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Sambhunath Sahoo

Indian Institute of Technology Bhubaneswar, Odisha, India, sambhumlis@gmail.com

Krushna Chandra Panda

Sambalpur University, ODISHA, INDIA, krushna52@yahoo.co.in

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Indian Institutes of Technology (IITs) Library System: A Comparative Study

*Sambhunath Sahoo, Assistant Librarian, IIT Bhubaneswar, Odisha
K C Panda, Former Professor, Head & Dean, Sambalpur University, Odisha
*Corresponding Author E-mail: sambhu@iitbbs.ac.in

Abstract

The main purpose of the study is to examine the Indian Institutes of Technology (IITs) Library System in India. The survey method is applied to IIT Libraries, where the questionnaire is used as a tool for data collection. This study is limited to IIT Libraries of India that established till 2015 with the inclusion of IIT (ISM) Dhanbad, one of the oldest institutes of the country, renamed in 2016. Data analysis revealed that the IIT Kharagpur library has the highest number of registered users (13254) and hardware resources (182), while the IIT Tirupati library has the lowest number of registered users (453) and hardware resources (6). In case of availability of print resources, Books are the primary print resource in IIT Libraries, followed by bound volumes and thesis & dissertations. In the case of electronic resources, e-books, e-journals, and e-theses & dissertations (ETDs) are the primary electronic resources in the IIT Libraries of India. In the use of library technology solutions, out of 18 IIT Libraries, 17 libraries were used more than 50% of library technologies, and only one IIT Library used 30% of library technologies. The Central Library of IIT Delhi used the highest number of library technology (10), while the Central Library of IIT Tirupati used the lowest number of library technology (3). This study may provide some insights into the librarians and researchers about the IIT Library system in India.

Keywords: *Library system, Users, Resources, Services, Library technology, Library website, IIT, India*

1.0 Introduction

The Indian Institutes of Technology (IITs) first conceptualized by Sir Ardeshir Dalal from the Viceroy's Executive Council (<https://www.iitsystem.ac.in/>), are apex autonomous public institutions of higher education, particularly for technical education and research in India and owe their existence to the visionary leadership of India's first Prime Minister late Pandit Jawaharlal Nehru. All IITs are governed by the Institutes of Technology Act, 1961 which has declared them as institutions of national importance and lays down their powers, funding, duties, and framework for governance, etc. The main objectives of IITs are to impart world-class training in engineering and technology and to conduct

research in the relevant fields for the advancement of learning and dissemination of knowledge (Jotwani, 2013). At present, there are twenty-three (23) IITs set up at Kharagpur, Bombay, Madras, Kanpur, Delhi, Guwahati, Roorkee, Ropar, Bhubaneswar, Gandhinagar, Hyderabad, Jodhpur, Patna, Indore, Mandi, Varanasi, Tirupati, Palakkad, Dhanbad, Bhilai, Goa, Jammu, and Dharwad.

The library system in IITs, one of India's prominent academic library systems, is well maintained and modernized Central Library in every institute. The focus at these libraries is to facilitate the creation of knowledge through acquisition, organization, dissemination of information and knowledge resources, and provision of user-responsive services (Jotwani, 2013). It serves its users with resources and services of global standards using smart library technologies, which makes them the liveliest place on the campus, providing a safe, comfortable, and friendly environment. These libraries have been the focus of several research studies in India because of their superior infrastructure, excellent collection, the better quality of services, and highly motivated staff. However, the whole gamut of the study presents a comprehensive and up-to-date overview of registered library users, library services, resources (print, electronic and hardware resources), and library technology solutions used by IIT libraries to provide smart library services to their respective patrons.

2.0 Literature Review

Some of the previous studies relating to the present study are discussed here. Verma and Sonkar (2017) studied the use of Information and Communication Technology (ICT) infrastructure, including library management system software, institutional repository software, security system, library network, web browser, network system software, internet connectivity and antivirus software in the IIT libraries in India. Another study on ICT facilities and services among Engineering College Libraries of Andhra Pradesh found that DELNET is the most preferred information network service and VSAT is mostly used communication service (Kumar, 2015). Mondal and Bandyopadhyay (2014) did a survey on the availability of ICT infrastructure in the University Libraries of West Bengal in India and found that most of the libraries have the basic infrastructural facilities.

Singh and Samyal (2014) evaluated the web contents of 15 IIT Libraries, using the e-survey method. The study unearths that IIT Kharagpur is the top provider of informational web content to its users, followed by the IIT Madras. The study recommended that each IIT Library should update library-related information, library collection, resources, services, Library 2.0 tools, design, layouts, and hyperlinks of its library website. Jotwani (2013) studied the level of automation, availability of ICT

infrastructure, access to electronic resources, and services, including the digital library initiatives taken by the IIT libraries. He said that libraries are an integral part of the IIT system and are highly valued by their users for their services by highly skilled staff, and easy to use collections. He suggested that these libraries need to move to the next level of technological up-gradation, including the application of cloud computing to improve their resources and services. Jeevan and Padhi (2008) studied on Infrastructure, Resources, and Services in IIT libraries and found various aspects of libraries in premier institutions, such as IITs, IIMs, and CUs are of continued interest to Library and Information Science researchers. Therefore, the present study is conducted with the objectives of research in mind.

3.0 Objectives of the Study

The main objectives of the study are:

- To identify the registered users of the IIT Library system;
- To examine the various type of resources (print, electronic and hardware resources) available at the IIT Library system;
- To study the services provided by the IIT Libraries to their users; and
- To analyze the library technology solutions used by the IIT Libraries in India.

4.0 Scope and Methodology

The present study has been restricted to the Indian Institute of Technology Library System in India. Out of 23 IITs, nineteen (19) IITs were taken in this study that established till 2015 with the inclusion of IIT (ISM) Dhanbad and excluding the rest four (4) new IITs (IIT Bhilai, IIT Goa, IIT Jammu, and IIT Dharwad) established in the year 2016. The study is based on the IIT Library system, which includes registered users, print and electronic resources, hardware resources, services, and library technology solutions used to provide services to their respective users. For a quantitative approach, the present study conducted a survey among the 19 IIT Libraries using a questionnaire as a data collection tool during the year 2018. The collected responses were quantified with the help of Microsoft Excel and presented in the next section, data analysis.

5.0 Data Analysis

Questionnaires were distributed among 19 IIT Librarians/In-charge and received a response from 18 librarians with a rate of 94.7%, which are presented here in different sub-sections. The researchers, therefore, coded each IIT Library with LIB followed by a sequence number like LIB01, LIB02 LIB18 to make the interpretation of data prominent. Table 1 shows the list of IITs and their libraries.

Table 1: Indian Institutes of Technology (IITs) and their Libraries

S. No.	Name of the Institution	Name of the Library	Estd.	Code
1	IIT Kharagpur	Central Library	1951	LIB01
2	IIT Bombay	Central Library	1958	LIB02
3	IIT Madras	Central Library	1959	LIB03
4	IIT Kanpur	P K Kelkar Library	1959	LIB04
5	IIT Delhi	Central Library	1961	LIB05
6	IIT Guwahati	Lakshminath Bezbaroa Central Library	1994	LIB06
7	IIT Roorkee	Mahatma Gandhi Central Library	2001	LIB07
8	IIT Ropar	Central Library	2008	LIB08
9	IIT Bhubaneswar	Central Library	2008	LIB09
10	IIT Gandhinagar	Central Library	2008	LIB10
11	IIT Hyderabad	IITH Library	2008	LIB11
12	IIT Jodhpur	The Learning Hub	2008	LIB12
13	IIT Patna	Central Library	2008	LIB13
14	IIT Indore	Central Library	2009	LIB14
15	IIT Mandi	Central Library	2009	LIB15
16	IIT (BHU) Varanasi	Main Library	2012	LIB16
17	IIT Tirupati	Central Library	2015	LIB17
18	IIT (ISM) Dhanbad	Central Library	2016	LIB18
19	IIT Palakkad	Central Library	2015	LIB19*

*LIB19 did not provide any response. Hence, excluded from this study.

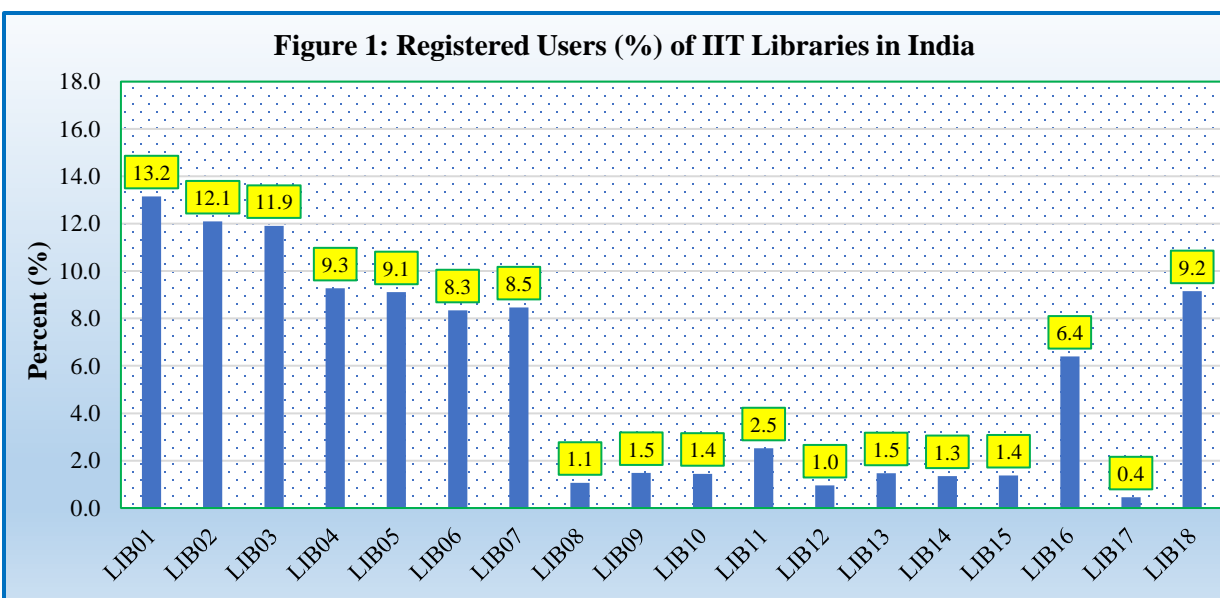
5.1 Registered Users of IIT Libraries in India

Users are the backbone of any academic library system globally, mainly including students, teachers, and staff. In this context, the registered users of IIT Libraries in India are segregated into the following groups: (i) Students (UG - undergraduates and PG - postgraduates), (ii) Researcher (PhD and Post-Doctoral Fellow), (iii) Faculty members, (iv) Non-teaching staff, and (v) Others. Table 2 depicts different categories of IIT Library users with their respective numbers. It is observed that IIT Kharagpur Library (LIB01), founded in 1951, has the highest number of users (13254), followed by IIT Bombay and IIT Madras, while IIT Tirupati Library (LIB17), founded in 2015, has the lowest number of users (453), which may be either due to the age of the Institution or the number of programmes offered by individual Institution.

Table 2: Registered Users of IIT Libraries in India (N=18)

Library	Student	Researcher	Faculty	Non-Teaching Staff	Others	Total	Percent
LIB01	8803	2457	694	1150	150	13254	13.2
LIB02	6625	3022	618	1820	100	12185	12.1
LIB03	6373	2767	607	1050	1199	11996	11.9
LIB04	6083	1620	436	1050	150	9339	9.3
LIB05	5345	2466	530	735	100	9176	9.1
LIB06	4848	1616	436	730	777	8407	8.3
LIB07	6109	1816	456	150	0	8531	8.5
LIB08	614	224	115	120	0	1073	1.1
LIB09	1031	211	129	100	20	1491	1.5
LIB10	912	295	111	140	0	1458	1.4
LIB11	1446	810	183	100	0	2539	2.5
LIB12	657	146	54	101	0	958	1.0
LIB13	937	332	110	85	15	1479	1.5
LIB14	734	384	116	71	52	1357	1.3
LIB15	853	223	106	200	0	1382	1.4
LIB16	4763	824	316	536	0	6439	6.4
LIB17	350	14	49	40	0	453	0.4
LIB18	5839	1841	340	1200	0	9220	9.2
Total	62322	21068	5406	9378	2563	100737	100.0

Figure 1: Registered Users (%) of IIT Libraries in India



5.2 Print Resources of IIT Libraries in India

Academic Library, including IIT Libraries, supports teaching, learning, and research activities of the institute with the available print and electronic resources. Print resources, which provide both primary and secondary sources of information, attract users to the library for reading in order to get information for their academic and research purposes. Table 3 shows different categories of print resources available in each IIT Library with their respective numbers. The total number of print resources available at 18 different IIT Libraries under study were 3031948. Print resources available in the libraries of the first generation IITs (old) found more in number than the second and third generation IITs (new). It is inferred that books are the primary print resource in IIT Libraries, followed by bound volumes, and thesis and dissertations.

Table 3: Print Resources of IIT Libraries in India (N=18)

Library	Books	Journals	Magazines	Newspapers	Theses & Dissertations	Bound Volumes	Others	Total
LIB01	265000	76	25	12	5800	132000	0	402913
LIB02	266966	150	235	10	22294	118925	0	408580
LIB03	266932	15	0	10	6697	114002	0	387656
LIB04	223468	0	0	10	16210	235537	0	475225
LIB05	215500	690	0	5	5000	105200	13430	339825
LIB06	154564	67	0	5	1565	37547	0	193748
LIB07	264000	130	24	7	15000	62000	0	341161
LIB08	14000	20	10	7	50	500	0	14587
LIB09	16846	0	20	8	50	0	0	16924
LIB10	26434	21	110	18	201	0	0	26784
LIB11	16700	0	0	5	750	0	0	17455
LIB12	12598	4	16	6	146	0	0	12770
LIB13	17762	0	1	10	66	0	0	17839
LIB14	33000	3	26	10	219	0	0	33258
LIB15	17450	6	13	14	18	0	0	17501
LIB16	121020	34	0	5	445	17738	0	139242
LIB17	4800	22	3	8	0	40	0	4873
LIB18	130237	22	40	14	10934	40360	0	181607
Total	2067277	1260	523	164	85445	863849	13430	3031948

5.3 Electronic Resources of IIT Libraries in India

Electronic resources (or e-resources) are those resources that are available in digital format and accessible electronically (Tan, 2016). E-resources support the teaching, learning, and research activities of academia. Table 4 acknowledges different categories of electronic resources available in each IIT Library with their respective numbers. The total number of e-resources available in 18 IIT Libraries under study was 1156783. It is found that the highest number of electronic resources among IIT Libraries in India were e-books (786432), followed by e-journals (270189), and e-theses and dissertations (65258). It is, therefore, inferred that e-books and e-journals are the primary electronic resources in the IIT Libraries of India.

Table 4: E-Resources of IIT Libraries in India (N=18)

Library	E-Books	E-Journals	E-Magazines	E-Newsletters	E-Theses and Dissertations	E-Databases	CD/DVDs	Audio Cassette	Others	Total
LIB01	135000	26000	0	1	4000	110	3500	0	0	168611
LIB02	5120	25000	0	0	22294	105	2784	0	0	55303
LIB03	14986	16000	0	0	16210	90	5780	0	5353	58419
LIB04	8000	20000	0	0	1	90	357	0	0	28448
LIB05	4000	25000	0	0	5000	100	2500	0	0	36600
LIB06	153089	24264	0	0	678	68	5801	0	2066	185966
LIB07	33300	15000	10	5	13000	60	300	0	0	61675
LIB08	5000	7000	0	1	50	52	153	0	0	12256
LIB09	800	8645	0	0	45	49	300	0	0	9839
LIB10	5884	12139	0	0	201	36	723	0	0	18983
LIB11	130000	13000	7	0	750	38	400	0	0	144195
LIB12	34	6900	0	1	146	33	1200	0	0	8314
LIB13	100000	15000	0	0	219	57	100	0	0	115376
LIB14	7600	7600	0	0	219	33	0	0	0	15452
LIB15	13100	10000	0	1	0	45	950	0	0	24096
LIB16	150000	14000	0	0	445	54	1065	0	8	165572
LIB17	519	7000	0	0	0	33	35	0	0	7587
LIB18	20000	17641	0	0	2000	50	400	0	0	40091
Total	786432	270189	17	9	65258	1103	26348	0	7427	1156783

5.4 Hardware Resources of IIT Libraries in India

Hardware resources available in IIT Libraries include personal computers (PC), servers, printers, scanners, projectors, and xerox machines. These resources with their respective software are useful while providing or availing library services. The users and the library staff use personal computers for their respective purposes. Servers are used by the libraries to host their web or desktop applications and other resources, including printers, scanners, projectors, and xerox machines used by the libraries for their official work. Table 5 acknowledges different categories of hardware resources available in each IIT Library with their respective numbers. The total number of hardware resources available in 18 IIT Libraries under study was 1226. It is observed that the IIT Kharagpur Library (LIB01) has the maximum number of hardware resources, followed by IIT Delhi (LIB05) and IIT Madras (LIB03).

Table 5: Hardware resources of IIT Libraries in India (N=18)				
Library	PC	Servers	Others*	Total
LIB01	150	4	28	182
LIB02	75	12	22	109
LIB03	106	2	17	125
LIB04	65	6	26	97
LIB05	100	5	34	139
LIB06	34	6	11	51
LIB07	48	4	13	65
LIB08	9	1	4	14
LIB09	50	2	19	71
LIB10	23	3	7	33
LIB11	18	3	7	28
LIB12	20	1	4	25
LIB13	57	1	5	63
LIB14	30	1	6	37
LIB15	15	1	7	23
LIB16	61	2	10	73
LIB17	3	1	2	6
LIB18	60	3	22	85
Total	924	58	244	1226

*Others: Printers, Scanners, Projectors, and Xerox machines

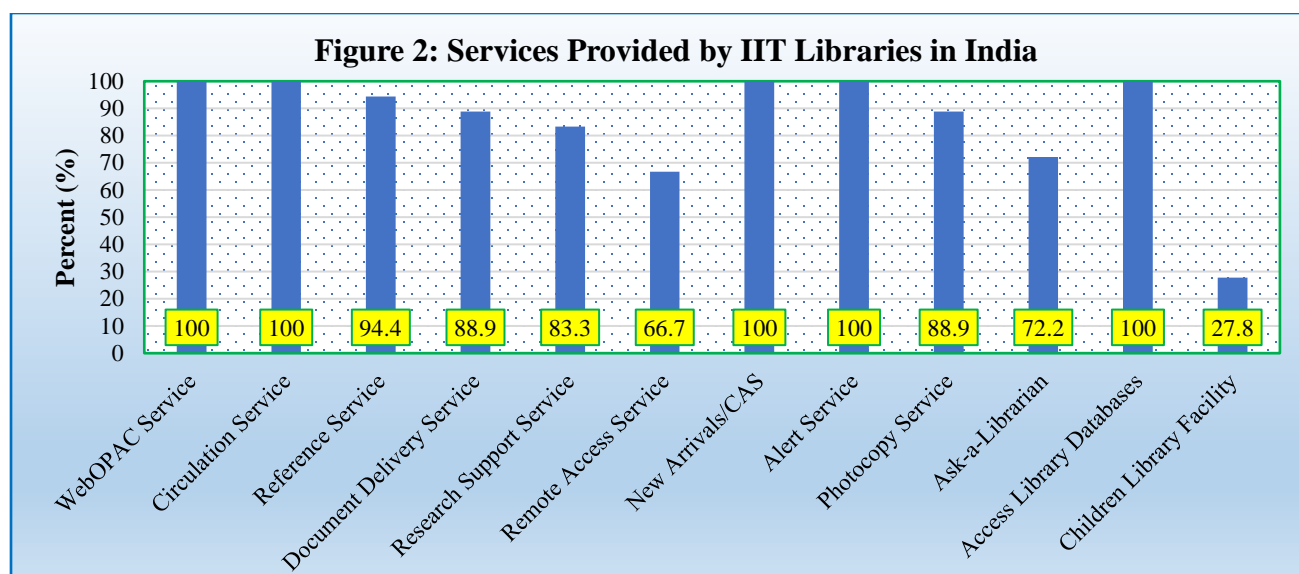
5.5 Services Provided by IIT Libraries in India

Resources and activities provided by libraries to address information needs of users is termed as library service. The library services are WebOPAC service, circulation services, reference services, inter

library loan, document delivery service (DDS), research support services, remote access service, current awareness services, alert service, photocopy service, ask-a-librarian, access library databases, and children library facility. Here, all responses are represented as Y = 1 and N = 0. From Table 6, it is observed that all 18 (100%) IIT libraries provided WebOPAC service, circulation service, New arrivals/CAS, alert service, and access to library databases. Seventeen (94.4%) IIT libraries provided reference service, 16 (88.9%) libraries provided DDS and photocopy service, 15 (83.3%) libraries provided research support service, 13 (72.2%) libraries provided ask-a-librarian service, 12 (66.7%) libraries provided remote access service, and five (27.8%) libraries provided children library facility.

Table 6: Library Services Provided by IIT Libraries in India (N=18)

Library	WebOPAC Service	Circulation Service	Reference Service	Document Delivery Service	Research Support Service	Remote Access Service	New Arrivals/CAS	Alert Service	Photocopy Service	Ask-a-Librarian	Access Library Databases	Children Library Facility	Total
LIB01	1	1	1	1	1	0	1	1	1	1	1	0	10
LIB02	1	1	1	1	1	1	1	1	1	1	1	1	12
LIB03	1	1	1	1	1	1	1	1	1	1	1	0	11
LIB04	1	1	1	1	1	0	1	1	1	1	1	1	11
LIB05	1	1	1	1	1	1	1	1	1	1	1	0	11
LIB06	1	1	1	1	0	0	1	1	1	0	1	0	08
LIB07	1	1	1	1	1	0	1	1	1	1	1	0	10
LIB08	1	1	1	0	1	0	1	1	1	0	1	0	08
LIB09	1	1	1	1	1	1	1	1	1	1	1	0	11
LIB10	1	1	1	1	1	1	1	1	1	1	1	1	12
LIB11	1	1	1	1	0	1	1	1	1	1	1	0	10
LIB12	1	1	1	1	1	1	1	1	1	1	1	1	12
LIB13	1	1	1	1	1	1	1	1	1	1	1	0	11
LIB14	1	1	1	1	1	1	1	1	0	0	1	1	10
LIB15	1	1	1	1	1	1	1	1	1	0	1	0	10
LIB16	1	1	1	1	1	1	1	1	1	1	1	0	11
LIB17	1	1	0	0	0	0	1	1	0	0	1	0	05
LIB18	1	1	1	1	1	1	1	1	1	1	1	0	11
Total	18	18	17	16	15	12	18	18	16	13	18	5	184
%	100	100	94.4	88.9	83.3	66.7	100	100	88.9	72.2	100	27.8	



5.6 Library Technology Solutions used by IIT Libraries in India

Table 7: Library Technology Solutions used by IIT Libraries in India

Library	WT	DB	ILS	BC	RFID	DLS	WSDS	CC	RA	W2.0	Total (%)
LIB01	1	1	1	1	0	1	1	1	0	1	08 (80)
LIB02	1	1	1	1	0	1	1	1	1	1	09 (90)
LIB03	1	1	1	1	1	1	0	0	0	1	07 (70)
LIB04	1	1	1	1	0	1	0	0	0	1	06 (60)
LIB05	1	1	1	1	1	1	1	1	1	1	10 (100)
LIB06	1	0	1	1	1	1	1	1	0	0	07 (70)
LIB07	1	0	1	1	1	1	0	0	0	1	06 (60)
LIB08	1	1	1	1	1	1	0	0	0	1	07 (70)
LIB09	1	1	1	1	1	1	0	1	1	1	09 (90)
LIB10	1	1	1	1	0	1	0	0	1	0	06 (60)
LIB11	1	1	1	1	0	1	0	0	1	1	07 (70)
LIB12	1	1	1	1	0	1	0	0	1	1	07 (70)
LIB13	1	1	1	1	1	1	0	0	1	1	08 (80)
LIB14	1	1	1	1	0	1	0	0	1	1	07 (70)
LIB15	1	0	1	1	1	1	0	1	1	1	08 (80)
LIB16	1	1	1	1	0	1	0	0	1	1	07 (70)
LIB17	1	0	1	1	0	0	0	0	0	0	03 (30)
LIB18	1	1	1	1	0	1	1	1	1	1	09 (90)
Total	18	14	18	18	8	17	5	7	11	15	131
%	100	77.7	100	100	44.4	94.4	27.8	38.8	61.1	83.3	

WT – Web Technology; **DB** – Database Technology; **ILS** – Integrated Library System; **BC** – Barcode Technology; **RFID** – Radio Frequency Identification; **DLS** – Digital Library Software; **WSDS** – Web-Scale Discovery Service; **CC** – Cloud Computing; **RA** – Remote Access Technology; **W2.0** – Web 2.0 Technology

The use of advanced technology in libraries makes the library services smarter. In this context, library technology refers to those technologies, which are used in libraries for providing smart library services to their users, perhaps keeping in view of the implications of five laws of library science as envisaged by Dr. S. R. Ranganathan (Sahoo & Panda, 2019). Table 7 shows the different kinds of library technology solutions used by IIT Libraries in India to provide smart library services to their users (Y = 1; N = 0). Ten major library technology solutions have been identified in this study are – Web Technology (WT), Database (DB) Technology, Integrated Library System (ILS), Barcode (BC) Technology, Radio Frequency Identification (RFID) Technology, Digital Library Software (DLS) Technology, Web-Scale Discovery Service (WSDS), Cloud Computing (CC), Remote Access (RA) Technology, and Web 2.0 (W2.0) Technology. The resultant figures clearly unearth the fact that out of 18 IIT libraries, 17 libraries used more than 50% of library technologies, and only one IIT library used 30% of library technologies in this study. The IIT Delhi Library (LIB05) used the highest with all ten numbers of library technologies, and the IIT Tirupati Library (LIB17) used the lowest with three numbers of library technologies. It is found that all 18 IIT libraries used web technology, where 14 IIT libraries used database technology (MySQL) in building their respective library websites. All the 18 IIT libraries have used ILS software technology and barcode technology, where 8 IIT libraries used only RFID technology for their library automation. Similarly, 17 IIT libraries used digital library software technology to set up an institutional repository (IR), 15 IIT libraries used Web 2.0 technologies, 11 IIT libraries used remote access technology, 7 IIT libraries used cloud computing, and 5 IIT libraries used web-scale discovery service, respectively.

6.0 Findings of the study

The following are the major findings of the study:

- The IIT Kharagpur, founded in 1951, has the highest number of registered library users (13254), while the IIT Tirupati, founded in 2015, has the lowest number of registered library users (453).
- In case of availability of print resources, Books are the primary print resource in IIT Libraries, followed by bound volumes, and thesis and dissertations.
- In the case of electronic resources, e-books, e-journals, and ETDs are the primary electronic resources in the IIT Libraries of India.
- The Central Library of IIT Kharagpur has the maximum number of hardware resources, followed by IIT Delhi and IIT Madras.

- The majority of IIT libraries provided WebOPAC service, circulation service, new arrivals/CAS, alert service, access to library databases, reference service, DDS, photocopy service, research support service, Ask-a-librarian service, and remote access service. However, about one-fourth (5) of IIT libraries provided children library facility.
- Library technology plays a vital role in providing smart library services. In this regard, out of 18 IIT Libraries, 17 libraries were used more than 50% of library technologies, and only one library used 30% of library technology taken in this study. The Central Library of IIT Delhi used the highest number of library technology (10), while the Central Library of IIT Tirupati used the lowest number of library technology (3).
- All the 18 IIT Libraries used web technology in their library websites, of which 14 Libraries used database technology in their websites. Similarly, all the 18 IITs have automated their libraries using ILS software and barcode technology, 17 IIT Libraries have set up their IR using digital library software technology, and 15 IIT Libraries have used Web 2.0 technologies.

7.0 Conclusion

The Indian Institute of Technology (IIT) Library system, one of the prominent academic library systems in India, is well maintained and modernized Central Library in every institute. It serves its users with resources and services of global standards using smart library technologies, which makes them the liveliest place on the campus, providing a safe, comfortable, and friendly environment. These libraries have focused on several research studies in India because of their superior infrastructure, excellent collection resources, the better quality of services, and highly motivated staff. However, this study presented a comprehensive and up-to-date overview of registered library users, library services, resources (print, electronic and hardware resources), and library technology solutions used by IIT libraries to provide smart library services to their respective users.

Library technology plays a significant role in higher academic institutions for providing smart library services to their user community. In this context, IIT Libraries used different kinds of library technologies, such as – Web Technology, Database Technology, Integrated Library System (ILS), Barcode Technology, RFID Technology, Digital Library Software Technology, Web-Scale Discovery Service, Cloud Computing, Remote Access Technology, and Web 2.0 Technology. The Central Library of IIT Delhi used the highest number of library technology, but the Central Library of IIT Tirupati used the lowest number of library technology. This study may provide some insights into the librarians and researchers about the IIT Library system in India.

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