation

Modules	Fully automated					Partially Automated					Not Automated				
Areas of Automation	Acquisition	Cataloguing	Circulation	OPAC	Serial Control	Acquisition	Cataloguing	Circulation	OPAC	Serial Control	Acquisition	Cataloguing	Circulation	OPAC	Serial Control
No. of Responses	8 -32%	18 -72%	19 -76%	20 -80%	11 -44%	9 -36%	3 -12%	3 -12%	2 -8%	8 -32%	2 -8%				
No. of TICs	LRDE, GTRE, DLRL, ADA, CABS, DESIDOC, DMRL, NPOL	LASTEC, SSPL, PXE, CAIR, LRDE, GTRE, MTRDC, DLRL, ITR, ANURAG, RCI, ADA, CABS, ADE, DARE, DESIDOC, DMRL, NPOL	LASTEC, SSPL, PXE, CAIR, LRDE, GTRE, MTRDC, DLRL, ANURAG, ASL, DRDL, ADA, CABS, ADE, DARE, DESIDOC, DMRL, DFRL, NPOL	SSPL, PXE, CAIR, LRDE, GTRE, MTRDC, DLRL, ANURAG, RCI, ASL, DRDL, ADA, CABS, ADE, DARE, ISSA, DESIDOC, DMRL, DFRL, NPOL	PXE, LRDE, GTRE, MTRDC, DLRL, ANURAG, ADA, ADE, DESIDOC, DMRL, NPOL	SSPL, PXE, MTRDC, CEMILAC, ITR, ANURAG, ASL, DRDL, ADE	CEMILAC, DRDL, ISSA	CEMILAC, ITR, RCI	CEMILAC, ITR	SSPL, CAIR, CEMILAC, ITR, RCI, ASL, CABS, DFRL	CFESS, DEBEL,				

It is observed from the Table-4 that majority 80% of TICs have developed Online Public Access Catalogue (OPAC). It is quite important that user concerned services the catalogue; in particular OPAC is taken up on priority as revealed in the Table. The circulation services are equally committed on important and on par with the OPAC with 80% of TICs fully automating and implementing this service. Thus, library catalogue and circulation services are fully automated areas with majority of TICs. Further, the next priority area of serials control system with 44% of TICs automating this process. In the context of partially automated systems the acquisition and serials control systems with 36% and 32% respectively are given the priority. Thus, based on the above analysis it can be concluded that cataloguing including OPAC and circulation, serials control systems and acquisition work related activities are given priority among majority of TICs of the study.

5.4 Automation Software

Table-5: Types of Library Automation Software used

Name of the Software	Response Rate	Names of TICs
In-house (Internally developed software)	8 (32%)	ADA, LASTEC, SSPL, ISSA, DLRL, ITR, RCI, CEMILAC
Libsuite 8.0	3 (12%)	ADE, LRDE, MTRDC
Virtua	1 (04%)	GTRE
KOHA	1 (04%)	CABS
LibSys	6 (20%)	DESIDOC, DRDL, CAIR, PXE, NPOL, DMRL
LiBeX Net	1 (04%)	DARE
SLIM 2.1, CALIBRE	1 (04%)	ANURAG
SOUL 2.0	1 (04%)	ASL
New Gen Lib	1 (04%)	DFRL
No Lib. S/W	2 (08%)	DEBEL, CFEES

Types of Lib. Automation Software used: No. of TICs
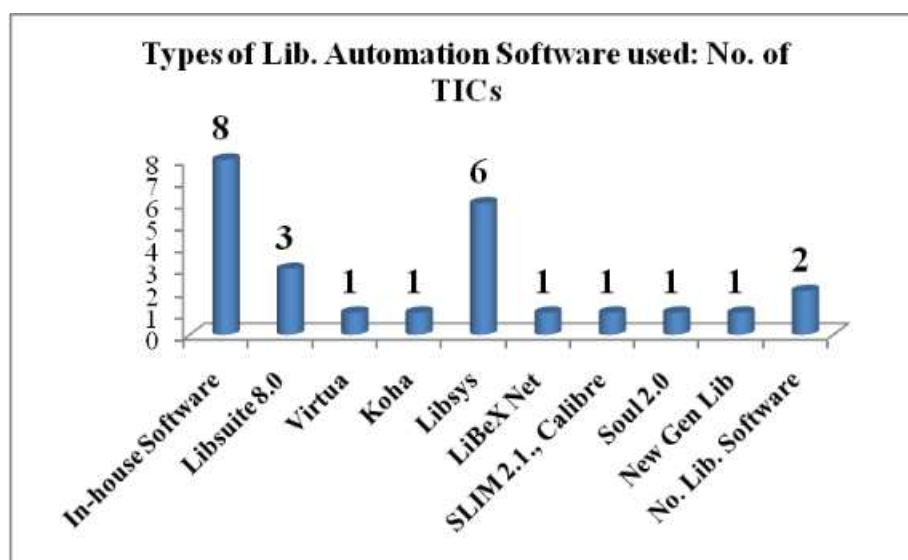
Figure-3: Types of Lib. Automation Software used

It is evident from the above Table-5 that the TICs of DRDO laboratories have adopted various types/kinds of software for automation purpose. It is found that 8 out of 25 TICs viz., ADA, LASTEC, SSPL, ISSA, DLRL, RCI, CEMILAC and ITR have adopted in-house software and quite interestingly one of the has been still managing with the dBASE III Plus platform. Secondly 15 out of 22 TICs comprising GTRE, CABS, DESIDOC, DRDL, CAIR, PXE, ASL, DARE, ANURAG, ADE, LRDE, MTRDC, DMRL, NPOL and DFRL with 60% of them have adopted the commercial software.   As found two TICs DEBEL and CFEES have not automated their libraries hence have obviously not software used by them.

As evident from the above table there is assortment of both in-house and commercial software packages and surprisingly none of the have a FOSS, due to the reason that the FOSS is a recent development and none of the TICs have not chosen to change over. The details of TICs using different types of ILMS are furnished under Table-6 above.

Table-6: Type of Library Software

Type of Software	Response Rate	Name of the TICs
Commercial	15 (60%)	DESIDOC, GTRE, CABS, DRDL, CAIR, PXE, DARE, ANURAG, ADE, LRDE, MTRDC, DMRL, NPOL, DFRL & ASL
In-house software	08 (32%)	ADA, LASTEC, SSPL, ISSA, DLRL, RCI, CEMILAC, ITR
No Library software	02 (8%	DEBEL, CFEES
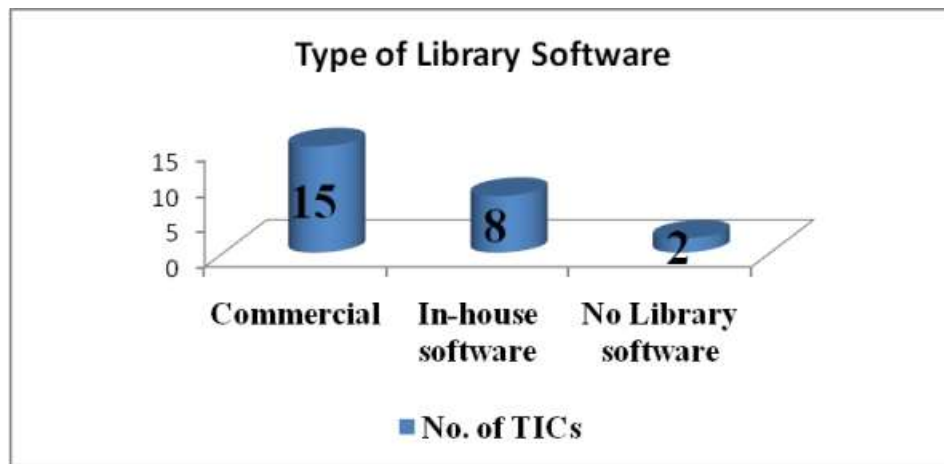
**Figure-4: Type of Library Software**

It is clear to note that 15 TICs are using commercial library software. Whereas, 8 TICs namely ADA, LASTEC, SSPL, ISSA, DLRL, RCI, CEMILAC, ITR are using in-house library software. It has been already mentioned that no TIC has adopted FOSS- ILMS.

5.5 Provision of OPAC/WEBOPAC
The data of TICs with provisions of OPAC and WEBOPAC facilities were compiled and presented under the Table-7 The data in summary shows that in 18(72%) TICs the OPAC/WEBOPAC facilities are provided and in 5(20%) TICs only OPAC is available.   The details of TICs with the above distribution with names of DRDO laboratories are presented under the Table-7 below and it is seen from the previous tables that two of the 25 TICs have not automated their libraries hence the absence of OPAC/WEBOPAC in them.

Table-7: Provision of OPAC/WEBOPAC

| Network environment	Response Rate	Name of TICs
OPAC/WEBOPAC	18 (72%)	DESIDOC, ADE, GTRE, SSPL, DLRL, LRDE, ADA, DRDL, ITR, MTRDC, CABS, CAIR ANURAG, RCI, PXE, ASL, DMRL, NPOL
OPAC	05 (20%)	LASTEC, ISSA, DARE, CEMILAC, DFRL
Not Responded	02(8%)	DEBEL, CFEES
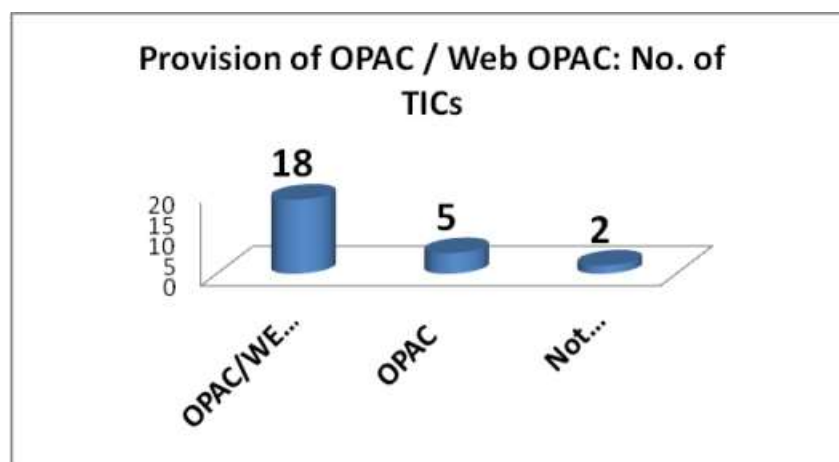
Figure-5: Provision of OPAC/Web OPAC

Lastly 02 (08%) TICs namely DEBEL and CFEES are not providing any kind of facilities because they have not automated their libraries.

5.6 Usage of Barcode/RFID Technology: The details given below show the status of Barcode/RFID technology in TICs of DRDO laboratories.

Table-8: Usage of Barcode/RFID Technology

Technology	Name of TICs	No. of TICs
Barcode	ADA, ADE, DLRL, DRDL, ITR, CABS, DARE, CEMILAC, PXE, ASL, NPOL	11 (44%)
RFID	DESIDOC, GTRE, LRDE, MTRDC, CAIR, ANURAG, DMRL, DFRL	08 (32%)
Not respondent	LASTEC, ISSA, SSPL, DEBEL, RCI, CFEES,	06 (24%)
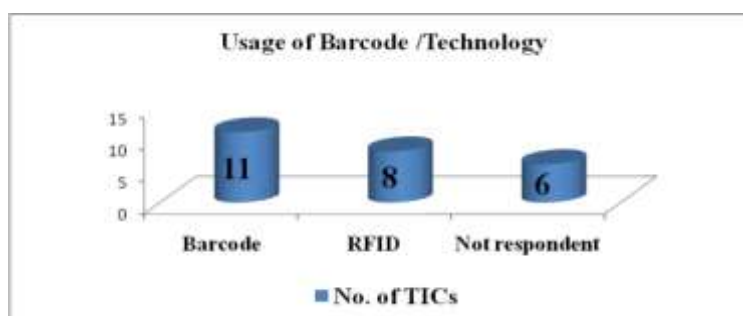
Figure-6: Usage of Barcode / RFID Technology

It is observed that 11(44%) TICs under the study have adopted Barcode technology and 08(32%) of TICs have adopted RFID technology in library and information work and activities. Remaining 06(24%) TICs namely LASTEC, DESIDOC, ISSA, SSPL, DEBEL, ADA, RCI & CFEES, have not adopted neither Barcode nor RFID technologies.

6.0 Findings of the Study:

Since a majority of the TICs were established after 1981 to 1990, there were 09 DRDO TICs were established **(Table-1).**

It is found that 92% of TICs have automated their library and information work. Only 02(08%) TICs namely DEBEL and CFEES are yet to automate their library functions and services **(Table-2).**

It is found that 17(68%) TICs of DRDO laboratories have fully automated their TICs and 06 TICs attached to CEMILAC, ITR, ASL, ANURAG, DFRL and ISSA have automated their TICs partially. Lastly 02(08%) TICs namely DEBEL and CFEES have expressed that they have not initiated the process yet and the reasons for the same are not known **(Table-3).**

It is observed that majority 80% of TICs have developed Online Public Access Catalogue (OPAC). It is quite important that user concerned services the catalogue; in particular OPAC is taken up on priority as revealed in the Table. The circulation services are equally committed on important and on par with the OPAC with 80% of TICs fully automating and implementing this service. Thus, library catalogue and circulation services are fully automated areas with majority of TICs. Further, the next priority area of serials control system with 44% of TICs automating this process. In the context of partially automated systems the acquisition and serials control systems with 36.00% and 32.00% respectively are given the priority **(Table-4).**

It is evident from that the TICs of DRDO laboratories have adopted various types/kinds of software for automation purpose. It is found that 8 out of 25 TICs viz., ADA, LASTEC, SSPL, ISSA, DLRL, RCI, CEMILAC and ITR have adopted in-house software and quite interestingly one of the has been still managing with the dBASE III Plus platform. Secondly 15 out of 22 TICs comprising GTRE, CABS, DESIDOC, DRDL, CAIR, PXE, ASL, DARE, ANURAG, ADE, LRDE, MTRDC, DMRL, NPOL and DFRL with 60% of them have adopted the commercial software. As found two TICs DEBEL and CFEES have not automated their libraries hence have obviously not software used by them **(Table-5).**

It is clear to note 15 TICs are using commercial library software. Whereas, 8 TICs namely ADA, LASTEC, SSPL, ISSA, DLRL, RCI, CEMILAC, ITR are using in-house library software. It has been already mentioned that no TIC has adopted FOSS- ILMS **(Table-6).**

It is found that 18(72%) TICs the OPAC/WEBOPAC facilities are provided and in 5(20%) TICs only OPAC is available. 02 (08%) TICs namely DEBEL and CFEES are not providing any kind of facilities because they have not automated their libraries **(Table-7).**

It is observed that 11(44%) TICs under the study have adopted Barcode technology and 08(32%) of TICs have adopted RFID technology in library and information work and activities. Remaining 06(24%) TICs namely LASTEC, DESIDOC, ISSA, SSPL, DEBEL, ADA, RCI & CFEES, have not adopted neither Barcode nor RFID technologies **(Table-8).**

7.0 Suggestions/Recommendations:

Library automation brings advantages to both library staff and users by alleviating staff job stress and facilitating the remote and timely provision of up-to-date information. The current study explores the status of library automation software in the Technical Information Centers (TICs) and libraries of DRDO laboratories in India, leading to the following recommendations:

1. Librarians should meticulously evaluate each software module through demonstrations before making a selection.
2. Cost-effectiveness should be a crucial criterion for librarians when choosing software for their parent institutions.
3. Opting for standard library software is recommended to enable seamless data exchange among libraries through computer networking, fostering future resource sharing. Standard library software, characterized by reliability, efficiency, flexibility, expansiveness, safety, user-friendliness, module-based structure, and

up-to-date technology, should be installed to meet the present and future needs of DRDO libraries in India. The recommendation is for all DRDO libraries to adopt standard library software for automation.

8.0 Conclusion

In conclusion, the information age has brought about challenges in collecting, processing, storing, and disseminating information. Computer and telecommunication technology have facilitated the exchange of information resources globally. Immediate steps are necessary to implement automation facilities and services in the Technical Information Centers (TICs) of DRDO laboratories in India to provide effective and expeditious service to top management, scientists, officers, staff, and researchers.

Library automation is a process that demands proper planning, timely implementation, and evaluation. The librarian, functioning as a skilled administrator, plays a pivotal role in analysing the current situation, setting priorities, and selecting a suitable integrated library management system to meet user requirements. The emergence of open-source software presents a new opportunity in library automation, offering advantages for government organizations, the private sector, and educational institutions. Organizations in developing nations that leverage free and open-source software stand to benefit significantly, while those neglecting this opportunity may witness a lag in their Information and Communication Technology (ICT) development compared to their counterparts.

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