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ICT Implementation and Usage in Selected University Libraries of Haryana

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University libraries are of vital importance in facilitating the research, learning, and instruction of academic establishments. Libraries must have a resilient IT infrastructure to provide users with information resources and services in the current digital era. The present article examines the implementation of ICT infrastructure in a subset of libraries located in Haryana, India. This study investigates various aspects of the library, including the overall seating capacity, communication facilities, browser usage, and network system software. The findings shows that none of the university libraries have their own websites, they all use the university's website to show library information and have email addresses for electronic contact. All universities, except Chaudhary Charan Singh Haryana Agricultural University and Kurukshetra University, have a Local Area Network (LAN). The prevalence of Google Chrome as the prevailing web browser across all ten universities serves as evidence of its pervasive acceptance and prominence within library environments. This research provides significant information for library administrators, lawmakers, and IT professionals, allowing them to make more informed decisions about infrastructure development, resource allocation, and future technology adoption. The study recommendations aim to increase the efficiency and efficacy of Haryana's university libraries, creating a more enriched learning and research environment for the academic community.
Keywords: Local Area Network (LAN), ICT Implementation, University Libraries in Haryana.

1. Introduction

University libraries serve as the cornerstone of academic institutions, providing students, faculty, and researchers with access to essential information resources and services (Kumar, 2012; Ingole & Chavan, 2023). In the current digital era, characterized by an exponential growth of information and rapidly evolving technologies, robust Information Technology (IT) infrastructure has become indispensable for libraries to fulfill their critical role effectively. This infrastructure forms the backbone of modern libraries, enabling them to deliver seamless access to digital resources, facilitate efficient information retrieval, and support innovative learning and research endeavors. The state of Haryana in India boasts a vibrant academic landscape with numerous universities catering to diverse educational needs. These universities house well-established libraries, each striving to provide their communities with access to a wealth of information resources. However, the effectiveness of these libraries in fulfilling their

objectives hinges heavily on the adequacy and functionality of their IT infrastructure.

Therefore, this research undertakes a comprehensive evaluation of the IT infrastructure implemented in university libraries across Haryana. This study seeks to get a better understanding of the existing condition of IT infrastructure in these libraries, identify areas of strength and weakness, and, finally, make recommendations for development. Evaluating the existing infrastructure is crucial for several reasons:

- Enhancing Information Access: Libraries can provide easy access to a wide variety of digital resources, such as multimedia content, electronic journals, books, and databases, because of their strong information technology infrastructure. This facilitates efficient information retrieval, allowing users to locate relevant information quickly and effortlessly, irrespective of their physical location.

- Empowering User Experience: A well-functioning IT infrastructure contributes significantly to user satisfaction. Reliable internet connectivity, user-friendly library management software, and readily available hardware resources like computers and printers ensure a smooth and efficient information access experience for library users.

- Supporting Teaching and Research: When it comes to helping with both classroom instruction and independent study, university libraries are indispensable. A robust IT infrastructure allows faculty to incorporate digital resources into their curriculum, fostering innovative learning methods. Additionally, researchers can leverage powerful online databases and specialized software to conduct their research effectively.

- Promoting Efficiency and Cost-Effectiveness: Efficient IT infrastructure streamlines library operations, minimizing manual tasks and optimizing resource allocation. This translates to cost savings for the library and allows staff to focus on providing value-added services to users.

Information Communication Technology has converted traditional libraries and print materials to electronic formats. Libraries' shapes and sizes are evolving because of information technology. Information literacy has led to diverse information needs among users (Tiwari, 2023; Sen & Das, 2022). To improve their services and cater to patrons' requirements, libraries and information centres are updating their facilities and technology. Library professionals employ information technology to organise, organise, and disseminate knowledge. Web publishing has greatly facilitated scientific research publication and communication. The libraries subscribe to electronic resources for its patrons (Shikoh & Haridasan, 2022). Developing suitable ICT infrastructure in libraries and information centres is essential for creating new services and updating old ones. In the digital era, most reading materials are available electronically and may be accessed via internet or intranet. Electronic resources can be developed using two approaches. One option is to develop digital content, while another is to transfer print resources into electronic formats. Electronic information resources offer several potentials for collection building, service creation, and improvement. If libraries want to keep up with the times and give their patrons the best library and information services possible, they need to put money into an appropriate information and communication technology infrastructure.

2. Literature Review

Iqbal et al., (2023) explored the use of software to automate academic libraries in Sialkot. The three primary goals of this study were to determine why librarians use library automation software, what challenges they encounter when using library software, and how satisfied they are with the features of library software. A validated questionnaire was used to obtain information from 46 library professionals. According to the study, the most important concerns for employing automation software were the cost of setup and maintenance, as well as software with multilingual support. According to this study, some of the most serious issues with library automation software are internet compliance, university or institution non-cooperation, training facility availability, an insufficient library budget, financial/economic resource shortages, staff turnover, and a lack of consulting and technical services.

Panda (2021) discovered that almost all the libraries did not offer VRS, and none of the libraries in the study provided Synchronous VRS (SVRS). Since the researcher was able to gather perspectives on VRS from institutions across a variety of fields, it is clear from the data that college libraries in Northwestern India serve a broad user population.

Hafezi et al., (2020) assessed the preparedness of libraries affiliated with SBMUs to implement knowledge management. The researchers examined the information technology, organisational culture, management approach infrastructure, and human resources. With the help of 58 librarians working at Shahid Beheshti University of Medical Sciences' libraries, we performed a descriptive survey to find out how the infrastructures under scrutiny are doing right now. Infrastructures (2.72), organisational structure (2.66), organisational culture (3.13), human resources (3.26), and technology (3.21) were the outcomes of the management method.

Bassey (2016) conducted a study on software adoption in Nigerian university libraries found that KOHA was the most popular and widely used programme. Additionally, in his opinion, university libraries in Nigeria do not use any kind of automation.

Verma et al., (2015) carried out a survey on the use of integrated library software at Lucknow's engineering college libraries. The majority of libraries make use of locally developed or adapted software. The analysis discovered that Libsys is the most installed and used programme in libraries.

Kumar (2015) investigated ICT infrastructure and services in engineering college libraries throughout Andhra Pradesh's Rayalaseema area. He discovered that 87.65% of libraries offer Windows XP and 72.84% had Pentium IV workstations. DELNET is the most popular information network service, whereas VSAT is the most widely utilised communication service. Approximately 60% of libraries are partially automated, with barcodes commonly used for circulation.

Bandyopadhyay & Mondal (2014) launched a survey to assess the presence of ICT infrastructure in university libraries in West Bengal, India. They noticed that most libraries contain a basic infrastructure. Most university libraries placed less emphasis on implementing ICT. The University of North Bengal offers open access to its library, whereas other institutions offer closed or mixed access options. All four of these universities—Calcutta, Jadhav, University of North Bengal, and Vidyasagar—have excellent computer infrastructure.

Konwar and Sinha (2014) recognised difficulties and proposed solutions for the library

system's development. They discovered that most colleges do not have appropriate ICT infrastructure. Among Silchar's educational institutions, only Gurucharan College has a fully equipped computer lab where patrons can use the internet and electronic resources.

Kumar & Singh (2014) performed a survey on the application and use of library software at Central University Libraries: A Comparative Study. They discovered that while both libraries utilised software and provided services through it, Aligarh Muslim University library experienced most issues during automation. Both libraries had good IT infrastructure and accessories.

Seena and Pllai (2014) examined the ICT proficiency of library personnel within the Kerala University Library System. The researchers discovered that the libraries' proficiency in a range of ICT-related tasks is comparatively average. Libsys was the software of choice for most libraries, and many professionals blamed a lack of training in information and communication technology applications for the slow adoption of ICT in libraries. The use of information and communication technologies in libraries was met with universal approval from all professionals.

Malik & Mahmood (2013) conducted an exploratory survey in Punjab, Pakistan, to determine the infrastructure necessary for efficient digital reference services (DRS) in university libraries. The poll revealed that, while infrastructure has improved, there is still potential for development. Libraries frequently have electronic collections, which include both general and reference materials. Only a few libraries have incorporated DRS, and the majority of reference transactions continue to take place in-person.

Nebeolise (2013) examined the effect of librarians who are up to date on information and communication technology (ICT) on the provision of library services in academic libraries, specifically looking at the library at the National Open University of Nigeria (Noun). Fast information service delivery, user access and retrieval, inadequate power supply, inadequate ICT infrastructure, inadequate provision of ICT training programmes, and a shortage of professional librarians with ICT skills were all found to be part of the study's conclusions. All these factors make it difficult for libraries to effectively use ICTs.

Dhanavandan and Nagarajan (2011) discovered that while most libraries had CD Tower facilities in their environments, the majority of libraries do not have CD ROM servers. Some of the engineering institutions in Tamil Nadu that are self-funded use Windows as their primary operating system in their libraries. Windows is usually the operating system of choice for most engineering college libraries. Autolib is the best commercial library programme when compared.

Dhanavandan et al., (2011) looked at the ICT infrastructure services for engineering college libraries in Tamilnadu that are self-financing. The study determined the status of electronic resources by examining the hierarchy of the library's network, electronic access points, databases, e-journals, and other electronic resources. The study shows that the library application software is used in most of the engineering schools in Tamil Nadu.

Walmiki & Ramkrishnagowde (2009) conducted a review of ICT infrastructure at six university libraries in Karnataka. The majority of libraries do not have sufficient internet, bandwidth, software, or technology, according to the poll. Libraries' information and

communication technology (ICT) infrastructure differs, and campus LANs are underutilised, according to the report.

3. Objectives

1. To investigate the ICT infrastructure facilities available in the central libraries.
2. To determine the seating capacity of users in the selected libraries of Haryana.
3. To learn about the communication facilities in the library.
4. To learn about the usage of browsers and network system in the library.

4. Scope of the Study

The study's goal is to completely analyse the information and communication technology (ICT) infrastructure installed in university libraries across the state of Haryana. The study will look into these libraries' technological resources and capacities, focusing on crucial factors such as computer availability, communication facilities, network topologies, and the integration of ICT tools. The study aims to provide a thorough overview of the current state of ICT infrastructure, including variances across universities. The study will look at aspects such as sitting capacity, communication tools, computer resources, and library networks to identify strengths, problems, and potential areas for improvement. The findings will not only add to the current body of knowledge on library technology but will also provide practical insights for improving ICT facilities in university libraries, creating an environment favourable to productive learning and research.

5. Research Methodology

This study examines ICT infrastructure in selected libraries in Haryana, India. Data was collected using survey research methods. A questionnaire was utilised to collect data. 10 questionnaires were given to librarians via email and personal visits. All ten questionnaires were received from universities. After obtaining the questionnaire, data was analysed, and findings and conclusions were written.

Table: 1 Description of Universities under study

S. No.	Name of Universities	Year of Establishment
Private Universities		
1	Ashoka University	2014
2	GD Goenka University	2013
3	Manav Rachna University	2014
4	O. P. Jindal Global University	2009
5	OM Sterling University	2019
Public/Government Universities		
1	Chaudhary Charan Singh Haryana Agricultural University	1970
2	Dr. B. R. Ambedkar National Law University	2012
3	Maharshi Dayanand University	1976
4	Central University of Haryana	2012

5	Kurukshetra University	1956

6. Data Analysis and Interpretation

The collected data was examined using simple statistical techniques. Data is displayed as tables and/or charts in MS-Excel 2007 software.

Table:2 Distribution of Questionnaire

S. No.	Universities	Questionnaire Distributed	Questionnaire Received	(%)
1	Ashoka University	1	1	100.0
2	GD Goenka University	1	1	100.0
3	Manav Rachna University	1	1	100.0
4	O. P. Jindal Global University	1	1	100.0
5	OM Sterling University	1	1	100.0
6	Chaudhary Charan Singh Haryana Agricultural University	1	1	100.0
7	Dr. B. R. Ambedkar National Law University	1	1	100.0
8	Maharshi Dayanand University	1	1	100.0
9	Central University of Haryana	1	1	100.0
10	Kurukshetra University	1	1	100.0

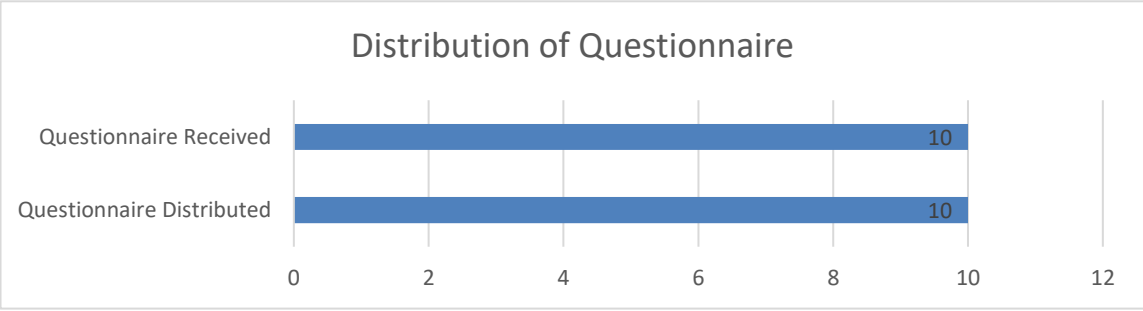

Figure: 1 Distribution of Questionnaire

Figure 1 and the table 2 illustrate how the questionnaire was distributed to the librarians who were selected for the libraries. Ten questionnaires were disseminated to the librarians of the ten universities located in the state of Haryana. From all ten universities, questionnaires were received in their entirety. This indicates that all responses were provided by the participants.

Table: 3 Sitting Capacity of Users in the Library

S. No.	Universities	Total number of sitting capacity
1	Ashoka University	570
2	GD Goenka University	480
3	Manav Rachna University	600
4	O. P. Jindal Global University	400
5	OM Sterling University	450

6	Chaudhary Charan Singh Haryana Agricultural University	1300
7	Dr. B. R. Ambedkar National Law University	800
8	Maharshi Dayanand University	2463
9	Central University of Haryana	850
10	Kurukshetra University	1750

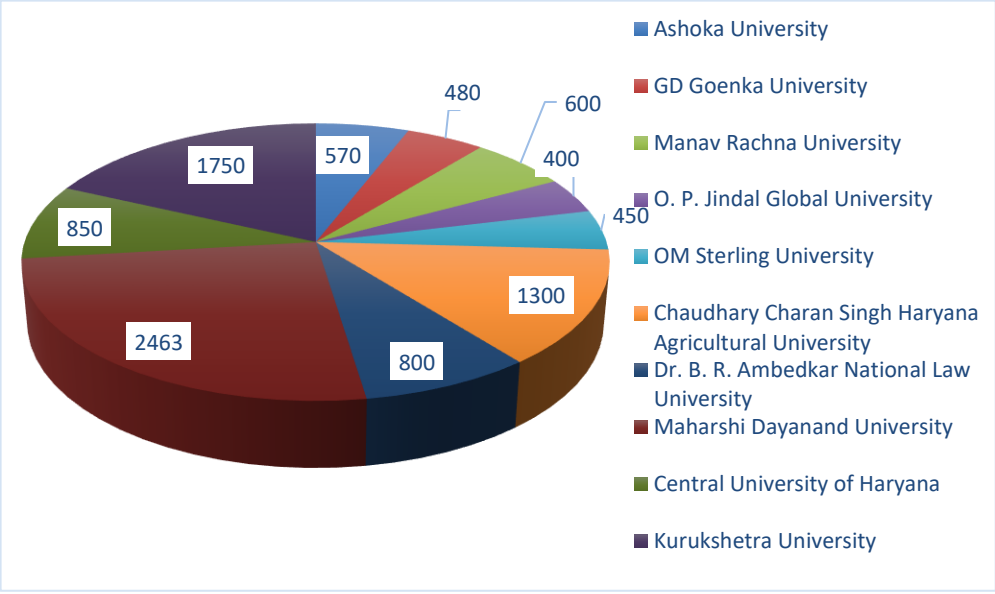

Figure: 2 Total number of sitting capacity

The table 3 and figure 2 provide information on the sitting capacity of various universities. Ashoka University has a seating capacity of 570, GD Goenka University accommodates 480, Manav Rachna University has a capacity of 600, and O. P. Jindal Global University can accommodate 400 individuals. OM Sterling University provides seating for 450, while Chaudhary Charan Singh Haryana Agricultural University has the highest capacity with 1300 seats. Dr. B. R. Ambedkar National Law University follows with 800 seats, Maharshi Dayanand University boasts a significant capacity of 2463, Central University of Haryana accommodates 850, and Kurukshetra University provides seating for 1750 individuals. The table offers a clear comparison of the seating capacities of these universities, highlighting the varying sizes of their facilities.

Table: 4 Communication Facilities

S. No.	Communication Tools	% of Libraries
1	Library Phone	100%
2	Library FAX	100%
3	Library on University Website	100%
4	Library Independent Website	NIL
5	Library Email Address	100%

Table 4 reveals that all Haryana university libraries have telephones and fax machines. While none of the university libraries have their own websites, all use the university's website to display library information and provide email addresses for electronic communication.

Table: 5 Availability of Computers in the Library

Name of University	Type of Computer		Total
	Server machine	Client computers	
Ashoka University	05	120	170
GD Goenka University	07	150	157
Manav Rachna University	04	37	41
O. P. Jindal Global University	01	23	24
OM Sterling University	03	36	39
Chaudhary Charan Singh Haryana Agricultural University	10	200	210
Dr. B. R. Ambedkar National Law University	09	85	94
Maharshi Dayanand University	12	96	108
Central University of Haryana	11	123	134
Kurukshetra University	09	160	169

The table provides information on the availability of computers in different universities' libraries, specifying the type of computers as server machines and client computers. Ashoka University has a total of 170 computers, with 5 server machines and 120 client computers. GD Goenka University follows with a total of 157 computers, consisting of 7 server machines and 150 client computers. The data continues to outline the computer inventory for other universities, including Manav Rachna University, O. P. Jindal Global University, OM Sterling University, Chaudhary Charan Singh Haryana Agricultural University, Dr. B. R. Ambedkar National Law University, Maharshi Dayanand University, Central University of Haryana, and Kurukshetra University. The information in the table provides an overview of the computing resources available in each university's library, facilitating a comparison of the type and total number of computers across the institutions.

Table 6 Type of Library Network

Name of University	LAN	MAN	WAN
Ashoka University	✓	-	-
GD Goenka University	✓	-	-
Manav Rachna University	✓	-	-
O. P. Jindal Global University	✓	-	-
OM Sterling University	✓	-	-
Chaudhary Charan Singh Haryana Agricultural University	✓	-	✓
Dr. B. R. Ambedkar National Law University	✓	-	-
Maharshi Dayanand University	✓	-	-
Central University of Haryana	✓	-	-
Kurukshetra University	✓	✓	✓
Total	10	1	2

Table 6 shows that all universities, except Chaudhary Charan Singh Haryana Agricultural University and Kurukshetra University, have a Local Area Network (LAN). Furthermore, only Chaudhary Charan Singh Haryana Agricultural University has a Wide Area Network (WAN), but Kurukshetra University is the only one with both a LAN and a Metropolitan Area Network. The universities indicated have a total of ten LANs, one MAN, and two WANs.

Table: 7 Use of Browser in the Library

Name of University	Google Chrome	Mozilla Firefox	Internet Explorer
Ashoka University	✓	✓	✓
GD Goenka University	✓	✓	-
Manav Rachna University	✓	✓	✓
O. P. Jindal Global University	✓	✓	-
OM Sterling University	✓	-	-
Chaudhary Charan Singh Haryana Agricultural University	✓	✓	✓
Dr. B. R. Ambedkar National Law University	✓	✓	✓
Maharshi Dayanand University	✓	✓	✓
Central University of Haryana	✓	✓	-
Kurukshetra University	✓	✓	✓
Total	10	9	6

A comprehensive summary of the favoured web browsers utilised in the libraries of various universities is presented in Table 7. Internet Explorer, Google Chrome, and Mozilla Firefox are the three browsers under consideration. The ✓ symbols in the table denote the number of institutions that have implemented each respective browser. The prevalence of Google Chrome as the prevailing web browser across all ten universities serves as evidence of its pervasive acceptance and prominence within library environments. With a usage rate of nine out of ten universities, Mozilla Firefox ranks as the second most prevalent web browser, behind Internet Explorer, which is employed by only six universities. The prevalence of contemporary web browsers, specifically Google Chrome and Mozilla Firefox, in the library settings of these academic institutions is illustrated in the table. This indicates a prevailing inclination towards modern and streamlined web browsing tools. The discrepancies in Internet Explorer adoption among universities may indicate divergent technological infrastructures or preferences.

7. Findings

The distribution of questionnaires achieved a 100% response rate from all ten universities, indicating a strong engagement and willingness of librarians to participate in the study. This high response rate enhances the reliability and representativeness of the gathered data. The analysis of sitting capacity revealed substantial diversity among the universities, with capacities ranging from 400 to 2463. This indicates variations in the size and scale of library facilities, reflecting the differing needs and capacities of each institution to accommodate students and researchers.

The use of traditional communication tools such as phones, faxes, and university websites is widespread across all libraries. The absence of independent library websites suggests a potential area for improvement in enhancing the visibility and accessibility of library resources. The availability of computers in the libraries shows variations in both type and quantity of computing resources. This information provides insights into the technological capabilities of each university's library and may guide future investments in upgrading and maintaining information technology infrastructure.

The presence of Local Area Networks (LANs) in all universities underscores the significance of local connectivity within library systems. Notably, Chaudhary Charan Singh Haryana

Agricultural University stands out with a Wide Area Network (WAN), emphasizing a broader network reach. Kurukshetra University's possession of both LAN and Metropolitan Area Network (MAN) signifies a more comprehensive networking infrastructure.

8. Conclusion

In conclusion, the research conducted on the evaluation of the ICT infrastructure implemented in university libraries of Haryana provides valuable insights into the technological landscape of these institutions. The distribution of questionnaires (Table 2) demonstrates a 100% response rate from all ten universities, indicating a comprehensive understanding of the ICT infrastructure from the perspectives of the librarians. The analysis of sitting capacity (Table 3 and Figure 2) reveals significant variations among the universities, emphasizing the diversity in size and scale of library facilities across the region.

The examination of communication facilities (Table 4) highlights the widespread use of traditional tools such as library phones, faxes, and university websites for disseminating library information. The absence of independent library websites is notable. The availability of computers in the libraries (Table 5) showcases the differences in the type and quantity of computing resources, providing a basis for assessing the technological capabilities of each institution.

The assessment of library networks (Table 6) illustrates that LANs are prevalent in all universities, emphasizing the importance of local connectivity. Chaudhary Charan Singh Haryana Agricultural University stands out as the only institution with a WAN, emphasizing its broader network connectivity. Kurukshetra University's possession of both LAN and MAN signifies a more comprehensive networking infrastructure. In summary, the research findings shed light on the current state of ICT infrastructure in Haryana university libraries, offering a foundation for further discussions and potential improvements in these essential academic resources.

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