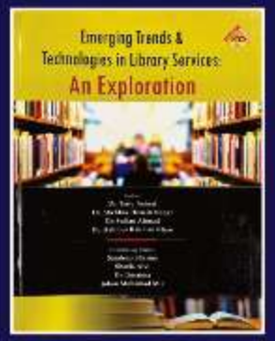

Emerging Trends & Technologies in Library Servies

Dr. Tariq Ashraf
Dr. Shahbaz Husain Naqvi
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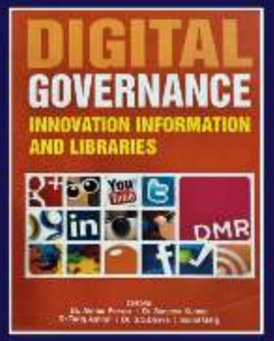


Digital Governance

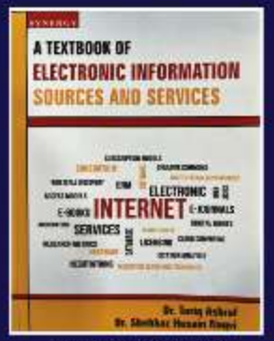
Dr. Akhtar Parver
Dr. Sanjeev Kumar
Dr. Tariq Ashraf
Dr. S.S.Dhaka
Sonal Garg

Expanding Digital Footprints

Dr. Hasan Jamal Abidi
Dr. Raj Kumar Bhardwaj
Dr. Tariq Ashraf

Mapping Doctoral Research in Library & Information Science in India, 1950-2023 (Vol. 1 & 2)

Prof. (Dr.) Shashi Prabha Singh
Dr. Parveen Babbar



A Textbook of Electronic Information Sources and Services

Dr. Tariq Ashraf
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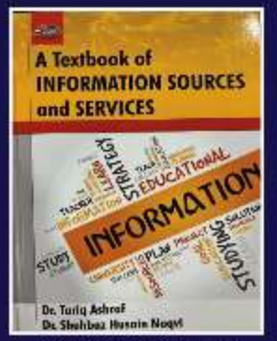

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Published in Association with
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Academic Libraries: Sustaining Excellence Through Innovation & Technology

Shahzeb Hasan • Dr. Sanjeev Kumar
Subhajit Panda • Dr. Abdul Haseeb Mir
Khalid Nadeem Khan • Ghulam Samdani

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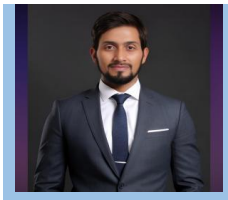
ACADEMIC LIBRARIES

Sustaining Excellence Through Innovation & Technology

The Editors



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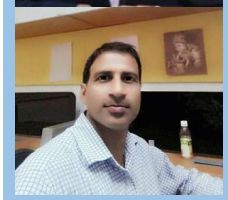

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MD Ghulam Samdani, a seasoned Library Professional, brings over 12 years of experience to his role at the South Campus Library, University of Delhi South Campus, New Delhi. With dual Master's degrees in Library and Information Science from the University of Delhi and a Master's in Science from Aligarh Muslim University, Samdani oversees e-resource management and Library Services. He has contributed to reputable journals, conferences, and is a lifetime member of the Asian Library Association.

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ACADEMIC LIBRARIES

Sustaining Excellence Through Innovation & Technology

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Foreword

The current era in academia is characterized by rapid technological advancements and an expanding digital landscape across all knowledge domains. This transformation is apparent in the evolving dynamics of academic libraries, as evidenced by their usage, functions, and the nature of resources they provide. There is a notable transition in library models from traditional to digital, highlighting the adaptability of academic libraries. They continue to be pivotal in the innovation of ideas and the dissemination of knowledge. The theme "Academic Libraries: Sustaining Excellence through Innovation & Technology" underscores the critical role these institutions play in shaping the scholarly landscape of the 21st century.

Academic libraries use Information Assurance (IA), that is a comprehensive strategy for protecting data and systems. Within this framework, academic libraries stand out as guardians of knowledge, utilizing various technologies and strategies to facilitate learning, research, and exploration. Similar to the interconnectedness seen in the internet and smart devices, academic libraries create a global network that encourages collaboration and the sharing of knowledge across different borders and fields of study. And such global networks also have their own complexities and problems. In such situations academic libraries also face challenges that are both daunting and energizing. These challenges, however, present tremendous opportunities for innovation and development. By adopting new technologies, encouraging cross-disciplinary cooperation, and rethinking traditional roles, academic libraries are well-positioned not just to maintain excellence but to flourish amid ongoing transformative changes.

This book is a thorough guide to the changing dynamics of the Academic libraries. It explores numerous aspects of academic librarianship within the context of the digital era. This book delves into how academic libraries harness big data analytics to improve information access and utilize emerging technologies like artificial intelligence and virtual reality to revolutionize the user experience. The chapters in this book deal with various different aspects which reflect the dynamic and evolving field of modern librarianship. This book offers detailed insights into the evolving domains of Libraries and Information Centers by significantly enriching the current literature. Hopefully it will also be well-received by the Library and Information Science (LIS) community.

Apart from the above mentioned, this book also stands as a tribute to the commitment, enthusiasm, and creativity of library professionals and scholars. It is my hope that the ideas and experiences shared here will motivate the readers to seek new possibilities of change, challenge established ideas, and contribute to the lasting impact of Academic Libraries in the 21st century.

I congratulate the Editors as well as the Authors/Contributors for putting untiring efforts in bringing out such a significant work of research.

Prof. Gurmail Singh
VICE CHANCELLOR
Akal University, Talwandi Sabo

Preface

Welcome to "Academic Libraries: Sustaining Excellence Through Innovation & Technology." In this book, we embark on a journey through the evolving landscape of academic libraries, exploring how they navigate the complexities of the modern information age. As libraries stand at the intersection of tradition and innovation, their role in supporting education, research, and scholarly communication continues to evolve.

Academic libraries serve as dynamic hubs of knowledge, providing essential resources, services, and spaces to support the diverse needs of students, faculty, and researchers. In an era marked by rapid technological advancements and shifting educational paradigms, these institutions face both challenges and opportunities in sustaining their excellence.

The chapters in this book offer insights into various aspects of academic librarianship, ranging from collection development and management to user services, digital scholarship, and beyond. Through a lens of innovation and technology, we explore how libraries adapt to meet the evolving needs of their communities while upholding their core mission of providing equitable access to information and fostering lifelong learning.

Throughout this book, we draw upon the expertise of leading scholars, practitioners, and thought leaders in the field of library and information science. By sharing their insights, experiences, and best practices, we hope to inspire and empower academic librarians to embrace innovation, leverage technology, and sustain excellence in an ever-changing academic landscape.

As editors, we are grateful to the contributors who have generously shared their knowledge and expertise to make this book possible. We also extend our thanks to the readers who embark on this journey with us, and we hope that the insights and ideas presented in these pages will inform and inspire your work in academic librarianship.

Together, let us continue to explore, innovate, and sustain excellence in academic libraries through innovation and technology.

- Editors

Contents

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Research productivity of Social Sciences in Saudi Arabia from 2004 to 2023: A Bibliometric Analysis

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ABSTRACT

The study aims to evaluate the advancement of Saudi Arabian social science research over a 20-year period from 2004 to 2023. Employing a quantitative bibliometric approach, data extracted from Elsevier's Scopus database on March 5, 2024, was analyzed to demonstrate the growth of Saudi Arabian authors' publications in Social Sciences. Utilizing specific search criteria, including "Saudi Arabia" as the primary search term and "Country Affiliation" and "Social Sciences" as filters, bibliographic records were examined to assess periodic growth, collaboration patterns, productive institutions, preferred publication sources, and international collaboration. Microsoft Excel facilitated data analysis. Results indicate a total of 19,795 social science documents produced by Saudi Arabia, with an average annual output of 989.75 documents, notably 55% of which were published between 2021 and 2023. Leading contributions came from King Saud University and King Abdulaziz University, with the latter displaying the highest citation impact. Approximately a quarter of the documents were published in the top ten journals, with Sustainability (Switzerland) being the most prominent. Analysis of sub-categories revealed a focus on "Computer Sciences," "Environment Science," and "Art and Humanities." Egypt emerged as the primary collaborator, followed by the United States, the United Kingdom, and Pakistan. The study highlights the reasonable share of research in Library and Information Science (LIS) at 8.16%. The surge in social science research is attributed to advancements in higher education, the integration of the Saudi digital library, and Ph.D. scholarship provisions. The study recommends further collaboration with corporate and industrial sectors to maximize societal benefits.

Keywords*: Saudi Arabia; Social Sciences; Research Productivity; Publications; Bibliometric*

1. INTRODUCTION

Social Sciences is a significant area of learning that addresses the sustainable socioeconomic growth of society, study of cultures' compact attitudes, and the relationships between various social groups as well as between people (Tende, 2021; Haq, 2020). Social Sciences is a comprehensive branch of knowledge that consists of sociology, anthropology, psychology, economics, environmental issues, political science, library and information science (LIS), etc. Social scientists study both individual behavior and the collective mindset of a community (Bhattacherjee, 2012). Shapiro (1984) went into detail about the historical perspective of social sciences. Charles Fourier, a French writer, coined the term “science sociale” in 1818, while J. S. Mill used it to refer to social science in English in 1829. Ross (1993) provided an explanation of how the social sciences evolved in the US after the 1920s.

Saudi Arabia is the largest country on the Arabian Peninsula, endowed with abundant natural resources. Higher education and productive research are receiving a great deal of attention from the government. The new institutions and cutting-edge research facilities have been established during the previous 20 years (Haq, 2020; Meo et al., 2013). Analyzing the results of all these efforts is crucial, and one essential metric is the productivity of research. The bibliometric approach has been employed to gauge the expansion of research and evaluate the state of research worldwide. It helps draw attention to the areas of research that are strong and weak and helps policymakers revisit the research policies (Haq, 2020; Erfanmanesh et al., 2010; van Raan 2003). Emerging researchers can select a

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Chapter 1; S. Hasan, S. Kumar, S. Panda, K. N. Khan & G. Samdani (Eds); PP. 01-11; Synergy Books India, N.D.

topic, plan their research, and apply for research grants with the help of bibliometric study results (Schui and Krampen 2010).

Bibliometric studies have been conducted throughout the world to evaluate the productivity of research and its implications. Several bibliometric investigations have been carried out to understand the Saudi Arabian research scenario. A comprehensive bibliometric study on research collaboration patterns in Saudi Arabia from 1980 to 2014 was conducted in 2016 (Shehatta and Mahmood, 2016). This study found that the Saudi Arabia produced 88,506 publications as indexed in the Web of Science database. Two academic institutions, King Saud University and King Abdulaziz University, produced most of the literature (46%). Only 1,765 (2%) papers in the area of social sciences were identified. Some studies examined the growth in medical and health sciences research (Haq, 2020; Meo et al., 2013; Latif 2015; Zaher et al., 2018). According to Hassan and Ara (2021), out of the top 46 countries with at least 3,000 publications, Saudi Arabia has the fastest growth rate in medical research publications between 2019 and 2020.

A study conducted by Haq (2023) provided valuable insights on bibliometric indicators in Social Sciences research of Saudi Arabia. Although, this study covered the time span of fifty years (1973-2022), however, the study had certain limitations. The study exclusively considered original and review articles, overlooking other types of documents that could contribute significant information. The present study included all kind of documents contributed by Saudi Arabia during the period of 20 years.

The aim of the current study is to assess the development of social science research as represented in the Scopus database by authors with affiliation to Saudi Arabia.

2. OBJECTIVES

The study's objectives were as follows:

i) To examine the periodic growth of social sciences in Saudi Arabia from 2004 to 2023.
ii) To review the research collaboration and its citation influence on social sciences research.
iii) To analysis the sub-categories of social sciences research, especially the share of LIS.
iv) To point out the prolific research organization in social sciences research.
v) To investigate the preferred sources of publications in social sciences research.
vi) To scrutinize the trends of international research collaboration in social sciences research.

3. LITERATURE REVIEW

Almaizar and Abdelhamed (2018) analyzed the research pattern on 85 social work publications contributed by Saudi Arabia from 1999 to 2013. Fifty-five percent of the articles were written by female authors and three-fourths of the papers followed the descriptive research format, then theoretical (15%). The majority of research (76.5%) was produced from Riyadh, the Capital City of Saudi Arabia.

Ahmad et al., (2021) evaluated the publication growth of the Arab World. Saudi Arabia emerged as the second most productive country after Egypt from 1980 to 2020. *Engineering & Technology* was found the top area of research. A significant number (n=35,092) of papers found on social science in the Arab world; these papers obtained an average of 5.61 citations per paper.

Murphy (1979) documented the development of social science research in the Middle East, focusing on the American University of Cairo in Egypt, home of the Social Research Center, which was founded in 1952. Initially, the institution was largely dependent on foreign scholars, but over time, a group of local researchers was formed.

A study on LIS research in the Arab World identified that Saudi Arabia contributed the most papers (33.16%), followed by Kuwait and Egypt. Four of the top ten authors in terms of productivity were belong to Saudi Arabia (Siddique et al., 2023).

A 2017 study looked at the state of social science research in India. The study reported that the social sciences research output inspires civilizations by disseminating scholarly information that clarifies and comprehends the processes of human evolution, nature, and behavior. The study brought to light the problems with research productivity. Lack of funding, and proper infrastructure, were the two major hurdle in the production of high-quality research (Thorat and Verma 2017).

Gupta et al. (2013) evaluated India's development in social science publications between 2001 and 2010. India contributed 1.18% of the world's research output, producing 21,671 publications at an

average annual growth rate of 17.66%. Contributors with a geographic affiliation to Delhi (17.08%) provided the most papers, followed by Mumbai (9.02%) and Bangalore (8.65%).

Another study compared the social science research of Brazil, China, and India from 1996 to 2007. More than one-fourth (29%) of the research was contributed by the United States, whereas the quantified shares of China, India, and Brazil were 2.16%, 1.00%, and 0.48%, respectively. Research from Brazil had more citations than that from China and India. Additionally, Brazil had a higher rate of research collaboration than China and India (Gupta et al., 2009).

The bibliometric analysis of Pakistan's contributions to social science research from 1961 to 2020 revealed that approximately 75% of the papers were published in the last ten years (2011 to 2020). *Pakistan Development Review* published the most papers. The most popular social science subcategory was determined to be "Computer Science". The top three most productive universities were determined to be COMSATS University Islamabad, University of the Punjab, and Pakistan Institute of Development Economics. The top three countries sought in international research collaboration were the United States, the United Kingdom, and China (Haq, 2020).

The research productivity on Covid-19 in relation to social science from 2020 and 2021 reported that a total of 9,289 papers were published. These papers gained an average number of 3.45 citations per paper, and the ratio of authors per paper was found 3.21. The majority of the publications were published in "Frontier in Psychology", then "Sustainability". The subject distribution showed that "Business Economics" was the most popular field for research, with "Psychology" coming in second. The University of Oxford was determined to be the most productive institution, and the United States provided the most publications overall (Roychowdhury et al. 2022).

Henrisksen (2018) studied the co-authorship and research collaboration trend in the social sciences. The survey found that during the past three decades, co-authorship has become more common in the social sciences. The study's conclusions clarified that socializing and fostering synergy are two benefits of research collaboration, which add excitement to the process of conducting research. Co-authorship is becoming more common, which boosts career and advancement opportunities as well as publishing development. Another bibliometric study focused on the subject area of "urban agriculture". There were 424 papers found that were published between 1984 and 2020 and these papers received an average of 15.82 citations per paper. The last five years of the study observed a remarkable growth of publication (51%). The United States, United Kingdom, and South Africa were found to be the top most productive countries (Yusuf et al., 2022).

Nederhof (2006) investigated the social science publication and citation patterns. The proportion of single-author publications was higher in the social sciences than in the pure sciences, and researchers in the social sciences cited more books and non-serial literature. The reference material in the social sciences and pure sciences that was listed on Web of Science in 1993 was examined by Glänzel & Schoepflin (1999). In comparison to the social sciences, the pure sciences had a larger ratio of cited references from the serial literature.

The review of relevant literature shows the interest of researchers in various aspect of social sciences. The growing trend in the recent past is obvious. The researchers belonged to developed countries contributed more research as compared to developing countries. The findings of the previous studies served as the benchmark for the future studies.

4. RESEARCH METHODOLOGY

This bibliometric research method was applied to conduct this study. The data was extracted from Elsevier's Scopus database on 5 March 2024 to assert the research publication growth in the knowledge field of social science contributed by Saudi Arabian affiliated authors from 2004 to 2023. The word "Saudi Arabia" was typed in the main search box and "Affiliation Country" was opted in the subsequent search box. No filter was used in document types only ahead-to-print articles were excluded. The subject category of Social Science was selected from the filter of the subject area. The bibliographic details of selected documents were downloaded in the Comma Separated Value (CSV) file. Later, the file converted into Microsoft Excel for data analysis. The bibliometric parameters were chosen in the light of the literature review, including, periodic growth, collaboration pattern, segregation of sub-categories of social sciences, productive research organizations, preferred sources of publications and most collaborative countries in terms of documents.

The dataset and the findings were limited to the Scopus indexed articles and their citation counts. Scopus database provides comprehensive coverage of global literature with bibliographic details, abstracts and citation counts (Alhibshi et al., 2020).

5. RESULTS

A total of 402,018 documents were published under the country affiliation of Saudi Arabia from 2004 to 2023 and about half of the documents (n=191,217; 47.56%) are published in open-accessed format. The highest number of documents were published in "Engineering" (n=87,754; 21.82%), followed by "Medicine" (n=78,838; 19.61%) and "Computer Science" (n=65,747; 16.35%). The subject area of "Social Sciences" occupied the 14th position with 19,795 (4.92%) documents.
The assessment of document types shows that Saudi Arabian authors contributed 13 different types of documents in Social Sciences (Table-1). A total of 19,795 documents were found for data analysis consisting of articles (80%) and other documents (20%). The maximum number of documents published as original research articles; followed by published conference papers, book chapters, review articles, editorials and books. One percent (n=232) of the documents consisted of letters, erratum, notes, data papers, retracted, short surveys and abstract report.

Table 1: Types of Documents

Serial No.	Type of documents	Quantity
1.	Articles	15,743
2.	Conference papers	1,692
3.	Book Chapter	1,102
4.	Review	761
5.	Editorial	156
6.	Book	108
7.	Letter	72
8.	Erratum	66
9.	Note	56
10.	Data paper	18
11.	Retracted	17
12.	Short survey	3
13.	Abstract report	1

Figure 1 presents the details of documents on Social Sciences contributed by Saudi Arabia by year from 2004 to 2023. Very slow growth of documents (n=398; 2%) was found during the first five years from 2004 to 2008. In the next five years from 2009 to 2013, 1,464 (7.39%) documents were published. The promising growth of documents (n=3,620; 18.28%) was found during the next five years from 2014 to 2018. Fifty-two percent of the documents (n=14,313) were published during the last five years of study, from 2019 to 2023. This number has been even higher than the number of documents published in the first 15 years (n=5,482).

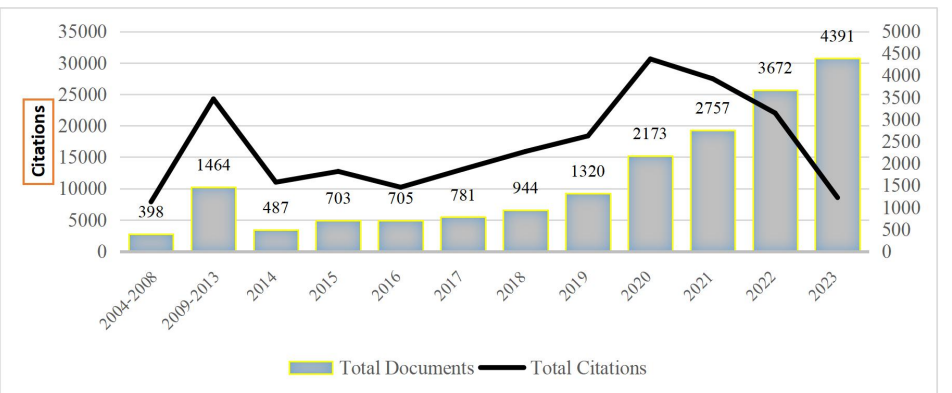

Figure 1: Distribution of documents by years (n=19,795)

The line in Figure-1 indicates the citations gained by the documents against each interval/year in the graphic format while Table 2 presents the details of citations and average citations in numeric format. All 19,795 documents were cited 202,127 times with a mean ratio of 10.21 cites/doc. The documents published in the year 2014 gained the highest citation impact with an average of 22.61 cites/doc, followed by the set of documents published from 2004 to 2008, with an average of 19.80 cites/doc.

Table 2: Distribution of documents, citations and citation impact by year

Years	Documents	Citations	Citation Impact
2004-2008	398	7,881	19.80
2009-2013	1,464	24,260	16.57
2014	487	11,012	22.61
2015	703	12,726	18.10
2016	705	10,208	14.48
2017	781	13,087	16.76
2018	944	15,905	16.85
2019	1,320	18,375	13.92
2020	2,173	30,626	14.09
2021	2,757	27,474	9.97
2022	3,672	22,015	6.00
2023	4,391	8,558	1.95

Table 3 elaborates on the authorship/collaboration pattern in Social Sciences research in Saudi Arabia. A total of 74,947 authors, including multiple counts, contributed to 19,795 documents with an average of 3.78 authors/doc. The ratio of the average of authors per document was recorded as 2.12 during the first five years (2004 to 2008) as the single-author pattern was dominant (47%) but after 2009 the collaborative research/multi-authors pattern increased. The highest ratio of collaborative research was found in the documents published in the year 2023. Overall, 25% of the documents were contributed by a single author.

The analysis of citation count shows that collaborative/multi-author research attracts more citations as compared to a single-author documents. The single-author documents gained an average of 5.49 cite/doc, while multi-author documents were cited with an average of 11.80 cites/doc.

Table 3: Distribution of documents, authors, average authors per documents and collaboration pattern by year

Years	Total documents	Total Authors	Average Authors per document	Single-author documents (%)	Multi-author documents (%)
2004-2008	398	845	2.12	187 (47%)	211 (53%)
2009-2013	1,464	3,796	2.59	498 (34%)	966 (66%)
2014	487	1,435	2.95	154 (32%)	333 (68%)
2015	703	2,158	3.07	190 (27%)	513 (73%)
2016	705	2,092	2.97	240 (34%)	465 (66%)
2017	781	3,344	4.28	189 (24%)	592 (76%)
2018	944	3,041	3.22	239 (25%)	705 (75%)
2019	1,320	4,309	3.26	321 (24%)	999 (76%)
2020	2,173	7,180	3.30	655 (30%)	1,518 (70%)
2021	2,757	11,394	4.13	618 (22%)	2,139 (78%)
2022	3,672	16,949	4.62	823 (22%)	2,849 (78%)

2023	4,391	18,404	4.19	890 (20%)	3,501 (80%)
Total/Average	**19,795**	**74,947**	**3.78**	**5,004 (25%)**	**14,791 (75%)**

Social Sciences is a broad term, the Scopus database further segregated all the documents into different sub-categories. Figure-2 shows that the maximum number of documents (30.70%) were written in the sub-category of "Computer Sciences", followed by "Environmental Sciences" (22.39%) and "Art and Humanities" (17.95%).

The Subject category of LIS has not been included in broad categories. By using the advanced search strategy, the data of LIS was retrieved. Saudi Arabian authors contributed 1,616 (8.16%) documents on LIS, and 79% of the documents were published in the last five years of study. These documents were cited 18,988 times, with an average of 11.75 cites/doc. The highest number of documents were published in "Sustainability", followed by "Library Philosophy & Practice" and "Intelligent Systems Reference Library". More than one-third (37%) of the documents were contributed by the authors of three universities, King Saud University, King Abdulaziz University and Imam Abdulrahman Bin Faisal University. There are six countries having research collaboration with more than 100 documents, Pakistan has been on the top, followed by Malaysia, United Kingdom, United States, Egypt and India.

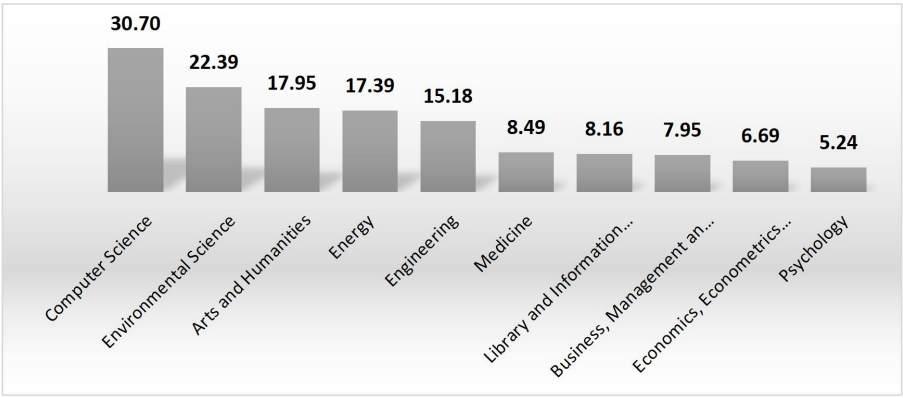

Figure 2: Distribution of documents by top-10 subject categories

Table 4 presents the details of the most contributing universities of Saudi Arabia in Social Science research. The highest number of documents (n=2,975; 15%) were contributed by the authors affiliated with King Saud University, the oldest and biggest university in Saudi Arabia. King Abdulaziz University contributed the second-highest number of documents (n=2,331; 12%). Only these two universities contributed more than two thousand documents each and their documents gained the citation impact 14 cites/doc and 15.92 cites/doc, respectively. King Fahd University of Petroleum and Minerals got the highest ratio of citable documents (81.62%) and its documents gained a citation impact of 14.22 cite/doc.

Table 4: Distribution of documents by contributing universities

SN	Name of University	Total Documents	Citable Document (%)	Total Citations	Average Cite/Doc
1.	King Saud University	2,975	2384 (80.13%)	41,665	14.00
2.	King Abdulaziz University	2,331	1,885 (80.86%)	37,125	15.92
3.	Prince Sattam Bin Abdulaziz University	1,269	815 (64.22%)	7,711	6.07
4.	Imam Abdulrahman Bin Faisal	1,196	822 (68.72%)	9,132	7.63

	university				
5.	King Fahd University of Petroleum and Minerals	1,012	826 (81.62%)	14,397	14.22
6.	King Faisal University	888	607 (68.35%)	8,980	10.11
7.	Al Qassim University	832	550 (66.10%)	6,240	7.50
8.	King Khalid University	827	576 (69.64%)	6,319	7.64
9.	Princess Nourah bint Abdulrahman University	746	503 (67.42%)	4,611	6.18
10.	Prince Sultan University	704	531 (75.42%)	7,136	10.13

The analysis of the top-10 preferred sources of publications shown in Table 5. The maximum number of documents (n=2,833; 14.31%) were published in "Sustainability (Switzerland)", followed by "Water (Switzerland)", "Information Science Letters", "World Journal of English Language" and "Advances of Medical Education and Practice" with 514, 274, 194 and 189 documents, respectively. Although the journal named "Foods" stood on the eighth rank with 175 documents, but these documents gained the highest citation impact, 16.07 cite/doc among the top-10 journals. "Sustainability (Switzerland)" and "Foods" have the highest CiteScore in this list. The second and the third highest citation impact was gained by "Sustainability (Switzerland)" and "Water (Switzerland)" with an average of 11.63, and 10.58 cites/doc, respectively.

Table 5: Top 10 Preferred Sources of Publications

SN	Name of Journal	CiteScore (2022)	Total Documents	Total Citations	Average Cite/Doc
1.	Sustainability (Switzerland)	5.8	2,833	32,945	11.63
2.	Water (Switzerland)	5.5	514	5,438	10.58
3	Information Sciences Letters	1.7	274	292	1.07
4.	World Journal of English Language	0.3	194	103	0.53
5.	Advances of Medical Education and Practice	2.9	189	1,329	7.03
6.	Sage Open	3.0	177	1274	7.20
7.	Theory and Practice of Language Studies	0.6	177	263	1.49
8.	Foods	5.8	175	2813	16.07
9.	Studies in System Decision and Control	1.6	156	280	1.79
10.	Journal of Language Teaching and Research	0.8	151	340	2.25

Table 6 reveals the preference for international research collaboration. The social scientists of Saudi Arabia mostly collaborate with the researchers affiliated with Egypt. About 8% (n=1,636) of the documents were the results of co-authorship with Egypt, followed by United States (n=1,557; 7.86%), United Kingdom (n=1,500; 7.57%) and Pakistan (n=1,477; 7.46%). Seven hundred and forty five (n=745) documents were written with the collaboration of Australian authors and these documents gained the highest citation impact, 29.57 cite/doc, followed by the United Kingdom, 23.50 cite/doc and the China, 23.19 cites/doc. Although, the research collaboration with Egypt occupied the top rank but had the lowest citation impact in the top-10 collaborative countries.

Table 6: Top 10 Research collaborative countries

Serial No.	Research Collaborative Country	Total Documents	Citable Document (%)	Total Citations	Average Cite/Doc
1.	Egypt	2,108	1,636 (78%)	21,563	10.22
2.	United States	1,855	1,557 (84%)	37,616	20.27
3.	United Kingdom	1,500	1,524 (84%)	35,256	23.50
4.	Pakistan	1,477	1,241 (84%)	21,085	14.27
5.	India	1,236	985 (80%)	17,962	14.53

6.	Malaysia	1,184	968 (82%)	18,427	15.56
7.	China	922	807 (88%)	21,388	23.19
8.	Australia	867	745 (86%)	25,639	29.57
9.	Jordan	661	449 (68%)	8,209	12.41
10.	Tunisia	500	396 (79%)	5,821	11.64

6. DISCUSSION

Bibliometric analyses have been employed to measure the advancement of scholarly publications and their impact (Shehatta and Mahmood 2016; Latif 2015; Ahmad et al., 2021; Haq et al., 2020; Haq, 2023). Social sciences is the broad subject category, and it deals with the community and social interaction or behavior of people that formulate their culture. The culture and conduct of commutes affect the whole world (Bhattacherjee, 2012). The current study examined the bibliometric parameters of Social Science research in Saudi Arabia from 2024 to 2023. The evaluation of bibliographic records discloses the dynamic tendencies of publications on Social Science produced by Saudi Arabian authors during the last 20 years from 2004 to 2023. The examination of data showed that slow growth of publications was observed in the first 10 years but remarkable growth was detected during the last five years from 2019 to 2023. These outcomes are in line with Haq et al., (2020) study, which assessed the noteworthy growth of medical literature in Saudi Arabia. Another study focused on Social Sciences research in Saudi Arabia from 1973 to 2022 and the study revealed that 88% of research was published during the last ten years (2013 to 2022).

Another study investigated Saudi Arabia's educational research from 1991 to 2020, and the last ten years saw a significant increase. The United States found with most collaborative research, but the articles produced with Germany gained the most citations (Mohsen and Ho 2022). Shehatta and Mahmood (2016) inspected the research profile of Saudi Arabia from 1980 to 2014 and they stated that most of the research was published during the last five years from 2010-2014. The study identified that only 2% papers were written on the area of social sciences. Our study shown an encouraging finding that out of the total Saudi Arabian research in the targeted period, about 5% of the documents was related to Social sciences.

Ahmad et al., (2021) evaluated the research growth of the Arab World and reported a growing tendency of research during the last decade of study. The study also discussed the share of social science research in the Arab World and these research papers gained with an average of 5.61 cites/paper. Our study reported that social science research produced by Saudi Arabia gained a higher citation impact (10.21 cite/doc).

The evaluation of authorship and collaboration pattern revealed that from 2004 to 2014, the average number of authors per document was less than three in social sciences research in Saudi Arabia. A fluctuation was found in the collaboration pattern but it increased significantly from 2021 to onward. The analysis of citations demonstrated that multi-author documents or collaborative research gained a higher ratio of citations as compared to a single-author document. Henrisksen (2018) endorsed that the research collaboration and co-authorship pattern in social sciences has increased during the last three decades.

The subject dispersion showed the strong and weak areas of Social Science Research in Saudi Arabia. The highest number of documents were written on *Computer Science*, followed by *Environmental Science* and *Art and Humanities*. The share of LIS research was found 8.16%. The study on research trends in Social Science research in Pakistan revealed that the majority of the research was performed in *Computer Science* (Haq, 2020).

The analysis of the most contributing research organizations of Saudi Arabia in Social Science research, *King Saud University* and *King Abdulaziz University* have found at the top in terms of the number of documents. *King Abdulaziz University*, *King Fahd University of Petroleum and Minerals* and *King Saud University* were found at the top in respect of citation impact among the top-10 most productive institutions.

About, one-fourth (n=4,840; 24.45%) of the total documents have been published in the top-10 most preferred sources. The analysis exposed that all of these sources are internationally published. It is suggested that quality research should be published in locally indexed journals, so the impact of these journals is enhanced. Egypt, United States, and United Kingdom were found on the topmost countries in the analysis of international research collaboration. These findings are in line with the

research of Shehatta and Mahmood (2016), who discovered bit similar results. The Saudi researchers collaborated on 8,204 papers with the United States, followed by Egypt (8,076) and United Kingdom (n=3,359).

The findings also highlighted that documents contributed by single-author and without international collaboration got fewer citations. This encourages to carrying out of collaborative research with local authors as well as international authors.

Scholarly research is essential to the nation's sustainable growth, and social science research is valuable since it is the foundation for comprehending how societies interact and how people think. An attempt has been made to depict Saudi Arabia's contribution to social science. The study determined the most productive organizations, popular sources, favored subcategories of social science research, and patterns of cross-border research collaboration. Future research might concentrate on the topics that were not included in the current study, and the results would encourage aspiring social scientists. These results could be used by the policymaker to ascertain the causes of the poor research performance in comparison to other industrialized nations.

The present study has some limitations; firstly, the dataset was obtained from only one database, (Scopus), and the findings cannot be generalized. Future researchers may be conducted further research using more databases, such as Web of Science and Google Scholar. Further, we relied on the subject dispersion of the Scopus, the in-depth content analysis would provide a deeper understanding of the state of Social Sciences research in Saudi Arabia. Lastly, the bibliometric examination does not provide a complete picture of research impact and quality. We didn't review the potential biases.

7. CONCLUSION

Saudi Arabia invested significant resources to promote higher education, the inclusion of Saudi digital library as well as the provision of doctorate scholarships to students and the outcome of their efforts have been demonstrated through research performance. The study presented the bibliometric evaluation of social science research produced by Saudi Arabia in the last twenty years. It is inspiring that an upward trend of research was observed in the last five years. We can't deny the value of research collaboration; the collaboration not only helps to increase productivity but also boost the quality aspect of papers. We should learn lessons from the model of the European Union research Framework Programs, which offer incentives to the researchers of the European Union to conduct inter-country research for the advancement of knowledge (Defazio, et al., 2009). The Arab countries and especially Gulf Cooperation Countries could formulate a research network of social scientists. The findings and further implementations of the recommendations of findings could improve inter-societies relations and improve the quality of life.

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Conflict of Interest

The authors report no conflict of interest related to this study.

Ethical Consideration

The data for the research has been retrieved from publically accessible commercial database, so the study is exempted from institutional board review.

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Research Productivity of Indian Institute of Management (IIM) Bangalore for the period 2002-2021: A Study

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ABSTRACT

The Publications of IIM Bangalore has been analysed for the period 2002-2021 using data from Scopus and WoS databases. Year-wise growth, Area-wise breakup, Document-wise break up, Top authors based on publications, Top Papers based on citations, Open Access publications and type break up has been presented. Results show that the Economics & Social Sciences Area published maximum number of articles (191), Prof. Pulak Ghosh was the Top author with 47 publications. The Journal IIMB Management Review recorded highest number (68) of articles. The highest number of Open Access (OA) articles were published during the year 2013 with 34% and Gold type of OA accounted highest coverage with 42% followed by Green with 33% and Bronze with 25% respectively.

Keywords: *Research Productivity, Indian Institute of Management Bangalore, Scientometrics, Research output, Publication Productivity, Management research*

1. INTRODUCTION

The Indian Institute of Management (IIMB) Bangalore was established in 1973. It has carved a niche among the IIMs in the country and has always been ranked among Top 5 rankings in NIRF Management Institutes Rankings. It also features among the World top rankings in QS University, Eduniverse, FT MBA etc. The Institute has specializations in 11 Areas (Disciplines) of Management Studies i.e Finance & Accounting, Economics & Social Sciences, Information Systems, Centre for Management Communication, Entrepreneurship, Strategy, Decision Sciences, Marketing, Organizational Behaviour & Human Resources Management, Production and Operations Management and Centre for Public Policy.

It offers the following degrees:

- Doctor of Philosophy (Ph.D.)
- Master of Management Studies (Public Policy)
- Master of Business Administration – one-year fulltime,
- Master of Business Administration – two years (weekend)
- Master of Business Administration – two years fulltime
- Master of Business Administration (Business Analytics) – two years fulltime

2. OBJECTIVES

The main Objectives of the study is to analyse the scattering of publications of IIMB for the period 2002-2021

- To identify year-wise publications of IIMB for the period 2002-2021
- To identify Area-wise break-up of publications
- To identify break-up of type of documents
- To identify Top-Authors based on number of publications
- To identify Top-papers based on number of citations received
- To identify Top-Journals based on the number of articles published
- To identify break-up of OA articles and types of Open Access publications (Green, Gold, Bronze)

3. LITERATURE REVIEW

Singh, Prashasti et al (2022) in their study have analysed the Research Productivity of IIMs of all 3 generations for the period 2010-2019 using data from Scopus database. They report that older IIMs like IIM Bangalore and Ahmedabad are doing well, however when compared with Global B-

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Schools like Harvard Business School, MIT Sloan School of Management and NUS Business School, there is large gap in terms of quality. It was also observed that the keywords 'sustainability', 'emerging markets' and 'supply chain management' were the most prominent thematic areas observed in the research output from IIMs. Anil Kumar, H and Dora, M (2012) have analysed Research Productivity of IIM Ahmedabad for the period 1999-2010. Highest number of papers were published in the year 2009 and Prof. Shukla, K R published the highest number of papers with 21 papers. In the author collaboration, maximum number of papers were by two authored papers with 34%. Maximum number of papers were published in the journal, Indian Journal of Agricultural Economics with 14 papers. Panda and Sinhababu (2021) discussed the research output & research interest of the Library and Information Science Department of Panjab University by collecting data from the Zenodo community. Tyagi, Sunil (2024) in his paper has analysed Research Productivity of Top four IIMs for the period 2010-2021. Total number of publications was 4397 with an average of 366 paper per year. IIM Ahmedabad accounted for the highest number of publications with 32%.

4. METHODOLOGY

Research articles published by IIMB for the two decade period 2002-2021 was obtained by searching two major databases i.e Scopus and Web of Science (WoS).

The term 'Indian Institute of Management Bangalore' was searched in the Organization field to retrieve all the records by the Institute. Year-wise records were downloaded as MS Excel files.

4.1. Merging of references and identification of duplicate references

The references obtained by searching the two databases were saved as MS Excel files and merged to get a single file. As there are many duplicate records, efforts was made to identify and delete them. Most of records in Scopus and WoS database contain the DOI field (Digital Object Identifier) which is unique. Records were sorted by DOI field so that duplicate lines are displayed next to each other. Duplicate rows were deleted using MS Excel tool

Data ->Remove Duplicates

This option deletes the duplicate rows. However, there are many records without DOI, for such records, they were sorted by article 'Title' field and similarly using the Remove Duplicates option, they were deleted. The Filters Option in MS Excel is used to narrow down only Open Access documents as per information provided in the open access field to obtain data on OA articles.

Limitations of the study : Scopus database has been providing OA Filters from the year 2020 onwards and similarly Web of Science (WoS) has been identifying OA resources from the year 2018 onwards. However, updating historical records for the past two decades may not be accurate. Hence, the study on OA coverage is limited to the extent of updates from the two databases.

5. DATA ANALYSIS

5.1. Growth of IIMB Publications for the period 2002 – 2021

Figure 1: IIMB Publications 2002-2021

Figure 1 shows the year-wise break-up of IIMB Publications for the period 2002-2021. The highest number of articles i.e 102 were published during the year 2017. The average number of articles is 64.15.

5.2. Area wise break-up of publications.

Table 1: Breakup of Area (Department) wise publications 2002-2021

S.No	Area	No. of publications
1	Centre for Management Communication	2
2	Centre for Public Policy	147
3	Decision Sciences	96
4	Economics & Social Sciences	191
5	Entrepreneurship	47
6	Finance & Accounting	71
7	Information Systems	181
8	Marketing	118
9	Organizational Behaviour & HR	137
10	Production and Operations Management	164
11	Strategy	129

Table 1 shows the Area i.e Department wise break up of publications for the period 2002-2021. IIMB has 11 Area (Specializations) and the Economics and Social Sciences Area has registered highest number of publications i.e 191 followed by Information Systems (181) and Production and Operations Management with 164 publications respectively.

5.3. Breakup of IIMB publications by type of Document

Table 2: Break up of IIMB publications by type of documents

Type of documents	Number	Percentage
Article	854	66.6%
Book/Chapter	184	14.3%
Conference paper	164	12.8%
Note	21	1.6%
Review	60	4.7%

Table 2 present the Document wise break-up of publications for the period 2002-2021. Journal articles constitute the major chunk with 854 publications followed by Book/Book chapters with 184 publications and Conference papers with 164 publications.

5.4. Top-Authors based on number of publications

Table 3: Top-authors based on number of publications

Rank	Author Name	No. of Publications (Scopus+WoS)
1	Ghosh, Pulak	47
2	Chanda, R	40
3	Hazra, J	37
4	Kulkarni, M	35
5	Sen, G	30

6	Jain, T	27
6	Shainesh, G	27
7	Saranga, H	25
8	George, R	23
8	Srinivasan, V	23
9	Mahadevan, B	21
9	De, R	21
10	Basu, S	20
11	Malghan, D	19
11	Manimala, M.J	19
12	Srinivasan, R	18
13	Kumar, K	14
14	Iyer, A	12
14	Natarajan, R	12
15	Muckstadt, J.A	11
15	Raghunath, S	11
15	Tripathi, R	11

Table 3 shows the Top-authors based on the number of publications during the study period. The list was prepared with authors having at least 10 or more number of publications. Among the Top three ranks, Prof. Pulak Ghosh has published the highest number of publications with 47 followed by Prof. Chanda R with 40 and Prof. Hazra J with 37 publications.

5.5. Top-papers based on citations

Table 4: Top-papers based on number of citations

Rank	No of Citations	Title	Authors	Source title	Year
1	529	Impact of digital surge during Covid-19 pandemic: A viewpoint on research and practice	De' R., Pandey N., Pal A.	International Journal of Information Management	2020
2	517	A comparative analysis of greening policies across supply chain structures	Ghosh D., Shah J.	International Journal of Production Economics	2012
3	444	Foreign and domestic ownership, business groups, and firm performance: Evidence from a large emerging market	Douma S., George R., Kabir R.	Strategic Management Journal	2006
4	386	Managing cross-cultural issues in global software outsourcing	Krishna S., Sahay S., Walsham G.	Communications of the ACM	2004
5	382	Radical change accidentally: The emergence and amplification of small change	Plowman D.A., Baker L.T., Beck T.E., Kulkarni M., Solansky S.T., Travis D.V.	Academy of Management Journal	2007

6	298	Catch-up strategies in the Indian auto components industry: Domestic firms responses to market liberalization	Kumaraswamy A., Mudambi R., Saranga H., Tripathy A.	Journal of International Business Studies	2012
7	276	How social and human capital influence opportunity recognition and resource mobilization in India's handloom industry	Bhagavatula S., Elfring T., van Tilburg A., van de Bunt G.G.	Journal of Business Venturing	2010
8	256	Women and Health: The key for sustainable development	Langer A., et al	The Lancet	2015
9	246	Uncertainty and supply chain risk: The moderating role of supply chain flexibility in risk mitigation	Sreedevi R., Saranga H.	International Journal of Production Economics	2017
10	242	An Effectual Approach to International Entrepreneurship: Overlaps, Challenges, and Provocative Possibilities	Sarasvathy S., Kumar K., York J.G., Bhagavatula S.	Entrepreneurship : Theory and Practice	2014
11	236	Preferred Interpersonal Distances: A Global Comparison	Sorokowska A., et al	Journal of Cross-Cultural Psychology	2017
12	214	Dimensions of service quality in developed and developing economies: multi-country cross-cultural comparisons	Malhotra N.K., Ulgado F.M., Wu L., Agarwal J., Shainesh G.	International Marketing Review	2005
13	213	The role of leadership in emergent, self-organization	Plowman D.A., Solansky S., Beck T.E., Baker L., Kulkarni M., Travis D.V.	Leadership Quarterly	2007
14	189	Uncertainty, knowledge problems, and entrepreneurial action	Townsend D.M., Hunt R.A., McMullen J.S., Sarasvathy S.D.	Academy of Management Annals	2018
15	188	Bridging the service divide through digitally enabled service innovations: Evidence from Indian healthcare service providers	Srivastava S.C., Shainesh G.	MIS Quarterly: Management Information Systems	2015

Table 4 shows the Top 15 papers based on number of citations received till date. It is surprising to note that a paper related to Covid-19 published three years back i.e. in 2020 by De, R et al has received the highest number of citations with 529 citations showing the currency and importance of the pandemic which affected the world.

5.6. Top-Journals based on number of articles published.

Table 5: Top Journals based on number of publications

Journal Title	No of Articles
IIMB Management Review	68
Economic and Political Weekly (EPW)	49
Vikalpa (IIM Ahmedabad)	39
European Journal of Operational Research	18

Journal of Business Research	18
International Journal of Production Economics	17
Journal of the Operational Research Society	11
Journal of Indian Business Research	10
Production and Operations Management	10

Table 5 shows the Top-Journals based on the number of articles published by IIMB faculty having 10 or more number of publications. The journal IIMB Management Review stands First with 68 articles followed by EPW with 49 and Vikalpa with 39 articles respectively. This shows the popularity of IIM's own Journal used by Faculty in communication their research.

5.7. Break-up of Open Access (OA) publications

Table 6 and Figure 4 shows the growth of Open Access (OA) publications for the period 2002-2021. The highest number of OA articles was reported during the year 2013 with 34% (30 articles). The last Five-year period i.e 2017-2021, the average number of OA articles is more than 23%.

Table 6: IIMB publications in Open Access Journals 2002-2021

Year	Total No of Publications	No of OA articles	% of OA articles
2002	17	1	6
2003	28	2	7
2004	30	3	10
2005	27	2	7
2006	32	7	22
2007	38	10	26
2008	48	5	10
2009	45	6	13
2010	79	14	18
2011	72	22	31
2012	73	12	16
2013	87	30	34
2014	83	26	31
2015	92	15	16
2016	87	15	17
2017	102	23	23
2018	87	23	26
2019	83	21	25
2020	82	20	24
2021	91	22	24

5.8. Breakup of OA publications by type of OA

Figure 2 shows the breakup of OA publications by type of OA. The Gold type of articles constituted highest with 42 % followed by Green type with 33% and Bronze with 25% respectively.

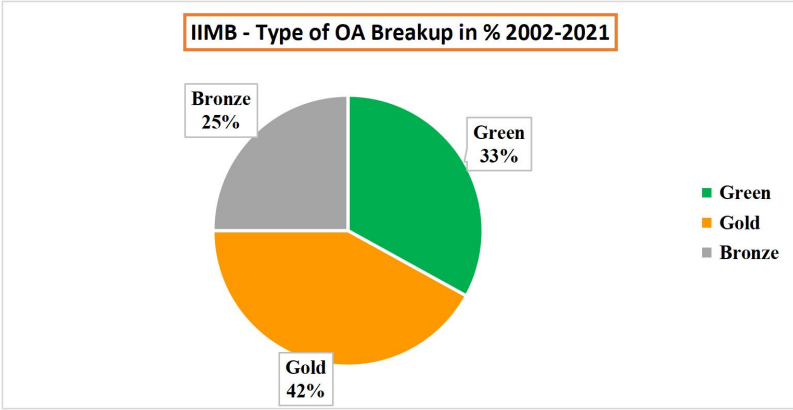

Figure 2: Breakup of OA publications by type of OA

In identifying Green, Gold, and Bronze Open Access (OA) articles, both Scopus and WoS utilize specific fields. Green OA articles are recognized based on entries that include "Green" or "Hybrid Green" while excluding "Gold" and "Bronze." Gold OA articles are identified by entries containing the word "Gold" without the inclusion of "Bronze." This encompasses variations such as "Gold," "Gold Green," "Green Gold," "Green Hybrid Gold," and "Hybrid Gold Green." Conversely, Bronze OA articles are singled out by entries containing "Bronze" and not "Gold" or "Green." Notably, the term "Diamond OA" was absent from both databases.

5.9. Keywords

The words used by authors in an article title conveys the main concept of the paper. These important words called 'keywords' are one of the best indicators to understand and to grasp the thought content of the papers, method used and areas of research addressed to (Angadi et al 2006). Table 7 shows list of keywords and frequency of usage in the article titles.

Table 7: Major Keyword frequencies from titles of publications

Keyword	Freq	Keyword	Freq	Keyword	Freq	Keyword	Freq
India	213	industry	45	strategies	30	education	23
Indian	128	business	43	global	29	growth	23
social	71	markets	40	firms	28	knowledge	23
analysis	64	role	40	effect	26	challenges	22
management	62	services	40	policy	26	gender	22
model	62	innovation	37	women	26	organizational	21
health	61	research	37	chain	25	process	21
study	61	supply	35	corporate	25	public	21
evidence	58	data	34	framework	25	quality	21
case	54	information	34	perspective	25	developing	20
emerging	53	software	34	product	25	governance	20
market	49	technology	33	risk	25	models	20
development	48	financial	31	service	25	strategic	20
impact	46	performance	31	bayesian	24		

6. RESULTS

- In the preceding sections, effort has been made to analyse the research output of IIMB publications for the two decade period 2002-2021. A total of 1283 publications were published with the highest being reported in the year 2017 with 102 publications.
- Of the 11 Areas (Departments), the Economics & Social Sciences accounted for highest number of articles with 191 publications followed by Information Systems (181) and Production and Operations Management with 164 publications respectively.
- In the document-wise break-up, Journal articles account for highest coverage with 66.6 % followed by Book/Book chapters with 14.3% and Conference papers with 12.8%.
- Among the Top-three authors, Prof. Pulak Ghosh stands first with 47 publications followed by Prof. Chanda R with 40 and Prof. Hazra J with 37 publications respectively.
- On the top cited paper, the paper 'Impact of digital surge during Covid-19 pandemic: A viewpoint on research and practice' related to Covid-19 published three years back i.e. in 2020 by De, R et al has received the highest number of citations i.e. 529 showing the currency and importance of the pandemic which affected the world.
- Among the Top Journals used for communications, IIMB Management Review stands First with 68 articles followed by EPW with 49 and Vikalpa with 39 articles respectively.
- On the OA publications, the year 2013 registered highest with 34% and in the type of OA publications, Gold OA accounted for highest with 42% followed by Green with 33% and Bronze with 25% respectively.

7. CONCLUSION

IIM Bangalore is one of the Top Management Institutes in India and was ranked at second place in NIRF rankings for the year 2023. This paper highlights the productivity for the period 2002-2021 which shows slight ups and downs but a healthy trend with an average number of publications in last five year i.e 2017-2021 being at 89. The Institute recognizes the benefits of OA publications and the average stands at 24% for the 5 year period 2017-2021. It will continue to be one of the top Management Institute and be a role model to new IIMs being set up in the country.

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Optimizing IIT Library Website Homepage: A Comprehensive Evaluation and Operability Testing

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ABSTRACT

The purpose of this paper is to assess the Indian Institutes of Technology (IIT) Library websites in context with their operability status in accordance with the Web Content Accessibility Guidelines (WCAG 2.1). The literature on the operability of library websites of IITs using automated technology is unavailable. To obtain the operability status of these websites, Siteimprove web-tool was used which were subsequently processed and analyzed using spreadsheet software for greater insight. The methodology and approach of this paper have value in terms of reusability and reproducibility. The findings of the study reveal that though the library website of IITs' in India possess a well-designed and easily navigable website homepage but as far as their accessibility for VIPs is concerned, there are several issues that are still to be resolved. Identifying and addressing the operability-related issues in the library websites will bridge the accessibility-divide and make the society more inclusive.

Keywords: *MVT, Operability, POUR, Siteimprove, Web Accessibility, Web Content Accessibility Guidelines (WCAG) 2.1*

1. INTRODUCTION

The Internet is fundamentally designed to cater to all individuals, regardless of their hardware, software, language, location, or proficiency. When the Internet accomplishes this objective, it becomes accessible to individuals with diverse hearing, movement, sight, and cognitive abilities (W3C, n.d.-a). Consequently, the impact of disability undergoes a radical transformation on the Internet, as it eliminates barriers to communication and interaction that many people encounter in the physical world. However, poorly designed websites, applications, technologies, or tools can erect barriers that prevent people from using the Internet (W3C, 2014). Ensuring the accessibility of the Internet is crucial to guarantee equal access and opportunities for individuals with varying skills. Web accessibility hinges on several components working in concert, including web technologies, web browsers, user agents, authoring tools, and websites (W3C_WAI, 2019).

The W3C Web Accessibility Initiative (WAI) is responsible for developing technical specifications, guidelines, techniques, and supporting resources that delineate accessibility solutions, such as the Web Content Accessibility Guidelines (WCAG). The latest iteration of WCAG, namely WCAG 2.1, revolves around four fundamental principles, denoted as POUR: Perceivable, Operable, Understandable, and Robust. These principles serve as the primary criteria for evaluating website accessibility. The guidelines and Success Criteria are structured around these principles, which are essential for the successful access and use of web content. This paper aims to pinpoint accessibility issues related to Operability, utilizing WCAG 2.1 guidelines as the standard, the Siteimprove accessibility checker as a tool, and the IIT libraries website homepage as the target website.

2. REVIEW OF LITERATURE

The literature review provides insights into various scholarly research efforts focusing on web accessibility, illustrating evaluations conducted across diverse regions and educational contexts.

Agangiba et al. (2017) evaluated the accessibility of 15 higher education institutions' websites in Ghana based on the WCAG 2.0. In this study, aDesigner, developed by IBM was selected

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Chapter 3; S. Hasan, S. Kumar, S. Panda, K. N. Khan & G. Samdani (Eds); PP. 20-31; Synergy Books India, N.D.

to analyze the accessibility of the websites. **Acosta-Vargas et al. (2018)** described the problems of web accessibility identified in 348 main university websites in Latin America according to their rankings on Webometrics. WAVE accessibility checker was used to study the current status of web accessibility of the selected university website homepages according to WCAG 2.0 guidelines. **AlMeraj et al. (2020)** assessed the current condition of online accessibility in Kuwaiti higher education institutions. The conformity of 41 higher education website homepages and college landing pages to the WCAG 2.0 standard was assessed using a quantitative technique. AChecker, Total Validator, and WAVE software conformance tools, as well as HTML/CSS/ARIA metrics, were employed in this study. **Kiruki and Mutula (2021)** examined the accessibility and usability of library websites to students with visual and physical disabilities in public universities in Kenya. The study used survey research design and adopted a mixed methods approach. Data were gathered using survey questionnaire, focus group discussions, structured interviews, and observation. The study population consisted of six public universities that had a longstanding tradition of enrolling students with disabilities. **Sharma and Choudhary (2021)** analysed the homepages of top 50 Indian university library websites (according to MHRD approved NIRF ranking) for accessibility errors and related issues with the help of WAVE accessibility evaluation tool. **Ismail and Kuppusamy (2022)** focused on the Web Content Accessibility Guidelines (WCAG), emphasizing the increasing importance of analyzing higher education websites' accessibility in regions like India due to growing enrollment of persons with disabilities (PwDs). Their study assessed 44 college websites affiliated with the University of Kashmir and Cluster University Srinagar, identifying key accessibility barriers using TAW and aXe tools. **Panda and Chakravarty (2022)** examined the impact of Open Educational Resources (OERs) on teaching and learning quality, assessing accessibility in e-PG Pathshala (ePGP) and SWAYAM with the TAW checker. **Tiurkedzhy et al. (2022)** evaluated web content accessibility in 56 library websites, revealing insufficient practices and advocating for optimization. **Panda and Kaur (2023)** explored web accessibility for visually impaired learners, highlighting WCAG 3.0's features and conducting an assessment of top-ranked institutions, emphasizing the pivotal role of accessibility in fostering inclusivity.

The amalgamation of these studies underscores the universal importance of web accessibility in educational contexts, revealing common challenges and advocating for enhanced inclusivity. Addressing accessibility issues is crucial for ensuring equal access to information and promoting a more inclusive online educational environment.

3. STUDY OBJECTIVES

The study aims to achieve the following objectives:

i) Understand web accessibility, web content accessibility guidelines and accessibility principles provided by WCAG 2.1.
ii) Gain a comprehensive understanding of the Operable guideline and its significance in the context of web accessibility.
iii) Assess the homepages of IIT library websites to pinpoint and analyze operability issues.

4. WEB ACCESSIBILITY AND WEB CONTENT ACCESSIBILITY GUIDELINES (WCAG)

Web Accessibility is a phenomenon designed to eliminate obstacles to communication and engagement for learners of all abilities through the design of websites, applications, technology, and tools. It ensures that individuals with disabilities, including those caused by auditory, cognitive, neurological, physical, speech, and visual impairments, can perceive, comprehend, interact with, and contribute to the Web. Web accessibility benefits individuals who use diverse devices with small screens, elderly persons with changing skills, individuals with transitory disabilities or situational limits, people with limited bandwidth, and those with poor Internet connections (W3C_WAI, 2022). It encourages the functionality and accessibility of the Web for everyone, irrespective of their hardware, software, language, location, or aptitude, promoting inclusive design.

4.1. Web Content Accessibility Guidelines (WCAG)

The Web Content Accessibility Guidelines (WCAG) constitute a crucial framework dedicated to improving web accessibility for individuals with disabilities. Evolving through various versions, WCAG has adapted to technological advancements, changing design trends, and the increasing

prevalence of mobile web usage. Developed collaboratively with individuals and organizations worldwide, WCAG establishes a global standard for web content accessibility, addressing a diverse range of impairments, including visual, auditory, physical, cognitive, and neurological disabilities.

The evolution of WCAG is evident in its successive versions. Starting with WCAG 1.0 in 1999, followed by WCAG 2.0 in 2008 with principles organized under POUR (Perceivable, Operable, Understandable, and Robust), and extending to WCAG 2.1 in 2018 to cover additional accessibility considerations (W3C, 1999; W3C, 2008; W3C, 2018a). The most recent version, WCAG 2.2 (W3C, 2021a), builds upon the foundation of WCAG 2.0 and 2.1, ensuring comprehensive web accessibility across various devices and platforms.

Anticipating the future, WCAG 3.0 is under development as the next major iteration, aiming to extend its scope beyond web content to include apps, tools, publishing, and emerging technologies (W3C, 2021b). This evolution underscores WCAG's commitment to providing inclusive accessibility guidelines that adapt to the dynamic digital landscape. In essence, WCAG remains a vital and adaptive framework, facilitating web accessibility for individuals with disabilities and fostering a more inclusive online environment.

5. FOUNDATIONAL PRINCIPLES FOR AN ACCESSIBLE WEBSITE: POUR

There are four fundamental principle indicator for check the accessibility of a website (Taylor, 2019):

- **Perceivable:** Perceivability mandates that the information and user interface components must be presentable to users in ways they can perceive. A website said to be a perceivable website when a user is able to use their sense(s) of sight, sound and touch to recognize and process the presented information.
- **Operable:** According to WCAG 2.1, user interface components and navigation must be operable. Operability here means that a user can successfully control the navigation, and interact with other necessary elements of a website solely through the use of a keyboard.
- **Understandable:** As per the WCAG 2.1, Information and the operation of user interface must be understandable. A website is understandable when a user can read and comprehend the content. The user interface should be intuitive as well as easy to read and to remember.
- **Robust:** Content must be robust enough that it can be interpreted by a wide variety of user agents, including assistive technologies. (WCAG 2.1)

If any of the above guidelines are not met, users with disabilities will not be able to use the Web efficiently. Under each of the principles, there are guidelines and success criteria that help to address these principles for people with disabilities. Many general usability guidelines make content more usable by all people, including those with disabilities. However, in WCAG 2.1, only those guidelines are included that address problem particular to people with disabilities (Bigby, 2018).

6. THE OPERABLE PRINCIPLE

The principle of an operable website is about the actions that people take when browsing. It covers any possible action that an end-user (both conventional and with a specific disability) takes while attempting to visit a website. Even the best content is of little use without the tools needed to navigate it; that is why operability is so important. WCAG's emphasis on operability guarantees that users can interact with and make full use of the website. In WCAG 2.1, under the Operable principle there are 5 guidelines and 29 success criteria to evaluate the operability of a website (W3C, 2018b).

6.1. Operable Guidelines and its Evaluation:

When developing or redesigning a website, evaluate operability early and throughout the development process to identify accessibility problems early, when it is easier to address them. Simple steps, such as changing settings in a browser, can help website designer to evaluate some aspects of operability. Comprehensive evaluation to determine if a website meets all accessibility guidelines takes more effort (W3C_WAI, 2019).

Table 1: Operable Guidelines

Sr.No.	Guidelines	Description
1	Keyboard Accessible	Make all functionality available from a keyboard (Web pages must

		be accessible without a mouse)
2	Enough Time	Provide users enough time to read and use content.
3	Seizures and Physical Reactions	Do not design content in a way that is known to cause seizures or physical reactions
4	Navigable	Provide ways to help users navigate, find content, and determine where they are.
5	Input Modalities	Make it easier for users to operate functionality through various inputs beyond keyboard.

There are several evaluation tools but no tool alone can determine if a site meets accessibility guidelines (WCAG 2.1). It also requires human intervention in terms of skills and wisdom to determine whether a website is operable. As recommended by WCAG 2.1 the operability of a website can be enhanced by following the undermentioned guidelines (Taylor, 2019):

- Avoid the use of mouse-dependent interactions, such as onMouseOver and onMouseOut JavaScript event handlers
- Include search features, site indexes, and site maps
- Create a discernible content structure of headings, sections, bulleted lists, links, and other elements by using semantic HTML every page, such as skip links for the website navigation.
- Use bypass blocks for repeated content found on Give users the capability to control timing and time limits
- Give users the capability to control media players, animation, and other types of time-dependent content
- Do not design content in a way that is known to cause seizures
- Do not hide keyboard focus styles in an effort to manipulate the design aesthetic

7. SCOPE

As mentioned in the table below, there are a total of nine issues, which are recognised by Siteimprove in the IIT libraries website homepage. Out of the nine issues, the paper discussed in detail only the issues which are associated with the Operable Principle, i.e. Issue IV-V identified by the web accessibility software Siteimprove from the IIT libraries website homepage. Table 2 contains the details of the library websites which are primarily taken for accessibility evaluation using Siteimprove Accessibility Checker.

Table 2: IIT Library Websites' Homepage Under Study

SN	IITs	Library Website Homepage
1	IIT Varanasi, BHU	https://www.iitbhu.ac.in/cf/lib
2	IIT Dhanbad, Indian School of Mines	http://www.iitismlib.ac.in/
3	IIT Bhubaneswar	https://library.iitbbs.ac.in/
4	IIT Bombay	https://www.library.iitb.ac.in/
5	IIT Delhi	http://library.iitd.ac.in/
6	IIT Dharwad	https://www.iitdh.ac.in/library.php
7	IIT Gandhinagar	http://www.iitgn.ac.in/research/library
8	IIT Goa	http://www.iitgoa.ac.in/campus.php?area=library&&lib=gallery
9	IIT Guwahati	https://www.iitg.ac.in/lib/
10	IIT Hyderabad	http://library.iith.ac.in/
11	IIT Indore	http://library.iiti.ac.in/
12	IIT Jammu	https://iitjammu.ac.in/library
13	IIT Jodhpur	http://library.iitj.ac.in/
14	IIT Kanpur	http://pkklib.iitk.ac.in/
15	IIT Kharagpur	http://www.library.iitkgp.ac.in/
16	IIT Madras	http://www.cenlib.iitm.ac.in/
17	IIT Mandi	http://library.iitmandi.ac.in/
18	IIT Patna	https://library.iitp.ac.in/
19	IIT Roorkee	http://mgcl.iitr.ac.in/
20	IIT Ropar	http://library.iitrpr.ac.in/

21	IIT Bhilai	https://www.iitbhilai.ac.in/index.php?pid=aca_library
22	IIT Palakkad	https://iitpkd.ac.in/library
23	IIT Tirupati	https://iittp.ac.in/CentralLibrary/

8. RESEARCH DESIGN/METHODOLOGY/APPROACH

The data pertaining to the adherence of the IIT libraries website homepage to the Operable principle as outlined in the WCAG 2.1 (W3C, 2018b) were obtained using the web accessibility measuring software *Siteimprove Accessibility Checker* (siteimprove, n.d.) which is a web-tool to gather details pertaining to W3C's WCAG 2.1 *(see Table 3)*. The data thus obtained were also visualized using spreadsheet software for greater insight. Siteimprove is an integrated cloud-based platform which helps in improving the content quality, better accessibility compliance, and measures website performance thus enhancing the website accessibility and visibility through thorough investigation of the concerned website.

Table 3: Operable Issues Identified in IIT Library Websites' Homepage

Issue no.	WCAG 2.1 Principle	WCAG 2.1 Guidelines	WCAG 2.1 Success Criterion	Conformance Level
I	Operable	Enough Time	Timing Adjustable	A
II		Navigable	Bypass Blocks	A
			Page Titled	A
			Focus Order	A
			Link Purpose (In Context)	A
			Focus Visible	AA
			Link Purpose (Link Only)	AAA
			Section Headings	AAA

9. RESULTS & DISCUSSION

After critically evaluate the IIT libraries website homepage by Siteimprove Accessibility Checker and identified the accessibility issues pertaining to Operable Principle are categorize here into two types of issues,

(a) Issue I: Enough Time

There are four "operable" guidelines including Enough Time making it possible to perform all tasks with a keyboard instead of a mouse, giving users enough time to perform tasks, avoiding information that flashes or flickers, as it may trigger seizures, and making it possible for users to navigate, find content, and figure out where they are. The table below depicts the result of WCAG 2.1 Guideline related to 'Enough Time' comprised of success criterion 'Time Adjustable' (Level A) of the IIT libraries website homepage evaluation.

Table 4: Issues Related to Enough Time Guidelines

Name of IIT	Timing Adjustable (Level A)	Name of IIT	Timing Adjustable (Level A)
IIT Varanasi, BHU	1	IIT Jodhpur	1
IIT Dhanbad, Indian School of Mines	1	IIT Kanpur	1
IIT Bhubaneswar	1	IIT Kharagpur	1
IIT Bombay	1	IIT Madras	1

IIT Delhi	1	IIT Mandi	1
IIT Dharwad	1	IIT Patna	1
IIT Gandhinagar	1	IIT Roorkee	1
IIT Goa	1	IIT Ropar	1
IIT Guwahati	1	IIT Bhilai	1
IIT Hyderabad	1	IIT Palakkad	1
IIT Indore	1	IIT Tirupati	1
IIT Jammu	1		

- **Discussion:**

For a website to become more accessible, the user interface components and navigation of the website must be easily operable. In case of moving notifications and highlighted menu bar, there should be enough time for the user to read and use the content. There are some criterion and one of which must be true for each time limit set by the content, e.g. Turn Off, Adjust, Extend, Real-time Exception etc.

For each time limit that is set by the content, at least one of the following is true:

- **Turn off:** The user is allowed to turn off the time limit before encountering it; or
- **Adjust:** The user is allowed to adjust the time limit before encountering it over a wide range that is at least ten times the length of the default setting; or
- **Extend:** The user is warned before time expires and given at least 20 seconds to extend the time limit with a simple action (for example, "press the space bar"), and the user is allowed to extend the time limit at least ten times; or
- **Real-time Exception:** The time limit is a required part of a real-time event (for example, an auction), and no alternative to the time limit is possible; or
- **Essential Exception:** The time limit is essential and extending it would invalidate the activity; or
- **20 Hour Exception:** The time limit is longer than 20 hours.

The intent of this Success Criterion is to ensure that users with disabilities are given adequate time to interact with Web content whenever possible. Again, disabling time limits is better than customizing the length of time limits, which is better than requesting more time before a time limit occurs. Table 4 indicates that all the IIT libraries homepage response to this evaluation criteria and also obtained equal value i.e. 1. It means all the IIT library website give sufficient time to its user to browse its web page and thus better accessible by the disabled people also. People with physical disabilities often need more time to react, to type and to complete activities in Web surfing through using screen readers, sign language or any other means. In circumstances where a sign-language interpreter may be relating audio content to a user who is deaf, control over time limits is also important. People with reading disabilities, cognitive limitations, and learning disabilities who may need more time to read or comprehend information can have additional time to read the information by pausing the content.

(b) Issue II: Navigable:

The following table displayed the results of Navigable issues of the success criterion Bypass Blocks (Level A), Page Titled (Level A), Focus Order (Level A), Link Purpose (In Context) (Level A), Focus Visible (Level AA), Link Purpose (Link Only) (Level AAA) and Section Headings (Level AAA); obtained by Siteimprove from the IIT libraries website homepage evaluation,

Table 5: Issues Related to Navigable Guidelines

Name of IIT	Bypass Blocks (Level A)	Page Titled (Level A)	Focus Order (Level A)	Link Purpose (In Context) (Level A)	Focus Visible (Level AA)	Link Purpose (Link Only) (Level AAA)	Section Headings (Level AAA)

IIT Varanasi, BHU	1	1	13	3	14	2	4
IIT Dhanbad, Indian School of Mines	1	1	9	1	75	8	2
IIT Bhubaneswar	1	-	-	-	27	-	2
IIT Bombay	1	-	4	1	86	1	2
IIT Delhi	-	-	1	5	-	-	5
IIT Dharwad	1	-	-	10	-	-	1
IIT Gandhinagar	1	-	-	28	-	29	3
IIT Goa	1	1	-	-	-	-	1
IIT Guwahati	1	-	5	2	4	2	1
IIT Hyderabad	1	-	-	10	27	6	-
IIT Indore	1	-	-	2	-	2	1
IIT Jammu	-	-	-	23	-	23	1
IIT Jodhpur	1	-	-	15	101	7	2
IIT Kanpur	-	-	1	20	96	4	2
IIT Kharagpur	-	1	1	1	-	-	2
IIT Madras	1	-	-	7	-	-	3
IIT Mandi	1	-	-	-	-	-	1
IIT Patna	1	-	-	35	-	-	1
IIT Roorkee	1	1	-	2	-	-	-
IIT Ropar	1	-	-	6	129	-	34
IIT Bhilai	1	-	-	1	1	1	2
IIT Palakkad	1	-	-	9	-	-	1
IIT Tirupati	1	-	-	-	10	-	3

- **Discussion:**

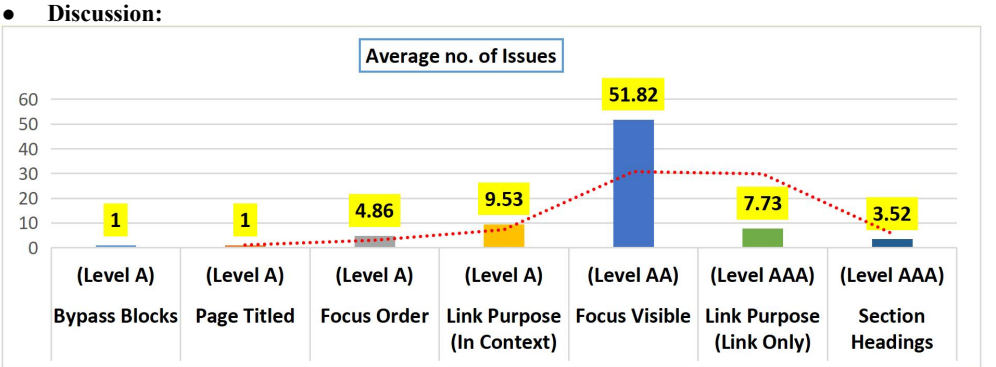

Figure 1: Average no of Navigable Issues

Web navigation refers to the process of navigating a network of information resources in the W3, which is organized as hypertext or hypermedia. A website overall navigational scheme includes several navigational pieces such as global, local, supplemental, and contextual navigation; all of these are vital aspects of the broad topic of web navigation. For a website to become more accessible, the user interface must be easy navigable in terms of find contents and also go through men menu to

every pages of the website. Following we discussed some of the success criterion of WCAG 2.1 which are identified by Siteimprove Accessibility Checker on the IIT libraries website homepage.

(i) Bypass Blocks (Level A):

A huge website may have more than one single page which repeatedly contained the same content. WCAG 2.1 success criteria Bypass Blocks is a mechanism to block such pages to save time of the user. The intent of this Success Criterion is to allow people who navigate sequentially through content more direct access to the primary content of the Web page.

In case of Bypass Blocks success criterion, the IITs either possess a very small value (i.e. 1) or does not respond to this evaluation. It indicates that in the case of Navigable accessibility issues related to Bypass Blocks success criteria, the IIT library websites possess a sound result towards becoming an accessible website.

When this Success Criterion is not satisfied, it may be difficult for people with some disabilities to reach the main content of a Web page quickly and easily:

- To avoid hearing all heading graphics and dozens of navigation links on every page navigate by screen reader user.
- To the People who use only the keyboard or a keyboard interface can reach content with fewer keystrokes.
- To the user who use screen magnifiers do not have to search through the same headings or other blocks of information to find where the content begins each time they enter a new page.
- To the people with cognitive limitations as well as people who use screen readers may benefit when links are grouped into lists.

(ii) Page Titled (Level A):

WCAG 2.1 success criterion Page Titled is generally evaluate the Web Page Titles which describes the topic or purpose of the page content. The intent of this Success Criterion is to help users find content and orient themselves within it by ensuring that each Web page has a descriptive title.

Evaluation of Page Titled success criterion responds by very few IIT library websites and with a very small value (i.e. 1). It indicates that in the case of Navigable accessibility issues related to Page Titled success criteria most of the IIT library websites possess a sound result towards becoming an accessible website.

This criterion benefits all users in allowing users to quickly and easily identify whether the information contained in the Web page is relevant to their needs, such as people with visual disabilities will benefit from being able to differentiate content when multiple Web pages are open, and people with cognitive disabilities, limited short-term memory and reading disabilities also benefit from the ability to identify content by its title.

(iii) Focus Order (Level A):

If a Web page can be navigated sequentially and the navigation sequences affect meaning or operation, focusable components receive focus in an order that preserves meaning and operability. This Success Criterion intends to ensure that when users navigate sequentially within the content, they encounter information in an order that is consistent with the meaning of the content and can be operated from the keyboard.

Focus order success criteria responds by only 7 IIT library websites and IIT Varanashi (BHU) possess the highest value (i.e. 13) and IIT Dhanbad is in very next position with value 9. Among other IIT Guwahati and IIT Bombay obtained a noticeable value i.e. 5 and 4 respectively. The result indicates that IIT library websites are in a good position when we talk about accessibility issues related to success criteria Focus Order, though some IITs like IIT Varanashi (BHU) and IIT Dhanbad need to improve more.

These techniques benefit keyboard users who navigate documents sequentially and expect the focus order to be consistent with the sequential reading order, such as:

- People with mobility impairments who must rely on keyboard access for operating a page benefit from a logical, usable focus order.
- People with disabilities that make reading difficult can become disoriented when tabbing takes focus someplace unexpected. They benefit from a logical focus order.

- People with visual impairments can become disoriented when tabbing takes focus someplace unexpected or when they cannot easily find the content surrounding an interactive element.

(iv) Link Purpose (In Context) (Level A):

The purpose of each link can be determined from the link text alone or from the link text together with its programmatically determined link context, except where the purpose of the link would be ambiguous to users in general. The intent of this Success Criterion is to help users understand the purpose of each link so they can decide whether they want to follow the link.

Evaluation of Link Purpose success criterion responds by maximum IIT library websites and some of them e.g. IIT Patna, IIT Gandhinagar, IIT Jammu and IIT Kanpur possess large value (i.e. 35, 28, 23 & 20 respectively). It intimates that in the case of Navigable accessibility issues related to Link Purpose success criteria the IIT library needs to improve enough towards enriching an accessible website.

This Success Criterion helps people with motion impairment by letting them skip links that they are not interested in, avoiding the keystrokes needed to visit the referenced content and then returning to the current content. People with cognitive limitations will not become disoriented by multiple means of navigation to and from content they are not interested in. People with visual disabilities will be able to determine the purpose of a link by exploring the link's context.

(v) Focus Visible (Level AA):

Any keyboard operable user interface has a mode of operation where the keyboard focus indicator is visible. The purpose of this success criterion is to help a person know which element among multiple elements has the keyboard focus. If there is only one keyboard actionable control on the screen, the success criterion would be met because the visual design presents only one keyboard actionable item.

Evaluation of Focus Visible success criterion responds by half of the IIT library websites and some of them e.g. IIT Ropar, IIT Jodhpur, IIT Kanpur and IIT Bombay possess large value (i.e. 129, 101, 96 & 86 respectively). It addresses that the IIT library needs to improve enough to enrich as an accessible website in the case of Navigable accessibility issues related to Focus Visible success criteria.

This Success Criterion helps anyone who relies on the keyboard to operate the page, by letting them visually determine the component on which keyboard operations will interact at any point in time. People with attention limitations, short term memory limitations, or limitations in executive processes benefit by being able to discover where the focus is located.

(vi) Link Purpose (Link Only) (Level AAA):

A mechanism is available to allow the purpose of each link to be identified from the link text alone, except where the purpose of the link would be ambiguous to users in general. This Success Criterion intends to help users understand the purpose of each link in the content, so they can decide whether they want to follow it.

Evaluation of Link Purpose success criterion responds by half of the IIT library websites and some of them e.g. IIT Gandhinagar and IIT Jammu possess large value (i.e. 29 & 23 respectively). It addresses that some of the IIT libraries need to improve enough to enrich as an accessible website in the case of Navigable accessibility issues related to Focus Visible success criteria.

This Success Criterion helps people with motion impairment by letting them skip Web pages that they are not interested in, avoiding the keystrokes needed to visit the referenced content and then return to the current content. People with cognitive limitations will not become disoriented by extra navigation to and from the content they are not interested in. People with visual disabilities will benefit from not losing their place in the content when they return to the original page. The screen reader's list of links is more useful for finding information because the target of the links is described.

(vii) Section Headings (Level AAA):

Section headings are used to organize the content. The intent of this Success Criterion is to provide headings for sections of a Web page, when the page is organized into sections. For instance, long documents are often divided into a variety of chapters, chapters have subtopics and subtopics are

divided into various sections, sections into paragraphs, etc. When such sections exist, they need to have headings that introduce them. This clearly indicates the organization of the content, facilitates navigation within the content, and provides mental "handles" that aid in comprehension of the content.

Almost all IIT library websites respond to this evaluation criteria and IIT Ropar has a far higher value than the rest of the IITs (i.e., 34). Very small values (i.e. 5-1) are obtained for the rest ones and two of them don't even respond to this test.

This success criteria benefits:

- People who are blind will know when they have moved from one section of a Web page to another and will know the purpose of each section,
- People with some learning disabilities will be able to use the headings to understand the overall organization of the page content more easily,
- People who navigate content by keyboard will be able to jump the focus from heading to heading, enabling them to find quickly content of interest, and

10. SUMMARY OF FINDINGS AND SUGGESTIONS

An accessibility audit involves looking at all the user-facing parts of the target website and hunting for potential accessibility issues. After all potential issues are found and logged, suggestions are given to improve the website. In this paper we use Siteimprove Accessibility Checker for evaluating the IIT libraries website homepage for check its accessibility issues related to Operability principle of WCAG 2.1.

There are total five guidelines (i.e. 2.1 - 2.5) under Operable Principle and near about 29 success criteria but the IIT library websites homepage in combine responds only two guidelines and 8 success criteria *(see table 3 above)*.

Now if we evaluate the result of each success criteria one by one some noticeable facts emerge, are discussed below:

- The study found that all the IIT library websites' homepage performed uniformly to the evaluation criteria pertaining to Enough Time: Time Adjustable, each reporting just one issue suggesting that these library websites offer adequate time to its user to browse its web page and ensuring better accessibility for the disabled persons.
- Now if the Navigable guideline is considered, there are total 7 success criteria responds by the IIT library websites' homepage.

  (i) Success criteria Bypass Blocks either possess a very small and uniform value (i.e. 1) or does not responds to this evaluation. Considering the respondents we can judge that the IIT library websites possess a sound result towards becoming an accessible website.

  (ii) Page Titled success criterion responds by very few IIT library websites and with a very small value (i.e. 1), indicates that the library websites are not responds well in this evaluation.

  (iii) Focus Order success criteria responds by only 7 IIT library websites' homepage. Among them IIT Varanashi (BHU), IIT Dhanba, IIT Guwahati and IIT Bombay possess sound result (i.e. 13, 9, 5 & 4) and considerably need to improve more.

  (iv) Evaluation of Link Purpose success criterion responds by maximum IIT library websites and some of them e.g. IIT Patna, IIT Gandhinagar, IIT Jammu and IIT Kanpur possess large value (i.e. 35, 28, 23 & 20 respectively) and needs to improve enough towards enriching an accessible website.

  (v) Only half of the target IIT library websites' homepage responds to the evaluation of Focus Visible success criteria.IIT Ropar, IIT Jodhpur, IIT Kanpur and IIT Bombay possess large value (i.e. 129, 101, 96 & 86 respectively), which addresses that the IIT library needs to improve enough to enrich as an accessible website.

  (vi) Same as Focus Visible, evaluation of Link Purpose success criterion responds by half of the IIT library websites and some of them e.g. IIT Gandhinagar and IIT Jammu possess large value (i.e. 29 & 23 respectively)) and considerably need to improve more.

  (vii) IIT Ropar has a far higher value than the rest of the IITs (i.e., 34) in the evaluation of Section Heading success criteria. Very small values (i.e. 5-1) are obtained for the rest ones and two of them don't even respond to this test.

11. CONCLUSION

In the case of internet-mediated information dissemination, websites become relevant among the most popular and useful means of disseminating information to the common people in any area of our society. The website is an increasingly important resource in many aspects of life, e.g. education, employment, government, commerce, health care, recreation, and more. It must be accessible to ensure equal access and equal opportunities for people with diverse abilities. Access to information and communications technologies over the web is defined as a basic human right in many countries. Many law & treaty also enforced to strengthen the rights of disabled persons, e.g. Marrakesh VIP Treaty (MVT).

When a website designed the end-user for whom the information likely to present in the web pages should be given the most priority. It should be in consideration that users of all abilities must be able to navigate the content and user interface components in ways that make sense to them. Not everybody uses a mouse. Not everybody has a touchscreen. Be sure everyone can navigate the content with ease no matter the devices they use. Libraries should check the complaints of their websites using Siteimprove or other such accessibility checker tools to identify and understand the accessibility-related issues and take appropriate steps to redesign their library websites for the benefit of all users without any inequality and discrimination.

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Awareness and Utilization of Open Access Resources Among Postgraduate Students, Research Scholars and Faculty Members of Universities of Jammu

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ABSTRACT

The purpose of this study was to ascertain how postgraduate students, research scholars, and faculty members at universities in Jammu, India, felt about and used open access resources. Data were gathered for the research using a standardized questionnaire, and descriptive statistics were used to evaluate the results. The findings demonstrated a high degree of participant knowledge and usage of open access materials, with search engines being the most popular search method. The research also highlighted various barriers to using open access materials, such as ignorance and access restrictions. According to the results, universities should encourage and provide students and faculty members access to open access materials to improve their academic and research endeavors.

Keywords: *Open access, postgraduate students, research scholars, faculty members, awareness, utilization, hindrances.*

1. INTRODUCTION

A key problem that requires attention is how postgraduate students, researchers, and teachers at institutions in Jammu are aware of and use open access materials (Ahmed, & Kousar, 2023). Although there is currently no information on the use of open access resources in this area, several factors are probably at play. These elements might include institutional support, discipline-specific resources, technological accessibility, and challenges related to language and culture (Akande, & Adekunjo, 2023). It would be beneficial to spread knowledge about the advantages of open access resources, provide instruction on how to access and utilize them efficiently, and make sure that discipline-specific materials are easily accessible in order to encourage the usage of these resources among these groups. Additionally, university administrations' assistance in fostering the use of open access resources can contribute to the development of an open access culture that is advantageous to both researchers and the general public (Bhat, & Gupta, 2021).

Due to the multiple advantages they provide, the usage of open access resources has grown in popularity in recent years (Charak, et. al. 2023). When compared to traditional publishing models, open access resources offer immediate and unrestricted access to academic publications and scholarly research, which can save time and money (Choudhary, 2023). Additionally, by making research more accessible to a larger audience, including researchers and policymakers in low-income countries who might not have the resources to access traditional subscription-based publications; open access resources can increase the visibility and impact of research (Gupta & Gupta, 2021; Panda & Kaur, 2024).

The use of open access materials within the context of Jammu's universities may have a number of beneficial outcomes. Open access materials might be beneficial for postgraduate students' research projects by enabling them too swiftly and effectively access current knowledge (Habib, et. al. 2022). Research academics may not have access to pricy subscription-based journals owing to financial restrictions; therefore they might gain from open access resources (Iqbal, et. al. 2023). By making their own research more accessible to a larger audience, faculty members may support the open access movement while also enhancing their teaching and research efforts.

It is crucial to raise awareness of the advantages of open access resources, encourage the use of open access publishing platforms, and provide training on how to access and use open access resources effectively among postgraduate students, research scholars, and faculty members in universities in Jammu (Kumar, et. al. 2023). The establishment of open access rules, promoting the use of open access resources, and giving funds to encourage open access publication are other ways

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that institutions may provide institutional assistance. Universities in Jammu may support the global open access movement and raise the quality and significance of regional research by doing these things (Maity, et. al. 2023).

However, some elements that might affect these groups' knowledge of and use of open access resources include:

i) **Technology Access:** The use of open access resources may be significantly influenced by the accessibility of computers and fast internet.
ii) **Institutional Support:** University administrations' encouragement and support of efforts to promote the use of open access resources may have a big influence on how widely such resources are used.
iii) **Resources specialized to the discipline:** The knowledge and use of open access materials among academics and students might be influenced by the availability of discipline-specific open access resources.
iv) **Cultural and linguistic barriers:** Students' and researchers' cultural and linguistic backgrounds may influence their knowledge of and use of open access materials.

The knowledge and use of open access materials among postgraduate students, research scholars, and faculty members of universities in Jammu may be influenced by a number of variables, in conclusion (Midha, & Kumar, 2022). To fully grasp the scope of these elements and how they affect the use of open access materials in this area, further study is required.

1.1. Open-Access Resource Awareness

The degree to which people, such as postgraduate students, researchers, and faculty members, are aware of and utilize the expanding number of open-access materials that are accessible in their area of study is referred to as open-access resource awareness (Mwachande, et. al. 2023). Open-access resources are digital documents, including books, research data, academic papers, and other items, that are made publicly accessible online to all users without charge or subscription (Shashikala, & Srinivasaragavan, 2019).

For researchers to access and use the most recent discoveries in their area of study, regardless of their location or institutional affiliation, they must be aware of open-access resources. Since there are more and more open-access resources available, it is crucial for researchers to be aware of them and understand where to look for and how to use them. Universities may use educational programs and seminars to educate researchers about open-access publication and how to look for and use open-access materials in order to raise awareness of these resources. By paying author fees and promoting open-access publication as a valuable research result, they may also encourage open-access publishing (Shukla, et. al. 2020).

Additionally, the creation of open-access infrastructure and policies may promote the expansion and use of open-access resources. To encourage the use and expansion of open-access materials, this might include the establishment of institutional repositories, the adoption of open-access policies for teachers and students, and cooperation with other institutions (Singh, & Charak, 2022).

Increased awareness via different channels, such as workshops, training sessions, and seminars, may be useful to encourage the usage of open access materials within Jammu's academic community. Additionally, making discipline-specific resources accessible and suited to the demands of the Jammu academic community can encourage their use. Finally, institutional support may contribute to the development of an open access culture that is advantageous to both academics and the general public by creating open access rules and giving funds to encourage open access publication (Singh, & Gupta, 2020).To create an open and inclusive research environment, stimulate cooperation and creativity, and ultimately benefit society as a whole, it is crucial to raise awareness about open-access resources.

1.2. Open-Access Resource Search Tactics

To obtain open access materials, postgraduate students, researchers, and faculty members use a number of search techniques. Here are a few of the typical search tactics:

i) **Search engine use:** To discover open access materials, many people utilize search engines like Google Scholar, Microsoft Academic, and Scopus. These search engines crawl the web to find and index academic papers and other publicly accessible research output.
ii) **Searching open access databases:** To identify relevant documents, some scholars examine institutional repositories or open access databases. Scholarly publications may be found in repositories like arXiv, PubMed Central, and DOAJ, which are well-liked among scholars.
iii) **Open access journals and publishers:** Through email newsletters and social media, many open access publishers and journals advertise their publications. Researchers that follow these journals and publishers can keep up with the most recent findings in their disciplines.
iv) **Colleague networking:** To find open access materials, researchers may connect with peers and other authorities in their subject. For instance, they could go to conferences or seminars and converse with other participants about their research interests and difficulties.
v) **Making use of library resources:** Many academic libraries provide access to open-access resources, and librarians may help you choose the right items. Additionally, some libraries provide classes on how to use and access open access resources.

The demands and tastes of certain users dictate the search methods used to obtain open access content (Sucuoğlu, & Karnley, 2023). Postgraduate students, researchers, and faculty members may access a variety of open access materials to help support their research activities by becoming acquainted with these tactics.

1.3. Advantages of Open Access Resources

Using the open access materials that are accessible in universities has several advantages. Here are a few of the main advantages:

i) **Savings:** Since open access materials are often free for users, institutions and researchers may enjoy substantial financial savings. For schools on a tight budget or researchers who may not have access to pricey subscription-based databases, this can be extremely significant.
ii) **Greater accessibility:** Anyone with an internet connection may access open access materials, regardless of geography or institutional affiliation. As a result, a wider variety of views and viewpoints may be reflected in the academic debate, broadening the reach and influence of research output.
iii) **Faster dissemination of research:** Research may be communicated more rapidly thanks to open access resources than via conventional publication techniques, which is crucial for research that must be done swiftly. This may enable more fast knowledge development and maybe quicken the pace of scientific and technological improvement.
iv) **Increased citation rates:** Studies have indicated that papers published in conventional, subscription-based journals tend to garner fewer citations than ones published in open access journals. Individual scholars as well as their institutions may gain from this enhanced influence and visibility.
v) **Collaboration and sharing:** Across institutions and fields, open access materials may promote collaboration and knowledge sharing. This may result in more multidisciplinary study and maybe more creative answers to challenging issues.

Overall, researchers, institutions, and society as a whole can gain significantly from using open access resources that are readily available in universities. Universities may contribute to the development of a more inclusive, collaborative and productive research environment by encouraging the use of open access materials and making investments in open access infrastructure and regulations.

1.4. Challenges to Utilizing Open-Access Resources

Despite the many advantages of open access resources, there are a number of things that can make it difficult for universities to use them. Here are a few of the crucial elements:

i) **Lack of knowledge:** It's possible that many students, researchers, and faculty members are unaware of the availability or presence of open access materials. This may be as a result of a lack of open access marketing or teaching inside the institution, as well as a lack of familiarity with the search techniques and accessing tools required.
ii) **Limited resource availability:** Even though the number of open access resources is expanding, there are still many fields of research where they are either scarce or unavailable. This can be

because of publisher constraints, a lack of financing for open access programs, or a lack of enthusiasm on the part of academics to make their work freely available.

iii) **Barriers posed by technology:** Using open access resources may need specialist knowledge or tools, such as a high-speed internet connection, unique software, or access to particular databases or repositories. These resources may not be available to all students or researchers, which can restrict their ability to utilize open access resources effectively.

iv) **Quality worries:** Some academics can be skeptical about the validity or dependability of open access materials. While many open access sources go through quality assurance and peer review, some might not, raising questions about the reliability of the research they contain.

v) **Institutional culture and policy:** Finally, the policies and culture of the university can have a big impact on how accessible resources are used. Students and researchers may be less likely to utilize open access materials, for instance, if the institution does not emphasize open access activities or if faculty members do not respect open access publication.

In general, overcoming these obstacles and encouraging the use of open access materials will call for a multifaceted strategy that involves finance, technology advancement, regulatory reform, and education (Uzel, et. al. 2023). Universities may contribute to the creation of a more inclusive and open research environment that is beneficial to researchers, institutions, and society at large by trying to overcome these obstacles.

2. OBJECTIVES OF THE STUDY

The specific objectives of the current study are stated as follows:

i) To investigate the level of awareness of different open access resources among post graduate students, research scholars and faculty members of universities under study.

ii) To examine the frequency level and purpose of using different open access resources by post graduate students, research scholars and faculty members of universities.

iii) To find out the different search strategies used by post graduate students, research scholars, and faculty members in accessing open access resources.

iv) To examine the different benefits associated with the use of available open access resources in the universities under study.

v) To find out the level of satisfaction among respondents towards open access resources available in the universities under study.

vi) To investigate the various factors causing hindrance in the usage of available open access resources in the universities.

3. LITERATURE REVIEW

While open-access resource awareness is generally high among researchers, different levels vary depending on discipline and seniority, according to a number of studies. For instance, 85% of researchers in the health sciences were aware of open-access materials, compared to 65% of those in the social sciences, according to a study by Hajar et al. (2017). Additionally, senior researchers were more likely than junior researchers to be aware of open-access resources. Open-access materials are more likely to be used by researchers who are aware of them, and open-access publication is becoming more widespread, according to studies. For instance, a research by Björk et al. (2014) found that open access was accessible for 50% of publications published in 2011, up from 20% in 2008. Although usage is increasing, there are still barriers to using open-access resources, such as restricted access to some databases or repositories. To find open-access materials, researchers use a range of search techniques, including generic search engines like Google Scholar, subject-specific databases, and institutional repositories. Evidence suggests that researchers are occasionally unaware of the full range of search techniques at their disposal. Researchers were typically aware with Google Scholar, according to a study by Kuchma and Johnson (2015), but they were less likely to be familiar with institutional repositories or discipline-specific repositories. Studies have emphasized the various advantages of open-access materials, including greater cooperation and multidisciplinary research, increased exposure and impact of research, and decreased access costs and times. For instance, a Swan and Brown research from 2005 indicated that open-access papers were referenced 30–50% more often than those that weren't. The use of open-access materials may be hampered by a number of

issues, such as lack of knowledge, a lack of resources, technical impediments, and worries about quality, institutional restrictions, and cultural norms, as was previously mentioned.

4. RESEARCH METHODOLOGY

4.1. Research Design: The project will be a cross-sectional survey with the goal of determining how well postgraduate students, researchers, and faculty members in Jammu are aware of, use, and what barriers they face in using open access materials.
4.2. Sampling: The study's participants will be chosen using a multi-stage sampling process. The participants will be chosen at random from among the various faculties and departments of the universities in Jammu once the institutions are first chosen at random. The study would include a total of 285 participants, including 45 academic members, 90 research scholars and 150 postgraduate students from Jammu institutions.
4.3. Data Collection: A self-administered questionnaire will be given to participants in person on the campuses of the universities in order to gather the data. To capture data on the degree of awareness, use, search tactics, advantages, satisfaction, and barriers to the use of open access resources, the questionnaire will contain closed-ended questions.
4.4. Sampling Location: The universities in Jammu, India, will serve as the study's sample site. We will specifically target academic members, research experts, and postgraduate students from the following universities in Jammu:

i) University of Jammu
ii) Central University of Jammu
iii) Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu
iv) Cluster University of Jammu
v) Baba Ghulam Shah Badshah University
vi) Shri Mata Vaishno Devi University

To choose the participants, we'll use random sampling strategies. We will start by identifying the university departments and programs that are most likely to use open access materials heavily. We'll next contact people from those departments and programs to ask them to participate in the research. The sample size will consist of 45 faculty members, 90 research experts, and 150 postgraduate students from the chosen Jammu institutions.

5. DATA ANALYSIS

The information presented relates to a study that looked at how postgraduate students, researchers, and faculty members used open access resources at institutions in Jammu, India. Data will be gathered on a number of variables, such as frequency and purpose of use of open access resources, search techniques and mechanism used to access open resources, advantages of utilizing open access resources, degree of satisfaction, and barriers preventing utilization. A total of 285 participants, including 150 postgraduate students, 90 research scholars, and 45 faculty members from six institutions in Jammu, would be chosen for the study using a multi-stage selection process. The information gathered will be shown in tables, including tables on frequency of use and purpose of open access resources, search tactics used, advantages of using open access resources, degree of satisfaction, and issues preventing utilization. In general, the information supplied is crucial for understanding how open access resources are used in Indian institutions and identifying possible opportunities to increase access to and use of these resources.

Table 1: Demographic Analysis by Gender

Gender	Postgraduate Students	Research Scholars	Faculty Members
Male	70	50	29
Female	75	36	15
Others	5	4	1
Total	150	90	45

The gender distribution of postgraduate students, researchers, and faculty members is shown in the table. 47% of the sample's total males, 49% of its females, and 4% of its members self-identify

as others. While there are almost equal numbers of men and women among postgraduate students, there are more men than women among research researchers and faculty members.

Table 2: Demographic Analysis by Age Group

Age Group	Postgraduate Students	Research Scholars	Faculty Members
Below 20 years	20	5	0
20-30 years	100	40	5
30-40 years	28	30	19
40-50 years	2	10	11
50-60 years	0	5	10
Total	150	90	45

According to the statistics, postgraduate students make up the bulk of those polled, and the majority of them fall into the 20- to 30-year-old age brackets. Faculty members make up the smallest category, while research researchers make up the second-largest. 50-60 year old groups make up a small percentage of the population in general across all demographic groups.

Table 3: Demographic Analysis by Field of Study

Field of Study	Postgraduate Students	Research Scholars	Faculty Members
Science	70	30	15
Arts	40	20	20
Commerce	20	20	5
Management	20	20	5
Total	150	90	45

The demographic profile of the participants by academic discipline is shown in Table 3. The majority of research researchers and faculty members were equally split between the fields of Commerce, Arts, and Management, whereas the majority of postgraduate students were from the Science sector.

Table 4: Search Mechanism of Open Access Resources

Search Options	Postgraduate Students	Research Scholars	Faculty Members
Title Search	70	45	21
Keyword Search	110	70	33
Author Search	80	55	27
Subject Search	60	40	20
DOI search	40	25	15
Boolean Search	35	20	10

The frequency of search choices used by academics, research researchers, and graduate students is shown in the table. Keyword searches are the most popular kind of searches, followed by author searches, title searches, and topic searches. Less people used Boolean search and DOI search.

Table 5: Frequency and Purpose of Using Open Access Resources

Purpose	Postgraduate Students	Research Scholars	Faculty Members
Research	80	55	30
Academic work	70	35	15
Total	150	90	45

The reason for which resources are used by academics, research researchers, and postgraduate students is shown in the table. 80 postgraduate students, 55 research scholars, and 30 faculty members reported using resources primarily for research reasons, which represents the majority of users across all categories. Resources are used for academic work by 15 faculty members, 35 research researchers, and 70 postgraduate students. Understanding the fundamental requirements of users and adjusting resource allocation and assistance appropriately may be done with the use of this knowledge.

Table 6: Search Engine

Search Engine	Postgraduate Students	Research Scholars	Faculty Members
Google	98	63	25
Bing	4	1	1
Yahoo	3	1	1
Google Scholar	30	20	12
Customized Search Engine	15	5	6
Total	150	90	45

The data reveals that, with a total of 98, 63, and 25 users, respectively, Google is the most often utilized search engine among postgraduate students, research researchers, and faculty members. Another well-liked search engine among the three categories is Google Scholar. Less people use Bing, Yahoo, and custom search engines. Understanding user preferences and enhancing access to resources via well-known search engines may both benefit from this knowledge.

Table 7: Benefits Associated with Open Access Resources

Benefit	Postgraduate Students	Research Scholars	Faculty Members
Easy access to information	110 (73.3%)	90 (100%)	43 (95.6%)
Cost savings	60 (40%)	80 (88.9%)	35 (77.8%)
Time savings	85 (56.7%)	85 (94.4%)	39 (86.7%)

Table and Figure 7 lists the advantages of using open access resources. The majority of participants said that saving time and having quick access to knowledge were the two biggest advantages of adopting open access resources.

Table 8: Level of Satisfaction

Level of Satisfaction	Postgraduate Students	Research Scholars	Faculty Members
Highly Satisfied	20 (13.3%)	25 (27.8%)	12 (26.7%)
Satisfied	100 (66.7%)	60 (66.7%)	26 (57.8%)
Neutral	20 (13.3%)	5 (5.6%)	6 (13.3%)
Dissatisfied	10 (6.7%)	0 (0%)	1 (2.2%)
Highly Dissatisfied	0 (0%)	0 (0%)	0 (0%)

The data shows that more postgraduate students are "satisfied" than research scholars and faculty members, and that most postgraduate students and research scholars are "very satisfied" with their experiences. In each category, a very tiny proportion of people claim to be "dissatisfied". This data may be helpful for pinpointing areas that need modification to improve the experiences of academics, teachers, and students.

Table 9: Factors Causing Hindrance to Usage of Open Access Resources

Factors	Postgraduate Students	Research Scholars	Faculty Members
Lack of awareness	60	30	10
Limited access	40	20	30
Inadequate infrastructure	20	10	20
Difficulty in using open access resources	50	40	20
Unreliable information	10	20	10
Others (please specify)	30	60	10

Table 9 list the primary barriers to postgraduate students, research scientists, and teachers using open access materials. Postgraduate students and research scientists struggled to use open access materials due to lack of understanding. Faculty struggled most with access and infrastructure. These findings suggest that raising awareness and improving training and infrastructure for open access resources may help these groups use them more.

Table 10: Participants by University and Participant Type

University	Postgraduate Students	Research Scholars	Faculty Members
University of Jammu	50	30	15
Central University of Jammu	30	20	10
Sher-e-Kashmir University of Agricultural Sciences...	20	15	5
Cluster University of Jammu	25	15	10
Baba Ghulam Shah Badshah University	15	5	5
Shri Mata Vaishno Devi University	10	5	-
Total	150	90	45

The chart lists the total number of postgraduate students, research associates, and academic staff employed by Jammu's six institutions. There are more people in each category at the University of Jammu than at the Central University of Jammu or the Sher-e-Kashmir University of Agricultural Sciences. The information offers perceptions into the regional higher education scene.

6. CONCLUSION

From the information given, it can be inferred that postgraduate students, researchers, and faculty members at institutions in Jammu are well aware of and often use open access materials. Search engines and academic databases are the most often used search tactics, and the majority of participants utilize open access resources for research and academic work. Additionally, it is clear from the data that open access resources give users quick access to information, cost and time savings, and that most users are happy with their use. But there are some things that make it harder to use open access resources, like lack of awareness, access restrictions, and technical difficulties. Overall, the statistics indicate that greater awareness raising campaigns and initiatives are needed to enhance access to open access materials, particularly for individuals who have restricted access owing to poor infrastructure or other issues. Additionally, to ensure that more people can benefit from the use of open access resources, ongoing efforts must be made to enhance the user experience and address the issues preventing its use.

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Exploring Students' Attitudes: Uniting Internet and Social Media for Synergistic Knowledge Sharing at University First Grade College Mangalagangothri, Mangalore, Karnataka, India

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ABSTRACT

The investigation provides important insights into the exploring students' attitudes: uniting internet and social media for synergistic knowledge sharing at university first grade college Mangalagangothri, Mangalore, Karnataka India. This study utilized a well-designed structured questionnaire to gather data in this research. A study was conducted of 186 undergraduate students at University First Grade College Mangalagangothri, Karnataka, India. The findings of the study revealed undergraduate students have a neutral perception of the internet and social media for synergistic knowledge sharing. More investigation is needed to understand the aspects that impact student attitudes towards reading and exams The study also highlights research suggestions to the specific context and needs of the undergraduate students at University First Grade College Mangalagangothri.

Keywords: *Students' attitudes, Internet, Social media, Knowledge sharing, University First Grade College Mangalagangothri*

1. INTRODUCTION

The growth of Internet, has altered communication and information access. Parents supervise and nurture their children in a technology-driven world and desire to limit children's reliance on technology and stop them from becoming excessively reliant on media. Social media generates an illusion of connection, dubbing it an increase of genuine connection. The present paper describes significant insights into the exploring students' attitudes: uniting internet and social media for synergistic knowledge sharing at university first grade college Mangalagangothri, Mangalore, Karnataka India.

2. REVIEW OF LITERATURE

Veer and Panda (2022) emphasized the vital role of information in daily life, highlighting libraries as essential hubs for providing accurate information. They acknowledged user studies as critical and investigated the information-seeking behavior of Teachers and Students at Jan Nayak Ch. Devi Lal Vidyapeeth, Sirsa, surveying nearly 200 respondents. The study underscored the need for libraries and information providers to understand how individuals sought information to enhance service delivery, recommending the expansion of informal communication channels to facilitate information flow. In Yao, Y. and Zhou, X.'s (2021) study, rapid urbanization in China was found to have challenged community governance, with technology offering opportunities to foster social capital and enhance community development. Rostami, C., Hosseini, E., and Saberi, M.K. (2022) investigated the information-seeking behavior of Iranian medical faculty members and the factors influencing their use of the Internet, scientific databases, and online social networks. Their findings indicated that gender, age, and experience significantly influenced their information-seeking behavior. Lopez-Fernandez O. (2018) conducted a study on the distinction between generalized pathological Internet use and specific pathological Internet use, concluding that specific pathological Internet use effectively captured addictive symptomatology among potential problem users, with online gaming emerging as the most severe behavioral addiction problem. Lynn, R., and Witte, J.C. (2015) investigated how people used multimedia to maintain social ties, particularly focusing on social networking sites like Facebook. Their study revealed that social networking sites were increasingly used to connect with close friends and family, demonstrating the role of multimedia in sustaining social connections.

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3. OBJECTIVES

i) To know the student attitude towards internet
ii) To know the student attitude towards social media
iii) To know the perceived benefits and challenges of internet and social media
iv) To suggest the specific context and needs of the students.

4. RESEARCH DESIGN AND METHODOLOGY

This study utilized a well-designed structured questionnaire to gather data in this research. The questionnaire consisted of carefully designed questions to collect information about the present study. The chosen methodology was deemed appropriate for gathering data, allowing for a comprehensive understanding of decoding student mindsets, exploring attitudes towards internet and social media at University First Grade College Mangalagangothri. A study was conducted of 186 undergraduate students University First Grade College.

5. SCOPE AND LIMITATIONS

In this research, confinement in University First Grade College Mangalagangothri, is examined. The study collected 186 responses from undergraduate students to gain insight into their perspectives decoding student mindsets, exploring attitudes towards reading and exams at University First Grade College Mangalagangothri. It is significant to note that the research only pertains to this specific educational institution.

6. DATA ANALYSIS AND INTERPRETATION

Table 1: Gender of the Respondents

S.No	Gender	Frequency	Percent
1.	Male	78	41.9
2.	Female	108	58.1
Total		**186**	**100.0**

The table 1 shows that the majority of participants were female (58.1%), while the minority were male (41.9%). The gender distribution is relatively evenly split, with a slight majority of females. The number of male participants is slightly lower than the number of female participants.

Table 2: Department Wise Respondents

S.No	Department	Frequency	Percent
1.	BA	26	14.0
2.	BBA	63	33.9
3.	BCOM	97	52.2
Total		**186**	**100.0**

The table 2 displays that the majority of students were from the BCOM department (52.2%), followed by the BBA department (33.9%) and the BA department (14.0%). The department distribution is skewed towards the BCOM department. The number of participants from the BA department is the lowest.

Table 3: Nationality of the Respondents

S.No.	Nationality	Frequency	Percent
1.	Indian	172	92.5
2.	International	14	7.5
Total		**186**	**100.0**

The table 3 shows that the majority of students were Indian (92.5%), while the minority were international (7.5%). The nationality distribution is heavily skewed towards Indian participants. The number of international participants is very low.

Table 4: Semester Wise Respondents

S.No.	Semester	Frequency	Percent
1.	II Semester	84	45.2
2.	IV Semester	53	28.5
3.	VI Semester	49	26.3
Total		**186**	**100.0**

The above 4 table displays that the majority of students were from the II semester (45.2%), followed by the IV semester (28.5%) and the VI semester (26.3%). The semester distribution is skewed towards the II semester. The number of participants from the VI semester is the lowest.

Table 5: Residential Area Wise Respondents

S.No.	Residential Area	Frequency	Percent
1.	Rural	153	82.3
2.	Urban	33	17.7
Total		**186**	**100.0**

The table 5 displays that the majority of students were from rural areas (82.3%), while the minority were from urban areas (17.7%). The residential area distribution is heavily skewed towards rural areas. The number of participants from urban areas is very low.

Table 6: Students' Attitudes: Uniting Internet And Social Media For Synergistic Knowledge Sharing

Descriptive Statistics								
S.No	**Statement**	**N**	**Min.**	**Max.**	**Mean**	**Std. Dev.**	**Rank**	**Decision**
1.	Using Social media Sites s for educational purpose is a good approach	186	1.00	5.00	2.1	1.11589	13	High Perception
2.	At present students lose sleep due to the late-night use of internet	186	1.00	5.00	1.8	.97977	32	Low Perception
3.	At present WhatsApp and Facebook is popular social media sites	186	1.00	5.00	1.8	.87140	26	Low Perception
4.	By using internet every student has to collect educational information	186	1.00	5.00	1.8	.78486	30	Low Perception
5.	I access internet at every free time	186	1.00	5.00	1.7	.78891	33	Low Perception
6.	I access internet through mobile especially smart phone.	186	1.00	5.00	1.4	.56055	34	Low Perception
7.	I use internet for downloading education materials	186	1.00	5.00	2.0	.88491	21	Low Perception
8.	In modern time every student has to open social media account	186	1.000	5.000	2.2	.965565	11	High Perception
9.	Information in the form of Multimedia will help the people to understand things much better	186	1.00	5.00	2.1	.90369	12	High Perception
10.	Internet affects student's personal life	186	1.00	5.00	2.3	1.05712	6	High Perception

11.	Internet facilitates global access and speedy retrieval of needed information	186	1.00	5.00	1.9	.80656	23	Low Perception
12.	Internet facilitates my self-assessment processes	186	1.00	5.00	2.3	.91714	8	High Perception
13.	Internet helps Resource sharing (sharing of books, catalogues etc)	186	1.00	5.00	2.1	.89631	17	High Perception
14.	Internet is a good tool for learning with entertainment and fun	186	1.00	5.00	1.8	.82696	31	Low Perception
15.	Internet is a knowledge sharing tool	186	1.00	5.00	1.8	.73442	28	Low Perception
16.	Internet is good technique to interchange of ideas, and materials among the students, professors, and scholars	186	1.00	5.00	2.0	.79748	22	Low Perception
17.	Internet provides communication skill	186	1.00	5.00	2.1	.92106	18	High Perception
18.	Internet reducing thinking capacity of students	186	1.00	5.00	2.5	1.24849	3	High Perception
19.	Internet reducing thinking capacity of students	186	1.00	5.00	2.3	1.08885	4	High Perception
20.	Internet using is nothing but wastage of time	186	1.00	5.00	2.7	1.23921	1	High Perception
21.	Social media Sites area a good medium to express feelings and ideas	186	1.00	5.00	2.1	.81329	13	High Perception
22.	Social media Sites help for sharing information among the students	186	1.00	5.00	1.8	.72966	27	Low Perception
23.	Social media Sites help for sharing information among the students	186	1.00	5.00	2.1	1.01061	18	High Perception
24.	Social media Sites is an effecting technique for e-learning	186	1.00	5.00	2.2	.98781	9	High Perception
25.	Students grades or school work suffer because they spend long time on online	186	1.00	5.00	1.9	.98975	24	Low Perception
26.	Students neglect their other activities as they spent much time for online	186	1.00	5.00	2.1	1.03936	15	High Perception
27.	Students spend more time on WhatsApp and Facebook or other sites which seriously affect their academic performance	186	1.00	5.00	2.1	.94683	15	High Perception
28.	Through internet students have a wide scope to access books, journals and other materials	186	1.00	4.00	1.9	.69339	25	Low Perception
29.	Using internet affects student's academic career (e.g. school absences, poor grades or low performance)	186	1.00	5.00	2.3	1.05265	5	High Perception

30.	Using internet affects student's mental health	186	1.00	5.00	2.1	1.08640	20	High Perception
31.	Using internet affects student's physical health (e.g. experience back pain, eye strain)	186	1.00	5.00	1.8	1.00548	29	Low Perception
32.	Using Social media Sites at every free time spoils the students	186	1.00	5.00	2.2	1.04484	10	High Perception
33.	Using social media sites enhance the rate of interactions among the students and teachers	186	1.00	5.00	2.3	.90483	7	High Perception
34.	Using Social media Sites for chatting and making new friends is a bad habit	186	1.00	5.00	2.7	1.19789	2	High Perception

(Note: N=104 104 5=Strongly agree, 4=Agree 3=Not sure 2=Disagree1=Strongly Disagree Decision - weighted average 32.87/34 =2.1)

The table no 6 shows students' attitudes: uniting internet and social media for synergistic knowledge sharing. The average decision value is 2.1, which is slightly above the midpoint of the scale (3). This suggests that respondents are generally aware of the benefits and drawbacks of using these technologies. Respondents are more likely to agree that the internet provides communication skills (statement 5) and is a good tool for learning with entertainment and fun (statement 8) than they are to agree that it is a good technique for the interchange of ideas and materials among respondents, professors, and scholars (statement 6) or that it is a knowledge sharing tool (statement 9).Respondents are more likely to disagree that the internet reduces their thinking capacity (statement 17) and that using it is a waste of time (statement 18) than they are to disagree that it affects their academic career (statement 14) or their personal life (statement 15). Respondents are more likely to agree that social media sites are a good medium to express feelings and ideas (statement 25) and an effective technique for e-learning (statement 26) than they are to agree that they help for sharing information among respondents (statement 24). Respondents are more likely to disagree that using social media sites at every free time spoils respondents (statement 21) than they are to disagree that respondents spend more time on them than on other activities (statement 16). The findings suggest that respondents have a nuanced view of the internet and social media sites. They recognize that these technologies can be both beneficial and harmful, and they are making informed decisions about how to use them.

7. FINDINGS

Students' internet usage is dominated by smartphones, and while they see its value for communication and global access to information, they're concerned about its impact on health, academic performance, and sleep. Social media, particularly WhatsApp and Facebook, is widely used and seen as potentially helpful for e-learning and interaction, but concerns remain about neglecting other activities and the overall impact on personal lives.

8. SUGGESTIONS

To combat the downsides of internet and social media use among students, a multi-pronged approach is key. This includes promoting effective time management skills, integrating technology into learning for better outcomes, prioritizing health and wellness, setting guidelines for online activities, highlighting positive aspects, collaborating with educators to leverage social media in the classroom, involving parents in the conversation, and continuously monitoring the situation to adapt strategies as needed. This holistic approach can empower students to use technology responsibly and reap its benefits while minimizing potential harms.

9. CONCLUSION

The paper provides valuable insights into students' attitudes towards internet usage and social media. The findings suggest a nuanced perspective, with both positive and negative perceptions among the respondents. By implementing targeted interventions and involving key stakeholders,

educational institutions can foster a positive online environment that enhances learning while mitigating potential negative impacts on students' well-being and academic performance.

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Bibliometric Portrait on Social Media in Relation to Libraries

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ABSTRACT

The science of quantitatively analysing publications is known as bibliometry. In the field of intellectual and scientific research, it is frequently used to assess the impacts, trends, and patterns associated with publications. Bibliometric analysis evaluates the influence and production of writers, journals, organisations, and even entire academic disciplines using statistical and mathematical techniques. This work offers a "Bibliometric" analysis of the literature on "Social media" pertaining to "Library," with a focus on publications beginning in 1945 as per SCOPUS Database. The research outcome is based on author keywords, works by different countries, organisations, and authors, as well as solo and collaborative author publications found through searches of the Scopus Database and the Authorship Collaboration Network, citation analysis, and term co-occurrences application VOSviewer and for maps Datawrapper generation tools have been applied. Excluding 2023, the results indicate a healthy development in literature, with the majority of publications coming from United State of America.

Keywords: *Bibliometric Study, Bibliometry, Social Media*

1. INTRODUCTION

A quantitative analysis of academic publications, such as books, journals, and conference proceedings, is called "bibliometry." It is used, typically in the context of scholarly and scientific publications, to analyse and quantify various elements of bibliographic data. It comprises analysing correlations, patterns, and trends in a group of articles or documents using statistical and mathematical techniques. The progress of scientific subjects, the output of researchers, and the importance of their work can all be clarified by bibliometric analysis. It makes an effort to measure and evaluate various aspects of scholarly communication, including the importance and influence of publications, the output of authors and academic institutions, and the collaboration patterns among academics. Researchers can use it to gauge their own contributions to their field, identify research trends, and make well-informed decisions about where to publish their work in the academic and research worlds. Additionally, it provides quantitative insights on the impact of scholarly work. The term "social media" describes websites and online platforms that let people engage in social networking activities as well as produce and distribute content. Through these platforms, people can communicate in a variety of ways, interact with one another, and share information. Computer-based tools that make it easier to create, share, and exchange knowledge, concepts, and multimedia content within online communities and networks are referred to as social media. Through these platforms, people and groups can communicate digitally and connect, engage, and interact with one another. Creating and disseminating user-generated content on social media usually entails text, photos, videos, and links. Social media is becoming an essential component of contemporary communication and is important for influencing public opinion, spreading news, and promoting interpersonal relationships. Social media raises worries about privacy, online harassment, disinformation, and the influence of social media on mental health, even while it also has beneficial features like connecting people, sharing information, and establishing communities. The function and influence of social media on society are probably going to shift even more as technology develops.

In the digital age, social media and library integration is becoming more and more crucial. Social media channels present libraries with exceptional chances for outreach, engagement, and communication. The following are some particular ways that social media and libraries interact:

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Chapter 6; S. Hasan, S. Kumar, S. Panda, K. N. Khan & G. Samdani (Eds); PP. 47-60; Synergy Books India, N.D.

Promotion of Events and Programmes: Libraries can advertise forthcoming workshops, events, and programmes on social media. This promotes community involvement and helps reach a larger audience. ***Resource Sharing***: Using social media platforms, libraries can notify their patrons about upcoming book releases, online resources, and other things. This makes it easier for users to find resources. ***Participation in the Community*:** Social media gives libraries a platform to interact with the public. In order to build stronger community relationships, libraries can answer questions, distribute user-generated content, and take part in discussions. ***Digital Narrative*:** Social media is a useful tool for libraries to employ for digital storytelling, where they may share success stories, initiatives, and the effects of their services on community members. ***Reader's Advice:*** Librarians can converse with customers about their literary interests and offer book recommendations and reading lists via social media. This strengthens the library's position as a helpful tool for readers. ***Information Exchange*:** Social media networks are useful for libraries to disseminate critical information, such as revisions to policy, holiday schedules, and operation hours adjustments. ***Informational Content*:** Libraries can utilise social media as a platform to disseminate informational content, such as guides on how to use the resources in the library efficiently, advice on information literacy, and suggestions for online courses. ***Virtual Events and Book Clubs*:** Libraries can now conduct online programmes, book clubs, and interactive debates using social media, enabling patrons to participate from any location. This is made possible by the growing popularity of virtual events. ***Partnerships & Collaborations*:** Social media makes it easier to work together with institutions, other organisations, and nearby companies. These platforms can be used by libraries to promote collaborations, cooperative events, and joint projects. ***Support and Advocacy*:** Libraries can utilise social media to promote the value of libraries in their local communities. This involves disseminating information about the advantages of library services as well as success stories and testimonies. ***Surveys and comments*:** Libraries can use social media to get comments from their users. Social media platforms can be used by libraries to gather information about user preferences and requirements through surveys and polls. ***Inclusivity and Accessibility*:** Social media is a powerful tool that libraries may utilise to spread information to a varied audience and encourage inclusivity. This entails meeting the requirements of diverse groups, utilising accessible formats, and offering material in numerous languages.

Libraries must adjust their social media strategies to the requirements and tastes of their particular community. Engaging on social media regularly and thoughtfully can improve the library's exposure, foster greater patron contact, and support community development initiatives. Now-a-days, there is an eternal link between social media and library. Literature appears also on this topic. This paper explores the bibliometric study of social media in relation to library.

2. LITERATURE REVIEW

In the subject of bibliometrics, this research examines growth patterns, core journals, and author distribution using data from Library and Information Science Abstracts (LISA). The expansion of literature does not follow any clear trend. 'Scientometrics' is determined to be the core journals in this field by applying Bradford's law of scattering. To find the productivity patterns of authors, Lotka's law was applied. It is noted that the distributions of the writers deviate from the original Lotka's law. The study also determined the top 12 authors in this subject, with over 20 publications each (Patra, Swapan kumar & Bhattacharya, Partha & Verma, Neera, 2006)

This study presents new issues, assesses bibliometric studies in tourism, and provides critical conversations for theory development and further research. 190 articles with bibliometric analyses from prestigious publications on hospitality and tourism were chosen, and they underwent critical analysis, in order to accomplish this goal. The study's conclusions show that after 2008, the number of bibliometric articles published in these journals increased dramatically. But the majority of studies turned out to be systematic review studies, with only a small number using relational and evaluative bibliometric studies. According to study findings, there is currently a lack of research, especially in relational bibliometric studies related to tourism. One of the earliest studies in this field to provide critical analysis and recommendations for theory building and further research along these lines is this one. (Mehmet Ali Koseoglu, Roya Rahimi, Fevzi Okumus, Jingyan Liu, 2016)

This work offers a bibliometric study of the "Library Herald" journal for the years 2006–2010. The primary topics covered by the analysis are the quantity of publications, authorship patterns,

subject-wise distribution of articles, average number of references per article, types of documents referenced, distribution of cited journals by year, and so forth. Every study highlights the journal's strengths and weaknesses, which will be beneficial for its continued growth. The findings indicated that of the 138 publications, 72 (52.17%) were contributed by a single author, and the remaining 66 (47.83%) were contributed by joint authors. According to the study, 89.85% of the contributions come from India, with the remaining 10.5% coming solely from outside sources. (Thanuskodi, S., 2011)

A relatively recent area of multidisciplinary study is tourist psychology. A bibliometric examination of the field of tourist psychology from 1990 to 2005 is included in this paper. During this time, citation patterns, Price, Lotka, and Bradford laws, as well as the development of scientific output, were examined. The findings indicated a notable expansion in the body of knowledge on the topic, along with a rise in co-authorship and institutional cooperation. This new research topic is likewise characterised by the presence of empiric regularities and bibliometric rules found in other disciplines. (Barrios, M., Borrego, A., Vilaginés, A., Ollé, C., & Somoza, M., 2008).

This study ascertains the features and growth of the literature found in digital libraries. In order to investigate authorship patterns, authors' productivity and notable contributors, language- and year-wise article distribution, country-wise journal distribution, core journals in the subject area, and indexing term frequency, over 1,000 articles from the 1998–2004 period were gathered from LISA Plus and examined. The majority of articles (61%) were written by one author; author productivity did not follow Lotka's Law, with the exception of one case; the highest number of articles published in 2003 were in the journal D-lib Magazine; the maximum number of articles published were in English, which is the most productive language; and the distribution of articles almost followed Bradford's Law. The study offers a thorough review of authorship in the field of library and information science, making it pertinent to anyone with an interest in bibliometrics. (Singh, G., Mittal, R., & Ahmad, M.,2007).

3. OBJECTIVES

The objectives of this study are to:

i) Investigate the access pattern
- *Year wise*
- *Document type wise*
- *Source and Contributors wise*
- *Language wise*
- *Country wise*
- *Domain wise*

ii) Investigate authorship pattern
- *Author Productivity*
- *Degree of Collaboration*
- *Collaborative Index*

iii) Analyse authorship pattern by visual portrait
- *Total Author Collaboration*
- *Author Collaboration among Countries*
- *Author Collaboration among Organization*

iv) Analyse term of occurrences by visual portrait
- *Total keywords*
- *Author keywords*
- *Index Keywords*

v) Visualize citation analysis and co-citation analysis

4. SCOPE & METHODOLOGY

This study has employed a general bibliometric procedure to determine its aims. Data have been retrieved on that particular domain as a registered member of the Scopus database using the search phrase ((TITLE-ABS-KEY(Social Media) AND TITLE-ABS-KEY(Library))) AND PUBYEAR > 1944 AND PUBYEAR < 2024 (Noruzi, 2017). Following retrieval, data were gathered, examined, and tallied while keeping the study's goals in mind. VOSviewer software has been utilised

for citation analysis and word co-occurrences, and Datawrapper for map construction in order to depict the authorship collaboration network.

5. DATA ANALYSIS AND INTERPRETATION

The collected data were analyzed and presented in the form of simple tables and figures with suitable interpretation. The dataset revealed a lot of interesting results. The study analyzes 3557 literatures regarding social media and library which were published in the world.

5.1. Year Wise Publication:

The figure 1 represents that year wise distribution of publication. In total more than 3000 publications were identified through Scopus database. Among the total papers, published within the 1945 to 2023, the highest number of publications i.e. 414 documents has been published in 2022 and the followed by 389 published in 2023, 385 published in 2021.

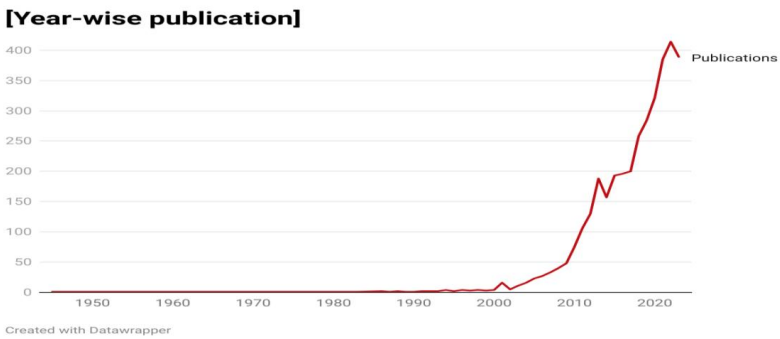

Figure 1: Year-wise publication

5.2. Document type wise Distribution:

Figure 2 indicates the document type wise distribution of publication on this topic. As per figure (fig.-2) 2013 journal articles has been identified through Scopus database. It is followed by Conference Paper (664) and Review (411).

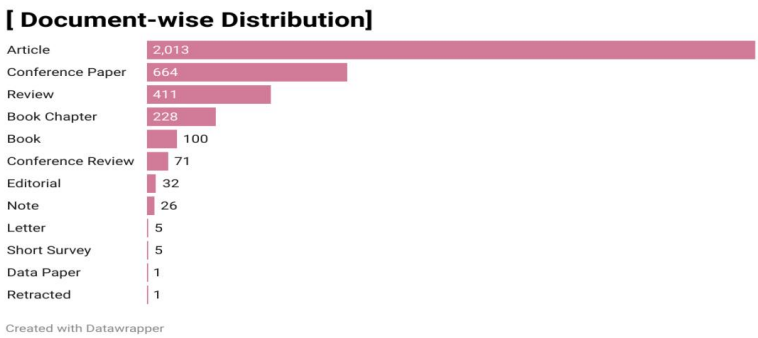

Figure 2: Document-wise distribution

5.3. Source and Contributors:

In this section, Table 1 represented that source wise distribution of publication. Source 'Library Philosophy And Practice' has received maximum number of publication on selected topic with 134. Table-2 presented the top ten contributors among selected documents. Following table (Table-2) shows that Chiu, D.K.W contributed more literature on a particular topic.

Table 1: Source title wise distribution of publication (Top ten)

Source Title	No. of Publication
Library Philosophy And Practice	134
Lecture Notes In Computer Science Including Subseries Lecture Notes In Artificial Intelligence And Lecture Notes In Bioinformatics	97
Proceedings Of The ACM IEEE Joint Conference On Digital Libraries	58
BMJ Open	52
Journal Of Academic Librarianship	44
Library Hi Tech News	43
Library Hi Tech	39
Ceur Workshop Proceedings	33
Journal Of Medical Internet Research	32
ACM International Conference Proceeding Series	31

Table 2: Top Ten Researchers

Name of Contributors	No. of Publications
Chiu, D.K.W.	12
Abrizah, A.	10
Alhoori, H.	9
Bhatti, R.	8
Bowler, L.	7
Marshall, C.C.	7
Nelson, M.L.	7
Nicholas, D.	7
Rachman, Y.B.	7
Anderson, K.E.	6

5.4. Language wise:

Following Table 3 depicted the top ten languages according to number of publications of respective study. “English” language holds 1st position with 3358 publications and then followed by Spanish (67) and Chinese (29).

Table 3: Top Ten Languages

Language	No. of Publications
English	3358
Spanish	67
Chinese	29
Portuguese	23
Croatian	17
French	14
Russian	14
German	12
Italian	9
Persian	9

5.5. Country wise:

From another aspect figure-3 measures the published documents according to affiliations of the authors. According to analysis of researchers United States holds 1st position with 1026

publications, UK holds 2nd position with 297 publications and India holds the 3rd ranks with 253publications.

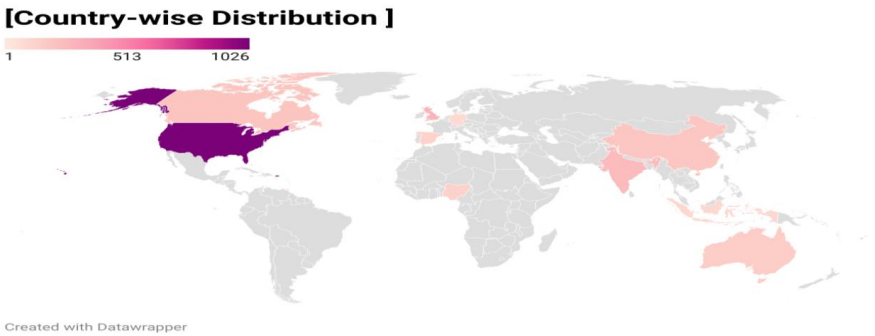

Figure 3: Country-wise Publication

5.6. Domain wise:

Table 4 depicts the top five domains according to number of publications of respective domains. Domain "Social Media" holds 1st position with 1166 publications. Then followed by "Human, Humans and Social Networking"

Table 4: Domain-wise distribution

Domain	No. of Publications
Social Media	1166
Human	605
Humans	453
Social Networking (online)	429
Digital Libraries	303
Libraries	274
Article	261
Systematic Review	255
Review	227
Academic Libraries	169

5.7. Authorship Pattern:

Following Table 5 shows the authorship pattern of research contributions published on regarding matter

Table 5: Distribution of Authorship Pattern

Publication Year	SA	MA	Publication Year	SA	MA	Publication Year	SA	MA
2023	64	325	2008	17	23	1993	2	0
2022	76	338	2007	12	21	1991	1	1
2021	84	301	2006	10	18	1990	2	0
2020	74	247	2005	13	10	1989	0	1
2019	84	200	2004	10	6	1988	2	0
2018	78	180	2003	4	7	1987	1	0
2017	69	131	2002	1	4	1986	1	1
2016	70	126	2001	8	8	1983	1	0
2015	69	124	2000	4	0	1982	1	0
2014	50	101	1999	2	1	1978	1	0
2013	60	128	1998	2	2	1975	1	0
2012	45	84	1997	1	2	1974	1	0
2011	100	66	1996	2	2	1966	1	0

2010	25	50	1995	2	0	1945	1	0
2009	23	25	1994	3	1			

** SA- Single Auth17orship; MA- Multiple Authorship*

Total numbers of single authorship contributions are 988; total numbers of multiple authorship contributions are 2569. From the table-6 it becomes clear that only 988articles were published by single author whereas 2569 articles were contributed by two or more than two authors.

5.8. Author Productivity:

Table 6 shows picture of average author per paper (AAPP) and productivity per author (PPA) in the selected time zone of this study. The formula for the AAPP and productivity per author are as follows.

Table 6: Author productivity

Year	Papers	Authors	*AAPP**	*PPA**	Year	Papers	Authors	*AAPP**	*PPA**	Year	Papers	Authors	*AAPP**	*PPA**
2023	389	196	0.503856	1.984694	2008	40	88	2.2	0.454545	1993	2	2	1	1
2022	414	186	0.449275	2.225806	2007	33	79	2.393939	0.417722	1991	2	3	1.5	0.666667
2021	385	197	0.511688	1.954315	2006	27	64	2.37037	0.421875	1990	1	1	1	1
2020	321	217	0.676012	1.479263	2005	23	49	2.130435	0.469388	1989	1	2	2	0.5
2019	284	184	0.647887	1.543478	2004	16	27	1.6875	0.592593	1988	2	2	1	1
2018	258	189	0.732558	1.365079	2003	11	28	2.545455	0.392857	1987	1	1	1	1
2017	200	182	0.91	1.098901	2002	5	10	2	0.5	1986	2	3	1.5	0.666667
2016	196	196	1	1	2001	16	37	2.3125	0.432432	1983	1	1	1	1
2015	193	183	0.948187	1.054645	2000	4	4	1	1	1982	1	1	1	1
2014	151	172	1.139073	0.877907	1999	3	4	1.333333	0.75	1978	1	1	1	1
2013	188	192	1.021277	0.979167	1998	4	7	1.75	0.571429	1975	1	1	1	1
2012	130	173	1.330769	0.751445	1997	3	7	2.333333	0.428571	1974	1	1	1	1
2011	106	166	1.566038	0.638554	1996	4	6	1.5	0.666667	1966	1	1	1	1
2010	75	176	2.346667	0.426136	1995	2	2	1	1	1945	1	1	1	1
2009	48	105	2.1875	0.457143	1994	4	7	1.75	0.571429					

AAPP*= average author per paper, PPA*= productivity per author

Average author per paper (AAPP) = Number of authors / Number of papers

Productivity per author (PPA) = Number of papers / Number of authors

From table 6, it is found that lowest AAPP is 0.449275with highest PPA is 2.225806 in the year 2022. On the other side, highest AAPP at 2.545455 with lowest PPA at 0.392857 is seen in the year 2003

5.9. Degree of Collaboration:

Table 7 describes the degree of collaboration among the authors. In this study the Degree of Collaboration (C) of the contributors has been calculated using the Subramanyam formula (Sarkar & Pal, 2020). The formula is as follows:

Degree of Collaboration (C) = Nm / Nm + Ns

Where,

C = Degree of Collaboration

Nm = Number of multiple authored paper

Ns = Number of single authored paper

Table 7: Degree of collaboration

	*Ns**	*Nm**	*(Ns +Nm)*	*C**		*Ns**	*Nm**	*(Ns +Nm)*	*C**		*Ns**	*Nm**	*(Ns +Nm)*	*C**
2023	64	325	389	0.835476	2008	17	23	40	0.575	1993	2	0	2	0
2022	76	338	414	0.816425	2007	12	21	33	0.636364	1991	1	1	2	0.5
2021	84	301	385	0.781818	2006	10	18	28	0.642857	1990	2	0	2	0
2020	74	247	321	0.76947	2005	13	10	23	0.434783	1989	0	1	1	1
2019	84	200	284	0.704225	2004	10	6	16	0.375	1988	2	0	2	0
2018	78	180	258	0.697674	2003	4	7	11	0.636364	1987	1	0	1	0
2017	69	131	200	0.655	2002	1	4	5	0.8	1986	1	1	2	0.5
2016	70	126	196	0.642857	2001	8	8	16	0.5	1983	1	0	1	0
2015	69	124	193	0.642487	2000	4	0	4	0	1982	1	0	1	0
2014	50	101	151	0.668874	1999	2	1	3	0.333333	1978	1	0	1	0
2013	60	128	188	0.680851	1998	2	2	4	0.5	1975	1	0	1	0
2012	45	84	129	0.651163	1997	1	2	3	0.666667	1974	1	0	1	0
2011	100	66	166	0.39759	1996	2	2	4	0.5	1966	1	0	1	0
2010	25	50	75	0.666667	1995	2	0	2	0	1945	1	0	1	0
2009	23	25	48	0.520833	1994	3	1	4	0.25					

Ns*= Number of single authored paper, Nm* = Number of multiple authored paper, C = Degree of Collaboration

Above table (Table-7) shows the individual year wise Degree of Collaboration. This table reveals that the highest value of DC is observed in the year 2023

5.10. Collaborative Index of Articles:

Collaborative Index (CI) of articles is the mean number of authors per joint paper. To determine the mean number of authors per jointly authored paper, the following Elango and Rajendran's formula (Elango & Rajendran, 2012) has been used.

Collaborative Index (CI) = Total number of authors / Total joint papers

Table 8: Collaborative Index (CI) of articles

Year	Total number of authors	Total joint papers	Collaborative Index
2023	196	325	0.603077
2022	186	338	0.550296
2021	197	301	0.654485
2020	217	247	0.878543
2019	184	200	0.92
2018	189	180	1.05
2017	182	131	1.389313
2016	196	126	1.555556
2015	183	124	1.475806
2014	172	101	1.70297
2013	192	128	1.5
2012	173	84	2.059524
2011	166	66	2.515152
2010	176	50	3.52
2009	105	25	4.2
2008	88	23	3.826087
2007	79	21	3.761905
2006	64	18	3.555556

2005	49	10	4.9
2004	27	6	4.5
2003	28	7	4
2002	10	4	2.5
2001	37	8	4.625
2000	4	0	-
1999	4	1	4
1998	7	2	3.5
1997	7	2	3.5
1996	6	2	3
1995	2	0	-
1994	7	1	7
1993	2	0	-
1991	3	1	3
1990	1	0	-
1989	2	1	2
1988	2	0	-
1987	1	0	-
1986	3	1	3
1983	1	0	-
1982	1	0	-
1978	1	0	-
1975	1	0	-
1974	1	0	-
1966	1	0	-
1945	1	0	-

It can be observed from table-8 that the maximum value of CI 4.9 is in the year 2005 and minimum value 0.55 is in the year 2022

5.11. Author Collaboration Network:

a) Author Collaboration

Figure 4a: The threshold which has been set for the visual portrayal of author collaboration network is minimum of 5 documents of an author to be chosen. Out of the 9282 authors 42 only meet the threshold. After VOSviewer has calculated the total strength of the co-authorship links with other authors, 2 clusters have been formed in this network.

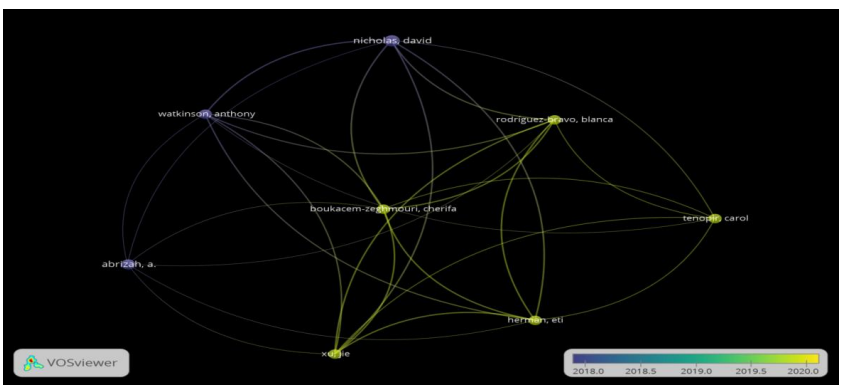

Figure 4a: Author Collaboration

b) Author Collaboration among Countries

Following figure (Figure-4b) presented the co-authorship links between the countries. The threshold which has been set for the visual portrayal of author collaboration network among countries is minimum of 5 documents of a country. Out of the 170 countries 75 meet the threshold.

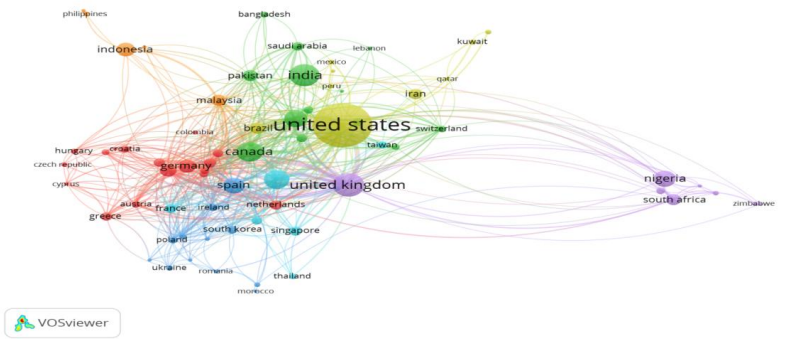

Figure 4b: Author Collaboration Among Countries

c) Collaboration among Organization

Figure 4c: Author Collaboration Among Organization

Figure (Figure 4c) presented the co-authorship links between the organization. The threshold which has been set for the visual portrayal of author collaboration network among countries is minimum of 2 documents of a country. Out of the 6602 organization 309 meet the threshold.

5.12. Analysis of Keywords:

The primary subjects and research trends in this field can be inferred from a word analysis of the titles and abstracts of publications found in libraries and on social media. The terms were analysed and visualised using VOSviewer. Initially, every noun word was taken out of those publications' titles and abstracts.

a) All keywords

Figure 5a: Out of 14789, 1274 meets threshold. Minimum no of occurrence of keywords is 5. There are seven clusters of varying colours with distinct circles of different items. Here also the weight represents the frequency of occurrence. Keywords such as “social media”, “human” and “article” occurred most common. Total link strength 158291, Total links 71193, Items 1000

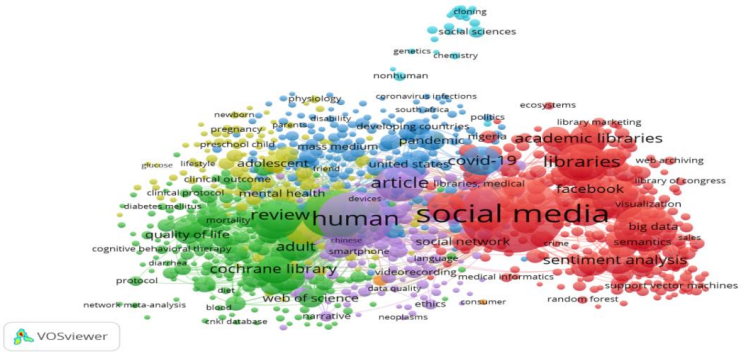

Figure 5a: Occurrence of Keywords

b) Author Keywords

Figure-5b: Out of 7467 keywords, 382 meet the threshold. Minimum number of occurrence of the keyword is 5.Here "Social Media" occurred most common.

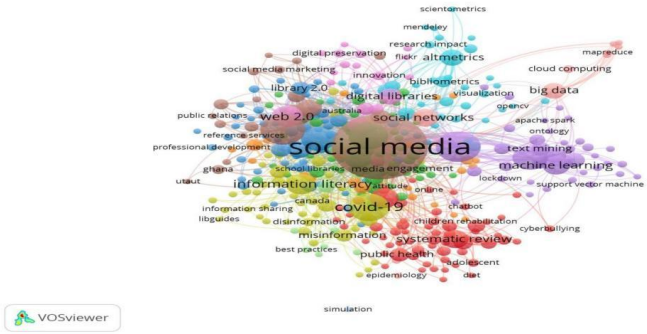

Figure 5b: Occurrence of Author Keywords

c) Index Keywords:

Figure 5c: Out of 9704 keywords, 951 meet threshold. Minimum number of occurrences keywords is 5. It has 6 clusters, 60923 links and 137969 links strength. Index keywords such as "Human", "Social Media" are most common.

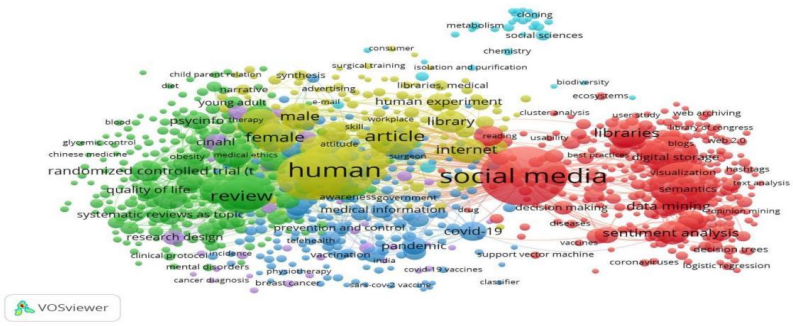

Figure 5c: Occurrence of Index Keywords

5.13. Citation Analysis and Co-Citation Analysis:

The number of references cited by the publications on social media and libraries is provided by the citing analysis. Co-citation analysis provides a summary of publications that have been mentioned jointly in other publications, with an emphasis on the relationship or interaction between two articles. It can be considered that two papers are more similar the more times they are referenced together (Li and Hale, 2015).

a) Document Citation

Figure 6a: This section depicts citation on documents. For this, author citation according to document has been tested by VOSviewer. Out of 3531 documents, 3531 meet the threshold. For each of 3531 documents, the number of citation links was 1113 having cluster of 40. Charnigo (2007) got 170 citations, thereafter Harrison (2017) got 59 citations.

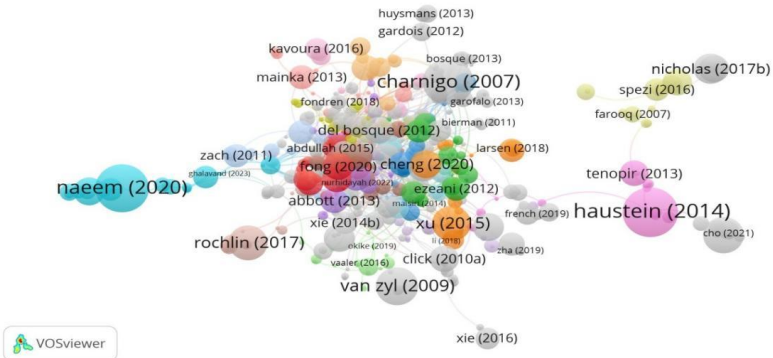

Figure 6a: Citation on Documents

b) Author Citation

Out of 9202 authors, 41 meet the thresholds. It distributed into 4 clusters, 40 links and 63 links strength. The below mentioned table 9 indicates that the authors having highest citations and it is visualized by VOSviewer by figure 6b.

Table 9: Top Most Authors Having More Citation

Author	Documents	Citations
abrizah, a.	6	137
nicholas, david	7	193
watkinson, anthony	5	185
boukacem-zeghmouri, cherifa	5	163
herman, eti	5	163

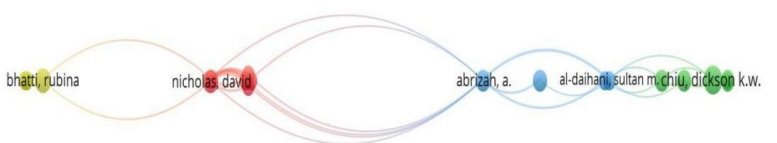

Figure 6b: Citation on Authors

c) Co-citation Analysis

The co-citations were analysed and visualised using VOSviewer. A reference needs to be utilised in the bibliography in order for it to be displayed in the co-citation map Fig. 6c displays the co-citation analysis's outcome. The circles' sizes indicate the quantity of citations; the bigger the circle, the more times an article has been cited. A closer relationship and greater similarity between two articles are indicated by a smaller space between them. Circles of the same hue indicate that these publications have comparable topics. The co-citation map, which displays the relationships between the references in social media and library publications, makes three separate clusters evident, each of which represents a subfield of social media and library study.

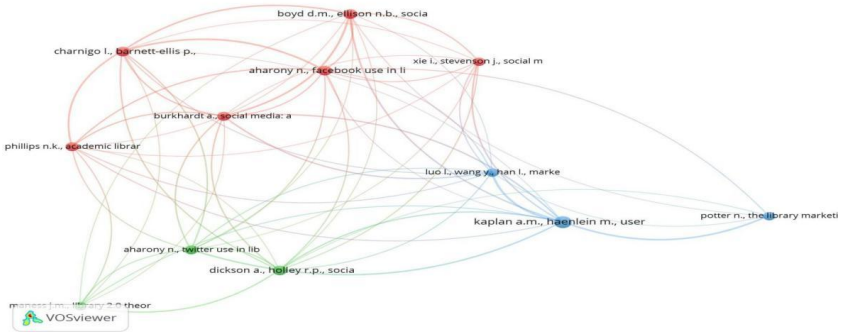

Figure 6c: Co-citation

6. CONCLUSIONS

This report provides an assessment of the worldwide research trends in social media and library publications from 1945 to 2023. Over the past 10 years, social media and libraries have been the subject of much research, and the amount of publications in this area has increased.

In Scopus database, more than 3000 publications have been found in total on this topic. Of all the articles published between 1945 and 2023, 414 were published in 2022, followed by 389 in 2023 and 385 in 2021. Data represented the largest number of publications among all the papers published between 1945 and 2023. The distribution of publications by document type was seen in Figure 2. According to figure (fig.-2) the Scopus database has been identified a number of journal articles are 2013. Conference Paper (664) and Review (411) come next. Table 1 showed the publication's source-wise distribution. The top ten contributors to the chosen documents have been shown in Table 2. The table that follows (Table-2) demonstrates that Chiu, D.K.W. produced more material on a specific subject. The top 10 languages have been shown in Table 3 based on the quantity of publications for each study. With 3358 publications, the "English" language is in the top spot. Spanish (67) and Chinese (29), in order, are next. Figure 3 compares the published papers based on the authors' affiliations. Researchers' analysis places the United States in first place with 1026 publications, the United Kingdom in second place with 297 publications, and India in third place with 253 publications. The top five domains have been shown in Table 4 based on how many articles each domain had. First place goes to the domain "Social Media," which has 1166 publications. "Human, Humans and Social Networking" come next.

The investigation has also been revealed that the combined authors' contributions exceeded those of the individual authors. There are 988 contributions with a single authorship overall, and 2569 with multiple authorship. Table 6 shows that in 2022, the greatest PPA is 2.225806 and the lowest AAPP is 0.449275. Conversely, 2003 shows the lowest PPA of 0.392857 and the greatest AAPP of 2.545455. Table 8 shows that the year 2005 has the highest value of CI 4.9, while the year 2022 has the lowest value of 0.55.

The bibliometric analysis may yield some beneficial results. First, it can be said that a lot of research is done in collaboration. A wide number of subject categories are ascribed to social media in relation to libraries, and numerous journals publish on the subject, indicating a vast variety of research issues and the multidisciplinary nature of such research. It is important to acknowledge certain

limitations associated with this bibliometric analysis. To begin with, the search was restricted to articles that were included in Scopus. Naturally, not all papers in a given topic are included in Scopus, despite the fact that it is one of the biggest worldwide databases.

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Assessment of HyFlex Library Operations: Perspectives, Readiness, and Challenges among Higher Education Institutions in North India

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ABSTRACT

The evolving landscape of contemporary education demands innovative models to meet diverse needs of students, faculty, and researchers. One such model, the Hybrid-Flexible (HyFlex) approach, seamlessly blends traditional and online instruction, prompting a parallel evolution in library services known as HyFlex Library Operations. These operations integrate traditional and digital resources, optimizing accessibility and adapting to evolving information access patterns. In higher education, HyFlex Library Operations enhance the learning experience by seamlessly blending physical and virtual library experiences, catering to both in-person and remote learners, and enhancing institutional resilience and responsiveness. This paper investigates the implementation of HyFlex Library Operations in North Indian Higher Educational Institutions (HIEs), assessing perspectives, readiness, and challenges. HyFlex seamlessly integrates traditional and digital library services, catering to diverse learning needs. Since its significance in higher education lies in enhancing accessibility and responsiveness, recognizing its relevance in North India's diverse educational landscape is crucial for effective implementation and enhancement of library services.

Keywords: *Higher Education Institutions (HEIs), Hybrid-Flexible approach, HyFlex Library Operations, Innovative Models, Learning Environment, North India*

1. INTRODUCTION

The evolving landscape of contemporary education demands implementation of innovative models to meet diverse needs of students, researchers, and faculty. One such model, the Hybrid-Flexible (HyFlex) approach, seamlessly blends traditional and online instruction, prompting a parallel evolution in library services known as HyFlex Library Operations. HyFlex Library Operations encapsulate a dynamic framework that integrates traditional library services with digital resources, accommodating the flexible learning preferences characteristic of the HyFlex model. This novel approach seeks to optimize accessibility, ensuring a harmonious interplay between conventional and virtual libraries. The integration of HyFlex Library Operations is not only a testament to the adaptability of libraries but also a response to the evolving nature of information consumption in the digital age.

In the context of higher education, where diverse learning preferences and technological advancements coexist, the significance of HyFlex Library Operations becomes increasingly evident. According to Beatty (2014), one transformative paradigm gaining prominence is the Hybrid-Flexible (HyFlex) approach, seamlessly blending traditional and online modes of instruction. By seamlessly blending physical and virtual library experiences, institutions can better cater to the needs of their academic communities, fostering a conducive environment for both in-person and remote learners. This innovative approach not only enriches the learning experience but also contributes to the overall resilience and responsiveness of Higher Education Institutions (HEIs). As we delve into the specific context of North Indian Higher Education Institutions, the relevance of HyFlex Library Operations takes on a unique dimension. North India, characterized by its rich cultural diversity and a rapidly growing academic landscape, presents a distinct set of challenges and opportunities. Understanding how HyFlex Library Operations align with the educational milieu in this region becomes imperative

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for effective implementation and enhancement of library services. This paper aims to investigates the implementation of HyFlex Library Operations in North Indian Higher Educational Institutions (HIEs), assessing perspectives, readiness, and challenges.

2. LITERATURE REVIEW

In an era defined by adaptation, the convergence of necessity and innovation led to the widespread adoption of online modalities across society. The once sporadic practice of remote work swiftly evolved into a dominant paradigm, enabling continuity amidst the disruptive influence of the pandemic (The Economist, 2021). Concurrently, the development and dissemination of vaccines heralded a new phase in our collective response, fostering a dynamic coexistence with the virus. Within the realm of education, the advent of HyFlex teaching and learning emerged as a transformative solution. Blending online and in-person modalities, HyFlex education proved instrumental in addressing the multifaceted challenges posed by the pandemic. By offering flexibility and safety in equal measure, this innovative approach empowered educators and learners alike to navigate the complexities of the new normal (Kohnke & Moorhouse, 2021).

Libraries, venerable bastions of knowledge, swiftly embraced the HyFlex paradigm to uphold their mission of universal access. From the Teaching and Learning Team at Oklahoma State University Library to the pioneering efforts of the University of Utah's Marriott Library, institutions worldwide innovated to ensure uninterrupted service amidst upheaval (Colquhoun et al., 2021; Rutledge et al., 2021). By harnessing the power of hyflex operations, libraries transcended physical constraints, reaffirming their role as vital community resources. As libraries and educational institutions alike pivoted towards sustainable HyFlex models, pertinent questions arose regarding preparedness and readiness. Romero-Hall and Ripine (2021) underscored the importance of faculty readiness in delivering HyFlex education, mirroring the challenges faced by libraries in adapting their services. Similarly, concerns lingered regarding students' aptitude for independent learning and resource utilization, necessitating a concerted effort to ensure comprehensive readiness (Decker, 2021).

In this evolving landscape, recent studies shed light on the efficacy and preparedness of HyFlex operations within both educational and library contexts. Frias (2022) highlighted the increasing reliance on online resources among law students, signaling a readiness for permanent adoption of HyFlex modalities. Navarro et al. (2023) stated that as this methodology extends beyond the classroom, it has prompted a parallel evolution in library services, giving rise to HyFlex Library Operations. Their study also delved into the challenges and triumphs faced by librarians in implementing HyFlex library operations, revealing a high level of preparedness despite encountered obstacles. Meanwhile, Vijayan et al. (2024) explored the transformative potential of HyFlex libraries, emphasizing the importance of technological integration and collaborative innovation in shaping the future of education.

An attempt is made in this study to explore the perspectives, readiness, and challenges associated with the adoption of HyFlex Library Operations in North Indian HEIs, shedding light on the transformative potential and the nuanced considerations that this paradigm shift entails. Since its significance in higher education lies in enhancing accessibility and responsiveness, recognizing its relevance in North India's diverse educational landscape is crucial for effective implementation and enhancement of library services.

3. STUDY OBJECTIVES

The objectives of this study are:

i) To assess respondents' knowledge levels regarding HyFlex library operations.
ii) To evaluate respondents' preparedness for implementing HyFlex library operations.
iii) To identify and analyze challenges encountered during the implementation of HyFlex library operations.
iv) To investigate the perceptions of respondents (university librarians only) regarding HyFlex library operations.

4. RESEARCH METHODOLOGY

4.1. Research Design

- *Method* - Quantitative method was used in this study for collecting the data.
- *Survey Instrument* - A structured questionnaire was employed to collect data from the target sample. The questionnaire was created using Google Forms and is accessible at: https://forms.gle/FyUDQdLvd7x4fUan7. In addition to the online distribution, printed questionnaires were also used as needed.

4.2. Sample Selection

- *Criteria for Inclusion* - Only the library professionals of university and college libraries were selected as the target sample.
- *Geographic Representation* - The target sample exclusively comprises library professionals from the North Indian region.

4.3. Data Collection

- *Survey Questionnaire* - The survey questionnaire comprises of 4 sections and each section consisted unique predesignated questions.
- *Data Collection* - More than 150 questionnaires were distributed in print form, with another 100 sent through email links to library professionals in the North Indian region. After thoroughly evaluating the completeness of the responses, a sample of 145 was selected for the study. The last section (Section D) was specifically designed for university librarians, and only 7 of them responded to the questions. The information related to data collection is tabulated in Table 1.

Table 1: Survey Data Collection

Section	Theme	No. of Questions	Targeted Sample
Section A	Respondents' level of knowledge on HyFlex library operations	5	145
Section B	Respondents' level of preparedness for HyFlex library operations	5	145
Section C	Challenges encountered in implementing HyFlex library operations	1	145
Section D	Perception of university librarians' about HyFlex library operations	5	7

5. FINDINGS AND DISCUSSION

5.1. Section A: Respondents' Level of Knowledge on HyFlex Library Operations

QA1. How would you rate your proficiency in navigating online library resources?

Understanding how to access online resources is necessary for library professionals as they embark on initiating or implementing HyFlex library operations.

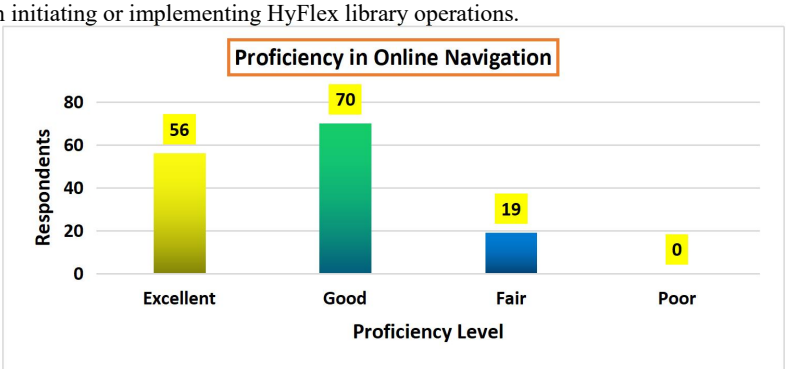

Figure 1: Respondents' Proficiency in Navigating Online Library Resources

Figure 1 illustrates that, within the selected respondents, 48.28% (70 individuals) exhibit proficient knowledge in navigating online resources, closely followed by 38.62% (56 individuals) showcasing excellent navigation abilities. Additionally, 13.10% (19 individuals) possess fair knowledge in online navigation, while none of the respondents claim to have poor knowledge in this aspect.

QA2. Select the level of your familiarity with functions related to hybrid and flexible library services:

Prior to the practical implementation of HyFlex library operations in any library, it is essential for library staff to have a basic understanding of the functions associated with HyFlex library operations. This knowledge equips them to proficiently manage the services offered to the users.

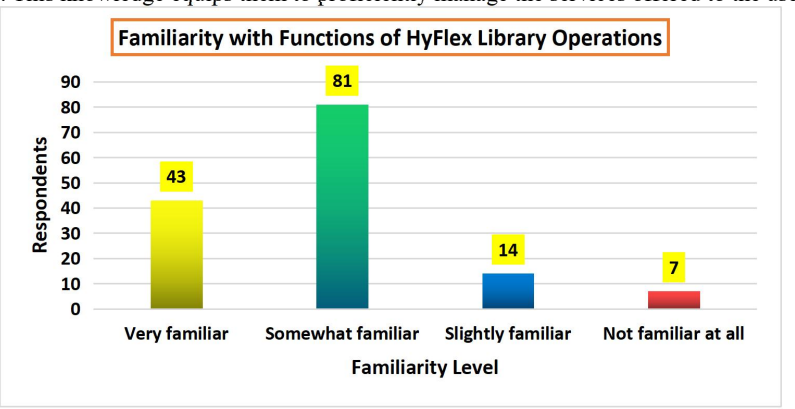

Figure 2: Respondents' Familiarity with Functions of HyFlex Library Operations

Figure 2 displays that among the respondents, majority (55.86%) have a moderate level of familiarity with the basic functions of HyFlex library operations. Additionally, 29.66% (43 individuals) exhibit a high level of familiarity. However, 9.66% (14 individuals) demonstrate only slight familiarity, while 4.83% (7 individuals) express no familiarity with the basic functions of HyFlex library operations.

QA3. Rate your skill level in organizing materials for HyFlex library operations:

Organizing materials or resources for implementing HyFlex library services demands a specific skill set to be acquired by library staff. This is crucial as it enables them to effectively manage both traditional and online services concurrently.

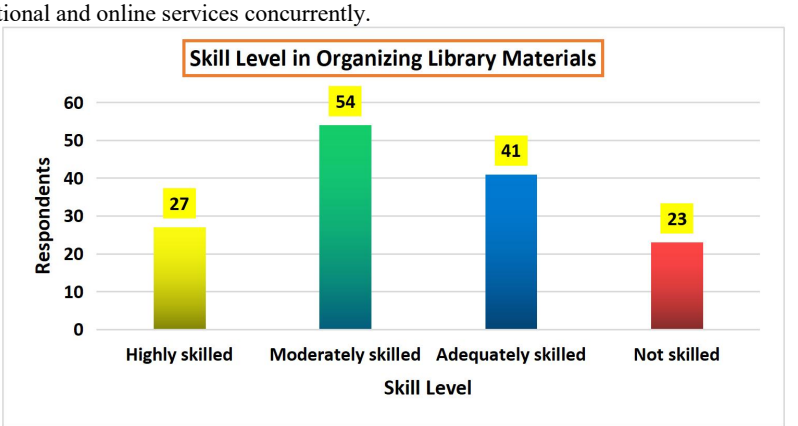

Figure 3: Respondents' Skill Level in Organizing Materials for HyFlex Operations

Based on the data depicted in Figure 3, a significant proportion of respondents possess moderate (37.24%) to adequate (28.28%) skills in organizing materials for HyFlex library operations. Additionally, 18.62% (27 respondents) exhibit a high level of skills, whereas 15.86% (23 respondents) indicate a lack of skills in organizing materials for HyFlex library operations.

QA4. Have you developed and implemented plans for enhancing discoverability and accessibility of print collections in a hybrid library?

This survey question tends to inquire about the proficiency of respondents in developing and implementing plans to enhance discoverability and accessibility of print collections in a hybrid library to start HyFlex library operations.

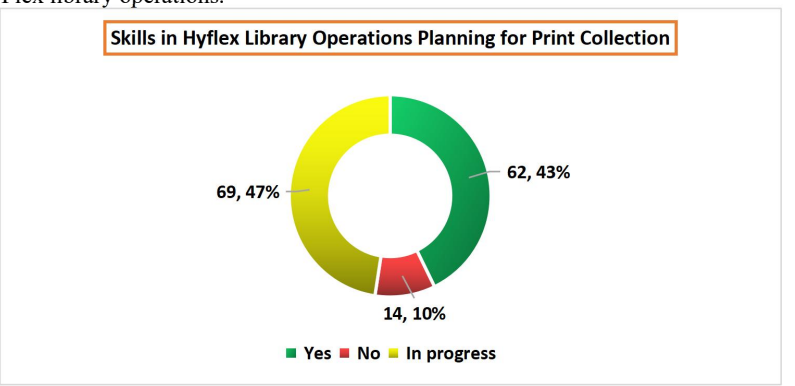

Figure 4: Respondents' Skills in HyFlex Library Operations Planning for Print Collection

Figure 4 indicates that the majority of respondents are either adequately skilled (43%, 62 respondents) or in the process of acquiring skills (47%, 69 respondents) in developing and implementing plans to enhance discoverability and accessibility of print collections in a hybrid library. A small percentage (10%, 14 respondents) mentioned that they currently lack adequate skills for same.

QA5. How confident are you in integrating various resources using different technologies across traditional and digital library realms?

To implement HyFlex library operations, library professionals need the ability and confidence to integrate various resources using different technologies across traditional and digital library realms. This survey question aims to examine the status of this ability or confidence level among the respondents.

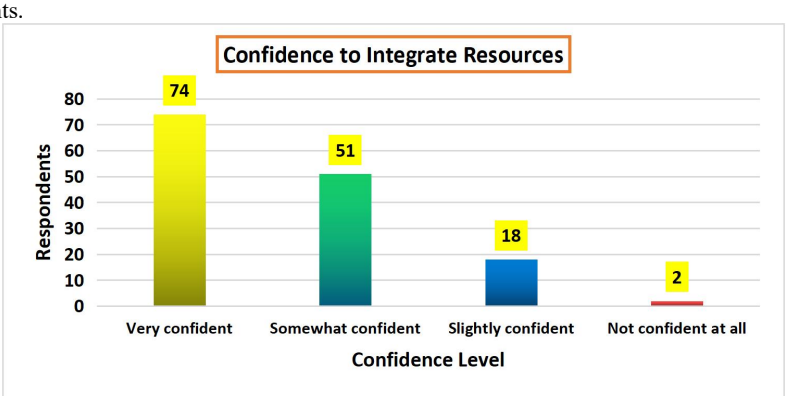

Figure 5: Respondents' Confidence in Integrating Resources across Traditional and Digital Library Realms

According to the survey data, as plotted in Figure 5, 74 respondents (51.03%) express a high level of confidence, while 51 respondents (35.17%) indicate a moderate level of confidence in their ability to integrate various resources using different technologies across traditional and digital libraries. Following this, 18 respondents (12.41%) are slightly confident, and 2 respondents (1.38%) express no confidence at all in this matter.

5.2. Section B: Respondents' Level of Preparedness for HyFlex Library Operations

QB1. How frequently do you engage in adopting innovative approaches to accessing information and providing library instruction across various teaching and learning methods?

This survey question aims to determine the frequency with which respondents employ innovative approaches to access information and deliver library instruction within the HyFlex learning environment.

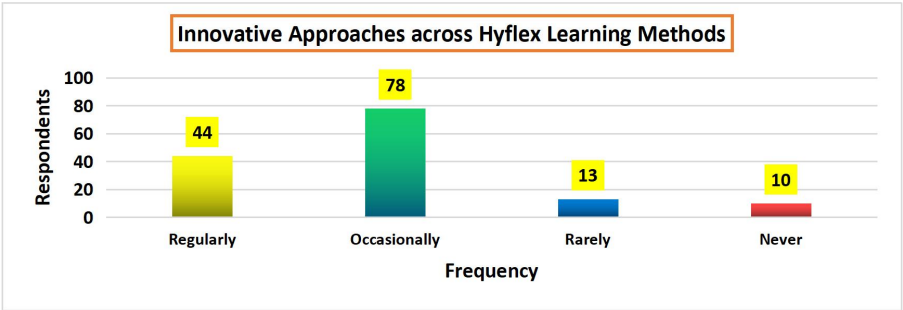

Figure 6: Use Frequency of Innovative Approaches across HyFlex Learning Methods

As shown in Figure 6, over half of the respondents (53.79%) occasionally use innovative approaches across HyFlex learning methods, followed closely by respondents who use them regularly, with a coverage of 30.34% (44). The remaining 23 respondents either rarely (8.97%) or never use (6.90%) such innovative approaches.

QB2. Have you utilized remote library services like e-Lending, e-Learning, or Document Delivery Services provided by your institution?

In this evolving digital age using e-resources and remote library services is very common. Now, in the HyFlex library environment the use of remote services is mandatory to link hybrid and flexible library operations.

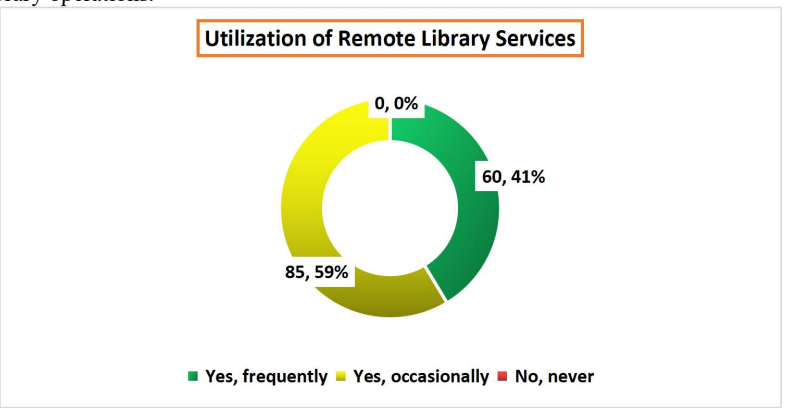

Figure 7: Utilization of Remote Library Services by the Target Libraries

Figure 7 illustrates that 59% (85) of respondents occasionally use remote library services, while the remaining 41% (60) use them frequently in their libraries. This indicates a positive readiness to implement HyFlex library services in these libraries.

QB3. In what ways has your library adapted by digitizing collections to meet the needs of HyFlex library services?

For the successful implementation of HyFlex library services, it is imperative that libraries develop digital collections in adequate proportion to their print counterparts.

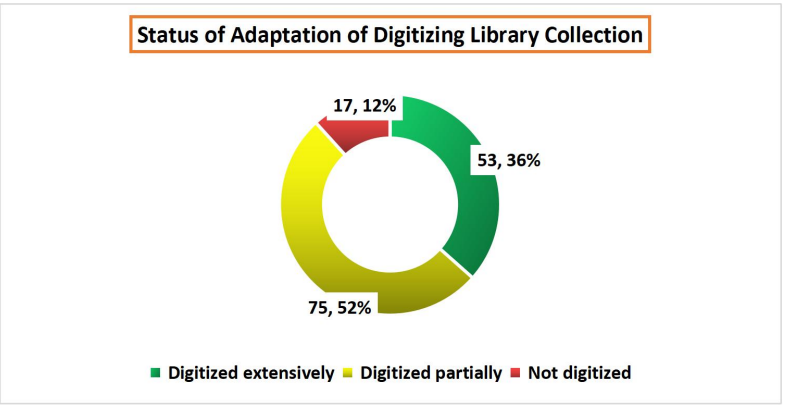

Figure 8: Status of Adaptation of Digitizing by Target Libraries

Figure 8 illustrates that most respondents (52%, 75) indicate that their library has partially adapted digitized collections, while another 36% (53) report extensive adaptation. The remaining 12% (17) of respondents admit that there has been minimal adaptation of digital collections in their libraries.

QB4. How comprehensive do you find the virtual services provided by your library that align with the demands of a HyFlex library services?

The demands of HyFlex library services are unique, and the digitization of collections and virtual services provided by the library complement them.

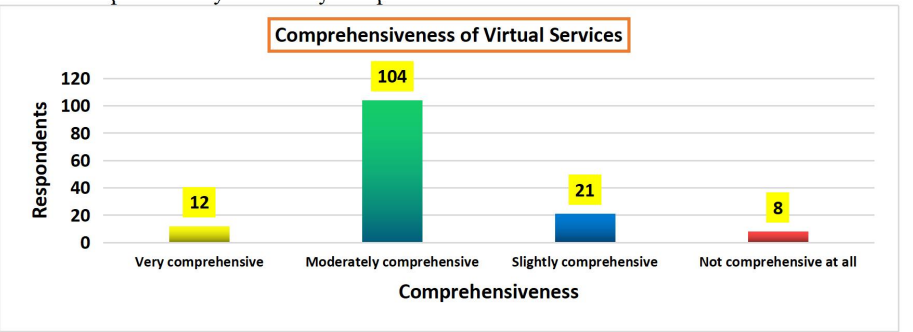

Figure 9: Comprehensiveness of Virtual Services Aligning with HyFlex Environment

According to the received responses, majority of respondents (104) indicate that the virtual library services provided by their library are moderately comprehensive in alignment with the HyFlex library environment. Twenty-one respondents choose slightly comprehensive, twelve respondents choose very comprehensive, and eight respondents choose the not comprehensive at all option.

QB5. Rate the level of enrichment your library collection (e.g., printed books, e-books, periodicals) have undergone to support HyFlex library services:

To successfully implement HyFlex library operations, it is necessary for the library collection to be enriched to support the changing environment.

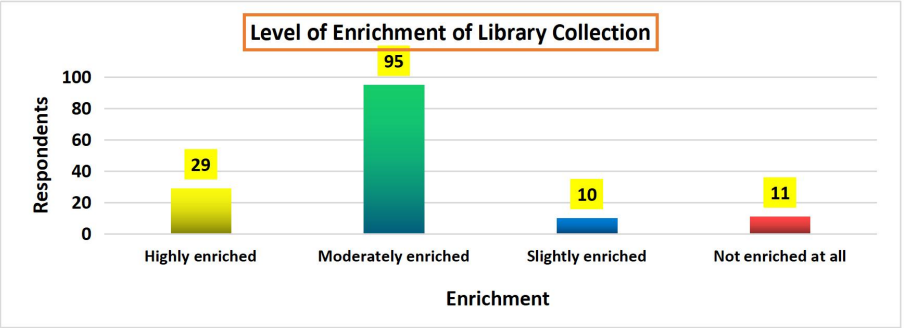

Figure 10: Level of Enrichment of Library Collection to Support HyFlex Services

Figure 10 illustrates that majority of respondents (95) perceive their library collection as moderately enriched to support HyFlex library services. Additionally, 29 respondents indicate their collection as highly enriched, 11 as not enriched at all, and 10 as slightly enriched.

5.3. Section C: Challenges Encountered in Implementing HyFlex Library Operations

Although the confidence and flexibility of the respondents is high enough to implement HyFlex library operations, but in India still there are challenges to implement HyFlex library operations.

QC1: What are the primary challenges encountered in implementing HyFlex library services?

This section contains only one multi selected question, where there are seven pre-selected and common challenges with 'other' options.

Table 2: Challenges Encountered in Implementing HyFlex Library Services

Sr. No.	Scale	Respondents	Percentage
1	Lack of e-resources	17	11.72 %
2	Lack of IT infrastructure	31	21.38 %
3	Lack of awareness among users	55	37.93 %
4	Accessibility issues	67	46.21 %
5	Lack of trained library staff	138	95.17 %
6	Lack of funding	145	100.00 %
7	Insufficient promotion or marketing	127	87.59 %
8	Other	37	25.52 %

The responses listed in Table 2 shows that all the respondents (100%) chose lack of funding as the major challenge to implement HyFlex library operations. Following this, lack of trained library staff and insufficient promotion or marketing were identified as two other major challenges, with 95.17% and 87.59% of respondents selecting them, respectively.

5.4. Section D: Perception of University Librarians' about HyFlex Library Operations

As the head of a university library, understanding the perception of a university librarian is crucial in comprehending the necessity, current status, and potential success of implementing HyFlex library operations. This section was specifically designed for university librarians, and only 7 of them responded to the questions under this section. The following five questions seek to elucidate the opinions and perceptions of university librarians concerning HyFlex library operations:

QD1: In your opinion, how effectively does the HyFlex library model cater to the diverse needs of students and faculty in accessing library resources?

This survey question aims to evaluate librarians' opinion on how effectively the HyFlex library model caters to the diverse needs of students and faculty in accessing library resources.

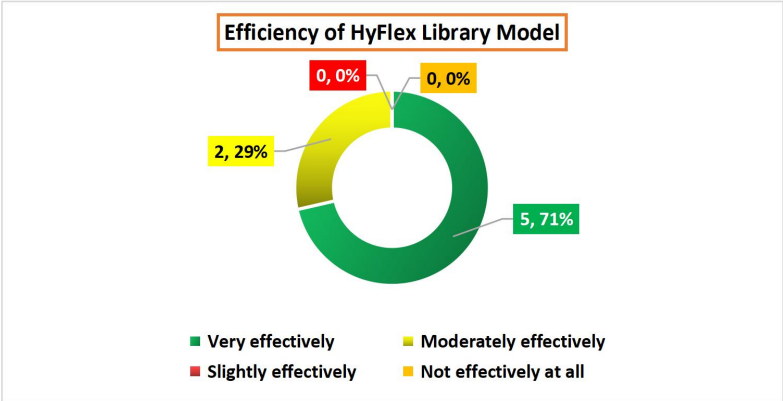

Figure 11: HyFlex Library Model Efficiency in Serving Diverse Resource Needs

According to the responses shown in Figure 11, of the 7 university librarians, the majority (71%) believe that the HyFlex library model is very effective in serving the diverse resource needs of students and faculty. The remaining 29% rate its effectiveness as moderate.

QD2: From your experience, how well-prepared do you believe the library staff is in adapting to and supporting HyFlex library operations?

To implement HyFlex library operations, library staff must be fully prepared to adapt to and support the upgrading of services. This survey question aims to assess the status of staff preparedness in the target libraries of North India.

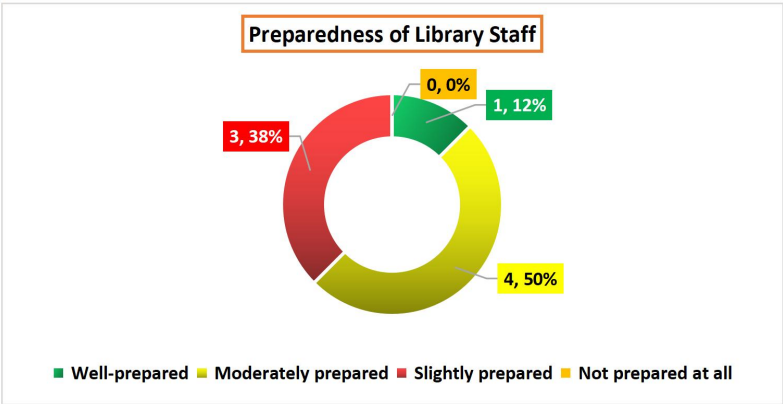

Figure 12: Status of Staff Preparedness for Implementing HyFlex Library Operations

According to the received responses depicted in Figure 12, 50% of university librarians acknowledge that their staff is moderately prepared for adapting to and supporting HyFlex library operations. 38% (3) marked their staff as slightly prepared, while only one (12%) university librarian indicated that their staff is well-prepared for implementing HyFlex library operations.

QD3: Do you think the current library services sufficiently align with the requirements and dynamics of a HyFlex learning environment?

When implementing HyFlex library services in a library, it is necessary for these to be well-aligned with ongoing library services and to meet the requirements and dynamics of a HyFlex learning environment. This survey question aims to assess the status of target libraries in this regard.

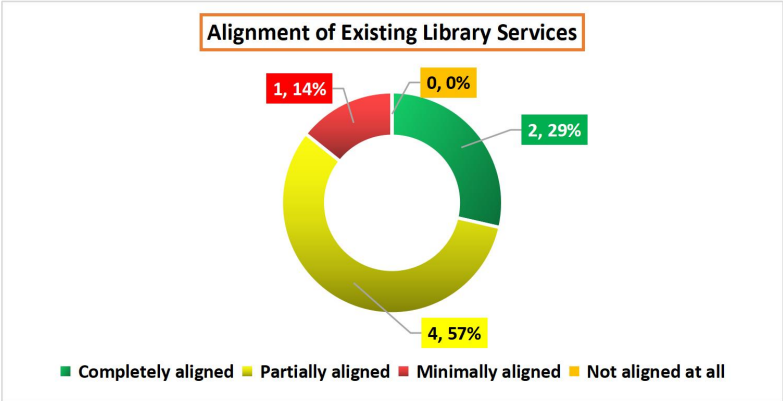

Figure 13: Alignment of Existing Library Services with HyFlex Learning Environment

Figure 13 clearly indicate that four university librarians stated that their library services are partially aligned with the requirements and dynamics of a HyFlex learning environment. Another two stated that their library services are completely aligned with it, while the remaining one librarian opted for the minimal alignment option.

QD4: To what extent have HyFlex library operations transformed the traditional role of the library in supporting teaching and learning within the university?

This survey question seeks to determine the extent to which HyFlex library operations have reshaped the conventional role of library in facilitating teaching and learning activities within the university.

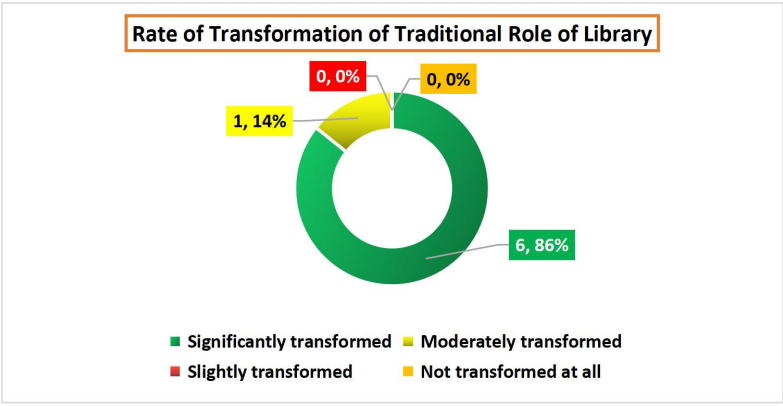

Figure 14: Library's Role Transformation in University Teaching and Learning

The responses represented in Figure 14 revels that six university librarians believe that HyFlex library services have significantly transformed the role of the library in facilitating teaching and learning activities within the university; the remaining one voted for moderate transformation.

QD5: How would you rate the effectiveness of communication and training provided to librarians regarding the implementation and management of HyFlex library services?

To support the implementation of HyFlex library services, institutions organize communication and training programmes periodically for library staff. This survey question aims to determine the effectiveness of such communications and trainings provided to librarians regarding the implementation and management of HyFlex library services.

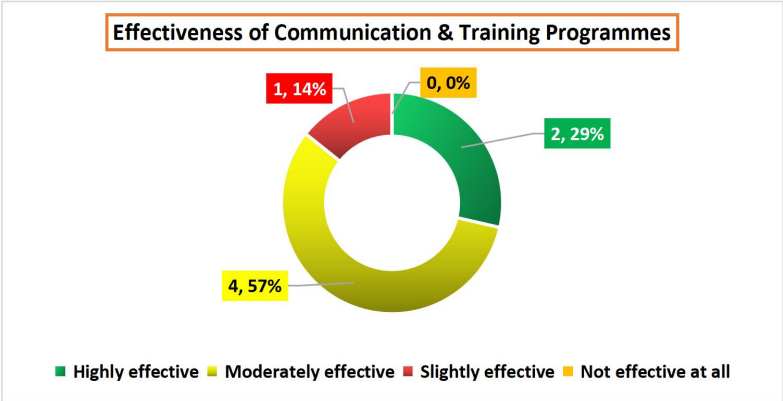

Figure 15: Effectiveness of Communications and Trainings provided to Librarians

According to the responses received from the university librarians shown in Figure 15, four of them voted for moderate effectiveness, two voted for high effectiveness, and only one voted for slight effectiveness of the communication and training programmes provided to librarians regarding the implementation and management of HyFlex library services.

6. RECOMMENDATIONS AND FUTURE DIRECTIONS

6.1. Recommendations

i) ***Invest in Continuous Training:*** Prioritize ongoing training and professional development initiatives for library staff to enhance their skills and adaptability in managing HyFlex library operations effectively.

ii) ***Allocate Adequate Resources:*** Ensure sufficient funding and resources are allocated to support the integration of digital technologies and the expansion of online collections, catering to the evolving needs of users in a HyFlex learning environment.

iii) ***Foster Collaboration:*** Encourage collaboration and knowledge-sharing among libraries and educational institutions to exchange best practices and innovative approaches in implementing HyFlex library operations.

iv) ***Prioritize User-Centered Design:*** Emphasize user-centered approaches in designing and delivering library services, prioritizing accessibility, inclusivity, and usability for all users.

v) ***Develop Comprehensive Communication Strategies:*** Create robust communication strategies to promote awareness and engagement among stakeholders about the benefits and opportunities associated with HyFlex library operations.

6.2. Future Directions

i) ***Conduct Longitudinal Studies:*** Undertake longitudinal studies to track the long-term impacts and outcomes of HyFlex library operations on user satisfaction, learning outcomes, and institutional effectiveness.

ii) ***Explore Emerging Technologies:*** Investigate emerging technologies and trends in library and information services to anticipate future challenges and opportunities for enhancing HyFlex library services.

iii) ***Integrate Artificial Intelligence:*** Explore the integration of artificial intelligence, machine learning, and data analytics tools in optimizing library operations and services for a HyFlex learning environment.

iv) ***Expand Comparative Analyses:*** Broaden research inquiries to include comparative analyses of HyFlex library models across different institutional contexts and geographic regions.

v) ***Innovate Library Assessment:*** Explore innovative approaches to library assessment and evaluation to measure the effectiveness and efficiency of HyFlex library operations in meeting user needs and institutional goals.

7. CONCLUSION

This study provides valuable insights into the landscape of HyFlex library operations within Higher Education Institutions in North India. The findings underscore the importance of knowledge, preparedness, and addressing challenges in implementing and optimizing HyFlex library services. Present research revealed a considerable level of awareness and readiness among respondents regarding HyFlex library operations, highlighting the significance of continuous training and professional development for library staff. However, challenges such as funding constraints, staffing issues, and the need for effective promotion and marketing remain pertinent concerns that require strategic intervention. Despite these challenges, the study showcases the resilience and adaptability of libraries in North India, as evidenced by their efforts to align with the evolving needs of users in a HyFlex learning environment. Through collaboration, innovation, and user-centered design, libraries can enhance their effectiveness in supporting teaching, learning, and research activities.

Looking ahead, it is imperative for institutions to prioritize investment in digital infrastructure, staff development, and strategic partnerships to further optimize HyFlex library operations. By embracing emerging technologies, fostering collaboration, and prioritizing user needs, libraries can continue to evolve as dynamic hubs of knowledge dissemination and academic support. This study serves as a foundation for future research endeavors aimed at exploring the evolving role of libraries in the digital age and advancing the effectiveness of HyFlex library operations in meeting the diverse needs of users and supporting the goals of higher education institutions. Through continuous evaluation, adaptation, and innovation, libraries can remain at the forefront of supporting academic excellence and innovation in North India and beyond.

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Utilization of Electronic Resources: An Analysis of Awareness and Perception of Research Scholars and Post-Graduate Students of Kashmir University

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ABSTRACT

Purpose: This paper focuses on the use of e-resources by research scholars and post-graduate students at Kashmir University. The main aim is to determine the use of e-resources, users skills in handling e-resources, and the purpose of their use. Further, the paper aims to highlight the problems faced by research scholars and post-graduate students in accessing e-resources. Design/methodology/ approach: The survey was conducted through a structured questionnaire circulated among 250 Research Scholars both (M.Phil/Ph.D.) and PG students were taken from different departments of Kashmir University and the response rate was 80 percent. Random sample method was used for the selection of respondents and interacting with them. The responses received from the research scholars to 14 questions are presented in the form of tables. Findings Major findings of the study reveal that the majority of the students reported using electronic journal resources for various purposes including working on assignments, research proposal writing, literature review, research report writing, current awareness, leisure for extra exploration of ongoing scientific debates through peer-reviewed papers. The challenges encountered in the use of electronic journal resources include a power outage, inadequate bandwidth, slow download speed, inability to access the resources from home, lack of training, lack of awareness, limited access to computers and difficulty in searching. The paper concludes that electronic resources have become an integral part of the information needs of research scholar's post-graduate students at Kashmir University. Further, it finds that e-resources can be good substitutes for conventional resources, if the access is fast, and more computer terminals are installed to provide fast access to e-resources. Finally recommendations for improving the use of electronic journal resources are provided. Originality: The paper highlights the use of e-resources by research scholars and post-graduate students of Kashmir University with some constructive suggestions for the improvement of electronic resources and services. This is the first time an effort has been made to assess the use of electronic resources by postgraduate students at Kashmir University. The study could be used to assess the postgraduate students' need for electronic resources at the Kashmir University and other users in higher learning institutions.

Keywords*: E-Resources, electronic journal, post-graduate, research scholars, problems*

1. INTRODUCTION

Information Technology is a recent and comprehensive term that describes the whole range of process of generation, storage, transmission, retrieval and processing of information. The rapid developments in information technology brought revolutionary changes in information processing, storage, dissemination and became a key ingredient in bringing up sea changes in overall aspects of society. Computer technology, Communication technology, CD-ROM technology and Reprographic technology are the four components of Information technology. The Computerization of the library is done with the help of computers. Huge information is stored in a small disc and solved the problems regarding libraries about space and the preservation of library resources. Traditional card catalogues are replaced with online public access catalogue which is popularly known as OPAC or Web OPAC.The Print form of library resources is replaced in digital form.The Concept of Electronic Resources (e-resources) has come into existence. In this way entire nature of libraries is changed in advent of Information Technology. There are many advantages as well as disadvantages of information technology such as Quickness, Timeliness, Accuracy, Multifunction, Worldwide, etc. are some advantages of information and communication technology.

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At present situation, we cannot imagine libraries without possession of electronic resources whether it is in online network based resources or CD, DVDs based e-resources. Academic libraries have been re-designed with their collection development policy considering the expansion of academic information desire in ICT era. Today, a lot of electronic resources are made available via Internet through various platforms for searching, viewing, accessing, downloading and sharing to each other with free as well as paid basis. Nobody patron can say about unavailability of reading materials for their academic purpose. It means that now there are varieties of resources available in different pattern such as Microfilm, Microfiche, Micro card, CD/DVD ROM, e-book, e-journal, e-databases, e-image, e-maps, e-thesis, e-newspaper, graphical presentation, e-learning audio-videos and so on. Academic libraries and information centers are acquiring, cataloguing, classifying and discriminating these valuable electronic based resources to their faculties, researchers and students for fulfillment of academic performance and assisting teaching-learning counterpart. In historical background of electronic resources era, the Gutenberg project named e-book was known as first electronic book (e-book) appeared in 1970 and around 1884, in journal counterpart, engineering journal from Elsevier scientific publication is produced as e-journal. In this way till today, many advancements occurred in electronic resources area and now we all are witnessed with realizing multimedia, multifaceted and multidimensional nature of electronic resources at desktop. (Gaur, 2012).

In both professional and personal spheres, every aspect of our lives has been transformed by information technology and communication (ICT). Global digital libraries, portals, and electronic resources have emerged as a result of advances in information and communication technology. ICT plays a significant role in academic institutions across all subject areas. In today's environment, e-resources are considered the cornerstone of any academic or research organization, offering quick and easy access to information. Libraries and information centers now integrate numerous electronic resources to meet the diverse needs of users and expand their collections effectively. The emergence of Information and Communication Technology (ICT) and the internet has profoundly impacted the knowledge and information sector, shaping new platforms for information retrieval. E-resources require access through devices like desktop computers, mainframes, or portable mobile devices. They offer built-in capabilities for modification and searching, making them more beneficial than print resources. Electronic resources support innovative teaching practices and foster the development of new fields of study. With the evolving trends in electronic publishing, both online and offline resources are increasingly in demand, providing scholarly resources such as peer-reviewed journals, databases, and proceedings. These efforts represent a significant boon to university library users, elevating the quality of higher education in our country.

Table 1: The holding of Central library (Printed and non-printed)

Collection Type	Quantity	Collection Type	Quantity
Books	700000	Books in digitized form	18000
Rare Books	1500	DVD and CDROM	1100
Manuscripts	600	Thesis and dissertation	1600
Digital talking books	165	Journals /Back volumes	24/57000

The Allama Iqbal Library offers reference services, copying services, Internet access, database access through INFLIBNET, bibliographic services, inter Allama Iqbal Library loan services, and selective information dissemination. P.G. students (5,960), Ph.D./M. Phil. students (398), instructors (375), and others utilize the Allama Iqbal Library (751). The study investigates how University of Kashmir research scientists and students use and encounter issues with Allama Iqbal Library-subscribed In fact, with the development of electronic systems including databases, the availability of e-resources for supporting teaching and learning is unquestionable. This indicates that e-information resources are, for most teaching staff and researchers, the lifeblood of their activities (Mishra, Das & Ramesh, 2019; Nicholas et al., 2010). As a result, e-resources are becoming more popular in teaching and research activities of academic and research communities (Muthurasu & Kannan, 2019; Tella et al., 2018; Mwantimwa, Elia & Ndenje-Sichalwe, 2017; Sharma, 2009). Some scholars such as Sharma (2009) contended that e-information resources and online database are replacing the print media (Sharma, 2009). With the mass- production of e-information, libraries have a wide range of resources to select from an offer to their users. The substantial investments being

made by universities worldwide to ensure their communities' access to e-resources is clear evidence of the value these resources have (Muthurasu & Kannan, 2019). For example, university libraries have subscribed to different online databases such as IEEE, Taylor and Francis, Springer Link, SAGE publications, Wiley Online Library, Nature Publishing Group Journals, and many others (Santhi & Gopalakrishnans, 2016). In Tanzania, there have been various initiatives seeking to facilitate the institutions and individuals' coping with technological changes as reported by Manda (2005). For example, the use of CD-ROMS by the early 1990s was the first innovative programme geared towards the adoption of e-resources. In 2001, far-reaching attempts sought to introduce the use of full-text electronic journals in Tanzania's research and academic community. Most higher learning institutions in Tanzania have subscribed to different online databases such as EMERALD, Wiley, SAGE, Taylor and Francis, and EBSCO publications. These initiatives, notwithstanding some inadequacies in the utilisation of e-resources, have yielded positive results. In fact, libraries are finding it easier to enhance the quality of their collections with the help of e-resources. However, despite the ability of these resources to improve library collections, libraries continue to experience unsatisfactory usage levels of the information they provide. While this problem is known to exist, clarity is needed considering that studies to systematically compare the usage of e-resources by academics and researchers to support teaching and research productivity in Tanzania are missing. This is the gap that this study has attempted to cover.

The Central library offers reference services, copying services, Internet access, database access through INFLIBNET, bibliographic services, interCentral library loan services, and selective information dissemination. As a result, e-resources are becoming more popular in teaching and research activities of academic and research communities (Muthurasu & Kannan, 2019) With the mass-production of e-information, libraries have a wide range of resources to pick from an offer to their users. The substantial investments being made by universities worldwide to ensure their communities' access to e-resources is clear evidence of the value these resources have (Muthurasu & Kannan, 2019). For example, university libraries have subscribed to different online databases such as IEEE, Taylor and Francis, Springer Link, SAGE publications, Wiley Online Library, Nature Publishing Group Journals, and many others.In Tanzania, there have been various initiatives seeking to facilitate the institutions and individuals' coping with technological changes as reported by Manda (2005).

2. LITERATURE REVIEW

A plethora of research studies have delved into electronic resource (ER) usage, analyzing citation patterns and subjects related to references, revealing the significance of open-access systems for scholars (Pranjal Deka, 2020). However, challenges persist, as ERs are underutilized due to issues like poor Internet connectivity and inadequate content (Burhansab et al., 2020). Studies conducted at various academic institutions, including Chandigarh College of Architecture and Olabisi Onabanjo University, Nigeria, underscore the importance of awareness and usage of ERs among students and faculty (Partap & Ranga, 2022; Osinulu, 2020). Faizul Nisha and Naushad Ali P.M. (2012) highlighted the extensive use of e-journals in higher educational institutions of Delhi, indicating their role in knowledge acquisition and research. Nonetheless, challenges such as slow downloading persist, necessitating attention from librarians. Ozoemelem (2009) identified barriers like inaccessibility and navigation difficulties hindering efficient ER use, while Verma et al. (2009) emphasized the reliance of faculty members on library staff for assistance with online resources.

Furthermore, Ansari and Zuberi (unpublished) revealed that despite high awareness of ERs, ignorance and networking issues impede usage. The need for new e-journal titles and enhanced advisories on availability and usability was also highlighted (unpublished). Similarly, Oyieke and Dick (2010) noted discrepancies in ICT integration between universities, with UEAB exhibiting greater ICT inclusion compared to KU. Additionally, Raghuram and Vatnal (unpublished) found that faculty members learned about UGC-INFONET primarily through library orientations, with social science users expressing a desire for more journals. However, student dissatisfaction with existing university subscribed online resources remains prevalent (Sinha et al., Ahmad et al., Gakibayo et al., Rehman et al., unpublished). Sivathaasan and Velnampy (2013) demonstrated a positive correlation between ER usage and academic achievement, while Toteng (2013) identified frequently used databases among undergraduate law students. Nevertheless, users continue to grapple with issues like

limited computers, poor bandwidth, and difficulties in downloading articles, contributing to faculty dissatisfaction with university subscription ERs.

Problem

E-resources have become fundamental in research organizations, offering convenient access to information anytime. The shift from print to electronic resources has implications for users' reliance and consumption patterns, as well as their academic productivity and navigation challenges (Dadzie & Van der Watt, 2015). Scholars typically access e-resources through various platforms like university websites, CD-ROMs, and Internet databases (Bamidele et al., 2018; Mollel & Mwantimwa, 2019). Siwach and Malik (2019) found that Science Direct, Springer Link, and Taylor and Francis were among the most frequently used databases by science faculty and researchers in North Indian universities. Similarly, Gupta (2017) observed Springer Link's popularity at Banasthali University, with significant usage of Science Direct and other platforms reported by Nanda (2017) and Kumar and Reddy (2016). Various e-resources like ACM, IEEE, and JSTOR are heavily utilized across universities (Egberongbe, 2011; Santhi & Gopalakrishnan, 2016). However, determining the most popular databases remains challenging due to accessibility and university subscription choices. University programs also influence database preferences, with some databases catering to specific disciplines (Moghaddam & Tallawar, 2008). Overall, both subscribed and open access resources are widely utilized by academics and researchers, reflecting the diverse needs and preferences across disciplines.

Usage of ERs

The literature on ER usage in academic institutions has extensively explored awareness, usage levels, user perceptions, and challenges. Studies consistently highlight underutilization of ERs in developing country contexts (Acheampong et al., 2019; Akinola et al., 2018; Momanyi et al., 2018; Tella et al., 2018). For instance, Tella et al. (2018) investigated ER usage by academic staff at the University of Ilorin, Nigeria, revealing motivations for usage but significant underutilization due to factors like poor Internet connectivity. Similarly, Akinola et al. (2018) found low awareness and usage among postgraduates at the University of Ibadan, citing inadequate searching skills and connectivity issues as barriers.

Thanuskodi (2012) examined ER usage among postgraduate students and research scholars at Annamalai University, revealing widespread awareness but limited use of certain resources, suggesting the need for user awareness programs. Panda and Sharma (2021) investigated library responses during the COVID-19 pandemic, emphasizing the role of online services and staff training. Their study suggested the adoption of webinars and digital skill enhancement for librarians. Recent studies, such as Veer and Panda (2021), focused on pandemic-era ER usage at Chandigarh University, highlighting user awareness and challenges faced in accessing resources. Similarly, Veer et al. (2022) assessed awareness, use, and satisfaction of library resources at Dronacharya College of Engineering, noting students' concerns about internet facilities and recommending measures to improve resource access and user satisfaction.

3. OBJECTIVES

The following are the objectives of study:

i) To investigate how often Central library is visited.
ii) To identify about Kashmir University students' knowledge and usage of various forms of technological resources.
iii) Determine the degree of user satisfaction with the current collection of electronic resources.
iv) To analyse the issues that users encounter while using electronic resources.

4. METHODOLOGY

The survey research technique is used for this study since it was thought to be more suited for this sort of research. A questionnaire was used to gather data for the research. The sample was selected from the population of post-graduate students and M.Phil/Ph.D research scholars from Kashmir university's Science and social science departments. A total of 250 questionnaires were distributed at random to the respondents. The response rate was 80%, which means that 200 completed surveys were returned. The remaining 50 respondents either skipped the questionnaire or returned incomplete or incorrectly completed questionnaires, thus they were excluded from the study.

The responses received from the respondents are presented in the form of tables. Moreover the gender wise distribution are presented in table 2.

5. DATA ANALYSIS

Analysis of data is the ultimate step in research process. It is the link between raw data and significant results leading to conclusions. The process of analysis has to be result oriented.

Table 2 presents the picture of the gender-wise distribution of respondents. The Researcher circulated 250 questionnaires among the students of Kashmir University. And only 200 were selected for analysis and the remaining were rejected due to human error, and incomplete and invalid reasons. The investigator has attempted to analyze gender wise students distribution among them and the study reflected that the majority of the community is in the male category with a rate of 81% (162) and the remaining community is in the female category is 38% (19) In this way, the study clearly shows that students from male categories are using e-resources than female category.

Table 2: Gender-wise Distribution of Respondents

Gender	Total	Percentage
Male	162	81%
Female	38	19%

5.1. Frequency of Visiting Central library

Frequency of Visiting Central library According to the survey, 100 percent of research scholars from science departments visit the Central library regularly, whereas 40 percent of social science research scholars visit the Central library regularly, and 52 percent visit the Central library sometimes visit the Central Library. Sixty percent of students in science disciplines visit the Central library regularly, but just 26.66 percent of students in social science do visit the library on regular basis. Table 3 provides a clear understanding. Users of social science faculty depend mostly on notes taken from seniors or professors, and they believe that visiting libraries is a waste of time. Users of scientific faculty, on the other hand, spend most of their time in the departmental or central Central library acquainting themselves with the most recent material accessible in their field of interest. The causes for the ignorance include a lack of exposure to computers and the internet. Another factor was a shortage of Central library experts to advise them, as well as a dearth of departmental computer laboratories in practically all departments.

Table 3: Frequency of Visiting Central library.

Respondents	**Science**				**Social science**			
	Total	***Regularly***	***Sometimes***	***Rarely***	**Total**	***Regularly***	***Sometimes***	***Rarely***
Research Scholars	25	25 (100)	0 (0)	0 (0)	25	10 (40)	13 (52)	2 (8)
Students	75	60 (80)	15 (20)	0 (0)	75	20(26.66)	30(40)	25(33.33)

5.2. Awareness of Different Types of e-Resources

Table 4 shows a more extensive summary of faculty science and social science users' awareness of various e-resources. According to the statistics, 25 (100%) of science research scholars and students are aware of e-journals, while 25 (100%) of social science research scholars and students are aware of e-journals. Similarly, 21 (84%), 20 (80%), 25 (100%), 23 (92%), and 20 (80%) of sciencestudents are aware of E-data archives, E-manuscripts, E-maps, E-books, and E-magazines. whereas in social science, 25 (100%), 18 (72%), 20 (80%), and 18 (80%) (72 percent) Students are made aware of these. Data analysis revealed that consumers of science are considerably more aware than users of social science faculty

Table 4: Awareness of Different Types of e-Resources

E-resources	**Research Scholars (M.Phil & Ph.D)**		**Post Graduate Students**	
	Science	Social Sciences	Science	Social Sciences

	Frequency	%	Frequency	%	Frequency	%	Frequency	%
E-Journals	25	100	25	100	75	100	60.2	80.1
E-Data archives	21	84	25	100	40	53.3	10.1	13.1
E-Manuscripts	20	80	18	72	21	28	10	13.3
E-Maps	25	100	20	80	34	45.3	24.3	32.1
E-Books	23	92	18	72	57	76	49.1	65.4
E-Magazines	20	80	10	40	57	76	30.5	40.1
E-Thesis	13	52	15	60	51	68	46.1	61.4
E-Newspaper	13	52	20	80	70	93.30	38	50.8
E-Mail	25	100	24	96	72	96	63.2	84
E-Research Reports	17	68	14	56	4	5.3	4	5.3
E-Bibliographic Databases	4	16	1	4	0	0	0	0

5.3. Use of Various e-Resources

During data analysis, "it was discovered (Table 5) that science faculty research scholars and postgraduate students use e-resources more efficiently and decisively than social science faculty research scholars and students. All research experts and students of science utilize e-journals (100%), whereas it was roughly 50% in social science faulty. E-journals (100%), e-mails (100%), and e-research reports (100%) are the most commonly utilized by research scientists and students of scientific faculty, followed by e-magazines (88%), e-maps (88%), e-data archives (80%), and e-newspapers (100%) (72 percent), While Research Scholars of Social Sciences utilize e-mail (88percent) e-newspapers (80 percent), e-magazines (80 percent), and e-journals (80 percent) (48 percent) Students in the science faculty use e-journals (100 percent), e-mail (100 percent), e-newspapers (92 percent), e-data archives (80 percent), e-magazines (80 percent), and e-maps (73.3 percent), whereas students in the social science faculty use e-books (78.7 percent), e-newspapers (66.7 percent), e- thesis (60 percent), and e-journals (60 percent) (48 percent). According to the survey, only a tiny proportion of students from both faculties use e-bibliographies databases. Table 4 provides a clear picture.

The results of the presented study are in concurrence with many previous studies. The study by Arshad & Ameen (2017) revealed that "academic staff consults a variety of information sources including print, electronic, and informal sources to carry out their scholarly and teaching endeavors. Academics' top most frequently used information source is e-journals. Online reference sources and discussion with colleagues are also frequently used sources. However, online indexing and abstracting services are not a frequently used source." Bhat & Ganaie (2016) stated in their study that "the I&A databases and e-journals emerge out as the most widely used e-resources, whereas the e-books and e-theses are not yet used to a desirable magnitude." Amjad, Ahmed & Naeem (2013) found that Internet, web resources, e-journals, HEC databases, e magazines, e-thesis, e-books, e-mail, and e- Newspaper were the frequent and most useable electronic resources among the academic scholars of The Islamia University of Bahawalpur (IUB), Punjab, Pakistan. Mahapatra, Swain & Jena (2012) found that a great majority of faculty members of Orissa University of Agriculture & Technology prefered e-journals, e-articles and edissertations and theses.

Table 5: Use of Various e-Resources

Databases	***Respondents***			
	Scholars (M.Phil & Ph.D)		**P G Students**	
	Science	***Social Sciences***	***Science***	***Social Sciences***
E-Journals	25.0(100)	12. .0 (48)	75.0(100)	36.0(48)
E-Data archives	20.0 (80)	9.0 (36)	60.0(80)	12.0(16)
E-Manuscripts	10.0 (40)	6.0 (24)	16.0(21)	20.0(26.7)

E-Maps	22.0 (88)	4.0 (16)	55.0(73.)	12.0(16)
E-Books	20.0 (80)	9.0 (36)	48.0(64)	59.0(78.7)
E-Magazines	22.0 (88)	20.0 (80)	60.0(80)	40.0(53.3)
E-Thesis	10.0 (40)	9.0 (36)	36.0(48))	45.0(60)
E-Newspaper	18(72)	20.0 (80)	69.0(92)	50.0(66.7)
E-Mail	25.0 (100)	22.0 (88)	75.0(100)	47.0(62.7)
E-Research Reports	25.0 (100)	3.0 (12)	63.0(84)	12.0(16)
E-Bibliographic Databases	16.0 (64)	2.0 (8)	27.0(36)	4.0(5.3)

5.4. Ease of Access to e-Resources

The findings show that research researchers (72 percent) and students (73.33 percent) of sciencefind it simple to retrieve information, whereas users of social science faculty (36 percent) find it difficult to access e-resources (34 percent). The reasons for this are that the social science faculty employs conventional ways of learning and seldom uses the internet or other digital offline resources for retrieving material, but the sciencefrequently uses the internet and modern high-tech devices in their labs. Table 6 depicts a clear picture.

Table 6: Ease of Access to e-Resources

Respondents	**Science**			**Social Science**		
	Total	**Yes**	**No**	**Total**	**Yes**	**No**
Research Scholars	25	18 (72)	7 (28)	25	9 (36)	16 (64)
Students	75	55(73.33)	20 (26.66)	75	34 (45.33)	41(54.66)

5.5. Accessing Electronic Resources through the Central library

Investigating how users search for information online, it was discovered that more than 26% of science faculty students and more than 44% of research users access the Central library website for their information, while the majority of users access other libraries' websites or other free websites. The website of the Central library is used by 60% of research scientists in the social science department and relatively few students. The Central library website is not marked as such to make it simple for people to explore and find the information they need. There is no traditional subject-basedclassification used to arrange the listings of electronic resources. Users find it difficult to browse the website of the Central library. Table 7 provides a very distinct, colorful image

Table 7: Use of Central Library Website as Gateway to e-Resources.

Respondents	**Science category**			**Social Science respondents**		
	Total	**Yes**	**No**	**Total**	**Yes**	**No**
Scholars	24	10(43)	13(55)	24	14(60)	10(40)
PG Students	76	21(27.66)	56(74.33)	76	10(14.66)	66 (86.66)

5.6. Satisfaction with Present Collection of e-Resources

According to data analysis, 72 percent of scienceresearch scholars are pleased, while 44 percent of social science faculty research scholars are satisfied with present E-resource collection. In contrast, 60 percent of students in the scienceand 30.66 percent of students in the social science faculty are pleased with the e-resource collection. According to the findings, the majority of social science students (69.33 percent) are dissatisfied with the university's Central library's E-resource collection. Table 8 provides a clear picture. Prior to developing an e-resources collection, the Central library consults with all members of the university by communicating with all department heads and department heads in collaboration with teachers, research scholars, and students to create a list of the most in-demand e-resources and send it to the Central library. In response to the request, the Central library purchases e-resources.

Table 8: Satisfaction with Present Collection of e-Resources.

Respondent	Science			Social Science		
	Total	Yes	No	*Total*	Yes	No
Research scholars	25	18(72)	7(28)	25	11 (44)	14(56)
Students	75	45(60)	30(40)	75	23(30.66)	52(69.33)

5.7. Training Taken Related to Electronic Resources

Computer training courses should play a significant role in enhancing the effectiveness of e-resources. According to the findings, users with a computer experience can use e-resources efficiently and easily. The research scholars and students (60 percent R.S from science departments have computer training, so they use more e-resources than the users and (76%) from the social science. The rest of the users who lack computer training have many difficulties accessing e-resources. Table 9 depicts a vibrant image. The importance of training in the use of e-resources has been highlighted in many studies. Ali (2005) in his study on use of electronic resources at IIT Delhi library laid emphasis on the training of the library staff who play a major role in encouraging the use of e-resources. Similarly, Madhusudan (2008) also in his study emphasized that "there appears to be some need for academics to be provided with training in using e-journals." Isubika & Kavishe (2018) recommended that Mzumbe University library "should equip library users with intensive training on information searching skills to increase utilization of the subscribed e-resources." In the study by Rehman & Ramzy (2004) a large number of the respondents proposed a variety of measures of formal orientation and training to become more effective users.

Table 9: Training Taken Related to Electronic Resources.

Respondents	Science			Social Science		
	Total	Yes	No	Total	Yes	No
PG Students	25	17(68)	11(44)	25	7(28)	18 (72)
Scholars	75	38(50.66)	35(46.66)	75	57 (76)	18(24)

5.8. Importance of e-Resources.

Users' responses suggested that 19 (76 percent) of research academics and 50 (66.66 percent) of science faculty students, while 20 (80 percent) of research. Scholars and 37 (49.33 percent) of social science faculty students believe that the introduction of e-resources has diminished the relevance of printed information resources. Table 10 provides a clear illustration. Print texts, being physical entities, restrict use of any given volume to a single user at any given time. Digital information can be replicated innumerable times and simultaneously dispersed to recipients worldwide; electronic documents are not exhausted by use. Therefore, digital transmission avoids certain pitfalls attached to the distribution of printed texts, including limited print runs or under stocking. While bandwidth and level of demand can reduce the speed of transmission, the document itself does not deteriorate or depend on outside production.

Table 10: Importance of e-Resources.

Respondent	Science			Social Science		
	Total	Yes	No	Total	Yes	No
PG students	25	19(76)	6(24)	25	20 (80)	5(20)
Research Scholars	75	50(66.66)	25(33.33)	75	37(49.33)	38 (50.66)

5.9. Reasons for Using e-Resources

According to the study's data analysis, 24(95)scholars and 51(68), the majority of users of science disciplines believe that e-resources save time and are proved informative than traditional resources but the majority of users of social science believe that e-resources are time consuming, difficult to use, and costly. Table 11 provides a clear picture.

The benefits that have been listed under Electronic resources are the –

(i) Currency and up to date Information: Currency and up to datedness of information retrieved since technology enables rapid updating of information, a feature that has high influence on Faculty, Research Scholar and PG and UG students. (ii) Easier and Faster Access: Technology has transformed the libraries and the manner in which they provide their services. Proxy server and virtual private networks allow users to connect to library resources remotely; hyper linking in integrated library systems publicizes the location of resources, regardless of formats. (iii) Access to Diverse resources: Access is provided to a variety of resources. Relational Mobility: Technology enables seamless transition from one source to another. The user needs only to click on the hyper link to view the cited document. (iv) Portability: Data can be doubled to USB memory, hard disks and carried from one location to another. Information available 24*7: Information can be accessed any time.

Table 11: Reasons for Using e-Resources.

Reasons for Using E-Resources	Science		Social Science	
	Scholars N=25	Students N=75	Scholars N=25	Students N=75
Time Saving	24(95)	51(68)	10(40)	23(30.66)
Easy to Use	118(72)	29 (38.66)	8(32)	20(26.66)
More Informative	23 (92)	60 (80)	16(64)	45(60)
More Expensive	20(80)	67 (89.33)	23(92)	73(97.33)

5.10. Problems Faced by Users in Accessing and Retrieving Information

Users facing Challenges in Accessing and Retrieving Information Table 12 shows that the majority of both faculties feel that a shortage of Central library professionals (92 percent; 98 percent) and a lack of support from Central library personnel (90 percent; 96 percent) are the most significant challenges to accessing e-resources. Users as such don't know the search tactics to boost the precision of their search results or the sources from where they received the information which they are in desire. Other issues they face include lack of knowledge, sluggish bandwidth, e-resource coverage and quality, a lack of time, and a shortage of computer terminals.

Thus, it is found that the users face some problems to a greater extent than the other problems in the use of electronic resources. The major problems faced by them included non availability of access from home, limited access to archives and retrieval of irrelevant information during the search of electronic resources. Power failure is not much of a problem these days as observed from the responses. Lack of IT skills is also not a major problem as the respondents seemed good in IT skills. Several problems were identified in the use of e-resources by authors of different studies. Sohail & Ahmad (2017) indicated slow downloading and blockage of website as the hurdle in proper utilization of electronic resources. Similar results were obtained by Nanda (2017) who found that slow downloading is the major barrier for faculty members (58.92%). Anil Kumar & Reddy (2016) found that majority of the research scholars (71.40%) encountered problems in using ejournals. The main problems faced by them included 'slow Internet connectivity', 'not familiar with searching e-journals' and 'inaccessibility of back volumes of periodicals'

Table 12: Problems Faced by Users in Accessing and Retrieving Information

Sr. No	Problems	Science Faculty N=100		Social Science Faculty N=100	
		Agree	Disagree	Agree	Disagree
1	Slow internet speed	50.0	50.0	90.0	10.0
2	Lack of computer terminals	17.0	83.0	75.0	25.0
3	Awareness of different types of e-resources	60.0	40.0	96.0	4.0
4	Lack of relevant information sources	40.0	60.0	84.0	16.0

5	Lack of assistance by Central library staff	90.0	10.0	96.0	4.0
6	Lack of knowledge to use	42.0	58.0	78.0	22.0
7	Lack of Central library professionals	92.0	8.0	98.0	2.0
8	Lack of time	38.0	62.0	22.0	78.0
9	Frequent power cuts	10.0	90.0	60.0	40.0
10	The level of quality of e-resources is not good	13.0	87.0	40.0	60
11	The e-resources doesn't cover my area of my interest	21.0	79.0	79.0	21.0

6. FINDINGS

The following are the study's principal findings:

100% of research scholars and 60% of science faculty students visit central library on a regular basis, whereas 40% of research scholars and 26.66% of social science faculty students visit Central library on a regular basis. It suggests that just a small percentage of social science users are over the age of 18. In comparison to the Social Science Faculty, the majority of research scientists and students in the Science Faculty are aware of e-journals, e-emails, e-maps, and e-newspapers. Both faculties are unfamiliar with indexing and abstracting databases.

The majority of users in both faculties often use e-journals, e-books, e-maps, and emails. Accessing material via the web is problematic for users of social science faculty. Both faculties found the Central library website difficult to navigate to the needed information resource. Both faculties believe that computer training or courses play an important part in properly locating information on the internet. E-resources are seen as time-saving and more informative by users of the scientific faculty, but time-demanding and less informative by users of the social science faculty. Lack of knowledge and assistance from resource workers and Central library professionals in the libraries are the key problems that both scientific and social science faculties face. Administrators of the university's Central library should set up awareness and orientation programs, hand out brochures, and display a list of the e-resources to which they have subscribed so that users are aware of the many e-resources and facilities/services offered by the library. Every department has to have a modern computer lab. Basic education in hardware and software, including MS Office, Internet research, and the use of electronic resources, should be part of each department's curriculum. Departmental libraries should provide access to electronic resources including online journals. For the Central library to encourage more use of readily available electronic materials, academic library administration should foster faculty-librarian relations.

The Central library consults with all university staff members before creating an e resources collection by speaking with all department heads and department heads working with teachers, researchers, and students to create a list of the most popular e-resources and send it to the Central library. In response to the need, the Central library makes an online resource acquisition. To ensure that all students and researchers, whether enrolled on a regular basis or via distance learning, can take advantage of e-resources, the university administration should hire qualified professional assistants for departmental libraries. This will lead to a higher utilization of electronic resources.

Regarding learning about the availability of e-resources, the findings indicate that some of academic staff and researchers learn through library staff, information literacy programmes, colleagues, and library websites. On the importance of e-resources, the findings show that the resources have been found to play an important role in teaching and research. Access to and use of e-resources positively contributed to access to and use of up-to-date references, improvement of teaching methods and preparation of teaching materials. The findings suggest that not only have teaching activities been improved; research activities such as conducting literature review, proposal writing, accessing secondary data, identification of research areas, report writing, and timely submission of reports were also enhanced.

7. SUGGESTIONS

The following suggestions with regard to improvement of ICT infrastructure, promotion of library resources, end-user training, etc. are made after thoroughly analyzing access and use of e-resources in Kashmir University central library which might help this library in strengthening and improving the facilities for fulfilling the requirements of their users.

- More collaboration is required between teachers, students, librarian, and library staff, so that the process of searching, and retrieving content based results from the e-resources type guidance may be given to students making them realize the benefits of using e-resources.
- Conducting expert user training (Information Literacy Programs) is essential for the better use of electronic resources in the library. It will train the users in techniques of using e-resources.
- Students' orientation programs should be organized on a regular basis to apprise them about advanced search strategies and the use of controlled vocabulary to make electronic search process much easier.
- Setting up of more terminals and printers for the users for their effective use.
- Moreover, instead of expecting users to accept whatever exists in the market, the right perspective is to know and provide whatever electronic resources suit users in their respective circumstances The library management, therefore, needs to conduct user study programs to know more about electronic resource needs of the users.
- University should increase the budget for subscribing more electronic resources. Without adequate budget library cannot cover all subjects' content. The e-journal cost is increasing day by day and among those the current issues are more costly than back issues. Most of the researchers and faculty member's requirements are current issues of article; some of them told that they no need to see the back issues of e-journals.
- Before and after the electronic resources subscription, survey on users should be done at regular interval. Library should also receive information and suggestions from the faculty members and the students, which need to subscribe or not.
- University should organize training program for the faulty members and the students so that they can know about different search interface, latest changes of the journals site and develop sophisticated searching and retrieval skills or techniques.
- Bandwidth of internet connection must be increased in university campus. Faster internet access should be offered to minimize download time.

8. CONCLUSION AND LIMITATIONS OF THE STUDY

The study highlights widespread awareness and utilization of e-resources among research scholars and post-graduate students at Kashmir University, India, primarily reliant on UGC-INFONET Digital Library Consortium for relevant information access. With the Indian government's initiative to establish new consortia nationwide, such as E-Sodhsindhu, merging existing ones, including UGC-INFONET and N-LIST, access to electronic resources is extended to various centrally funded institutions.

The exponential growth of information and communication technologies, alongside electronic resources, has revolutionized research, storage, retrieval, and communication of scholarly information. While electronic resources significantly impact users at Kashmir University, facilitating research endeavors, there remains a segment unaware of crucial online resources. Hence, proactive measures like orientation programs and workshops are vital for enhancing user understanding.

Despite its merits, the study has limitations, including reliance on random sampling, absence of student interviews to capture broader campus academic advancements, and focus solely on RIMT University's post-graduate students, limiting generalization. Thus, future research should delve deeper into the role of social media in education across global universities.

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Academic Information Seeking Behaviour and Library Use by Postgraduate Commerce Students: A Study at Mangalore University, Mangalore, Karnataka, India

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ABSTRACT

This study looks at the information seeking behaviour of postgraduate commerce students at Mangalore University in India. The aim is to understand their preferences and habits regarding academic information and library resources. Surveys and interviews were used to gather data from the students. The findings show that most students use the internet as their primary source but still value the library for borrowing materials and reading specific subjects. Challenges identified include insufficient internet access points and short book loan durations. The study offers insights for the library to enhance its services, improve resource availability, and provide necessary orientation and training for postgraduate commerce students. The study concludes that postgraduate commerce students at Mangalore University exhibit diverse information-seeking behaviors and utilize a combination of online and library resources. The findings provide valuable insights for the university library to enhance its services, improve resource availability, and provide necessary orientation and training to support the information needs of these students better.

Keywords: *Library resources, services, Information seeking behavior, Mangalore University.*

1. INTRODUCTION

The process of seeking information, known as information-seeking behavior, involves identifying, searching, selecting, interacting with, and analyzing appropriate sources of information. This is crucial to acquiring, utilizing, and implementing information, especially for academics, researchers, and students. Librarians need to understand what information is being sought and how to provide it efficiently. Technological advancements and innovations have transformed traditional libraries from storehouses to information gateways, changing how we think about storing, preserving, and disseminating information.

2. LITERATURE REVIEW

Several studies have examined the diverse aspects of information-seeking behavior and the impact it has on students' access to library services and academic performance.

A study by Veer and Panda (2022) conducted a survey on the information-seeking behavior of Teachers and Students at Jan Nayak Ch. Devi Lal Vidyapeeth, Sirsa, revealing a preference for independent research but encountering challenges due to limited information sources in libraries. Recommendations included expanding informal communication to facilitate information flow. Aminah Namugenyi and Peter Wamea (2021) explored the impact of information-seeking behavior on visually impaired students access to library services. The research suggests that collaboration between the government, university libraries, non-governmental organizations, and other supporters of visually impaired individuals is necessary to enhance library and information services for these students. Sujatha and Shivarama (2020). In their study discovered that library involvements influenced students' skills, confidence, and overall academic performance. Ahmed and Khan (2019) The study emphasized the importance of providing a conducive library environment and the accessibility of important resources. John, Biradar, and Pujar (2018) in their study highlighted the need for guidance and support from library staff and faculty in overcoming these challenges. Chaudhry, Qasmi, and Ahmed (2016) in their research findings indicated that students relied on offline and online sources, with online databases and academic journals being the most frequently used resources.

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Overall, thse literature underscores the importance of collaboration, supportive environments, and guidance from library staff and faculty in enhancing information access and academic success among students.

3. METHODOLOGY, SCOPE AND LIMITATIONS OF THE STUDY

A study was conducted on postgraduate commerce students at Mangalore University. A questionnaire was used to assess their information-seeking behavior and library use. The study's findings can help understand these patterns in the context of postgraduate commerce education.

4. OBJECTIVES OF THE STUDY

i) To find out Postgraduate commerce students' information-seeking behaviors.
ii) To determine whether postgraduate commerce students are familiar with using the library's resources.
iii) To find out information sources consulted by postgraduate commerce students.
iv) To investigate the information sources consulted by postgraduate commerce students.

5. DATA ANALYSIS AND INTERPRETATION

Table 1 displays a clear distribution of respondents' gender. Out of the 170 participants examined in this study, an overwhelming majority of 152 (88.9%) were female, while about 18 (10.5%) were male. This information sheds light on the composition of the participants and emphasizes the preponderance of female respondents in the study. When analyzing and interpreting the study's results related to academic information-seeking behavior and library usage among postgraduate commerce students at Mangalore University, it is essential to consider.

Table 1: The Gender Of The Respondents

Sr. No.	Gender	Respondents
1.	Male	18 (10.5%)
2.	Female	152(88.9%)
Total		170 (100%)

Table 2: Information Seek From The Library

Sr. No.	Information Seek from Library	Respondents
1.	Yes	163 (95.9%)
2.	No	7 (4.1%)
Total		170 (100%)

Table 2 shows that most respondents (163 out of 170) sought information from the library for this study. This indicates that the library is a crucial resource for postgraduate commerce students in their academic pursuits. Only a small percentage (4.1%) sought information from other sources. The high percentage of respondents relying on the library emphasizes the importance of libraries in supporting postgraduate commerce students at Mangalore University.

Table 3: Access The Needed Information

Sr. No.	Access the Needed Information	Respondents
1.	Consult with library staff/professionals	75 (44.1%)
2.	Discuss with friends	84 (49.4%)
3.	Discuss with teachers	10 (5.9%)
4.	Others	9 (5.3%)

A survey of 170 postgraduate commerce students at Mangalore University found that 49.4% of the respondents prefer discussing with friends to access information, while 44.1% consult with library staff/professionals. 26.8% of the respondents visit the library twice a week, while 22.1% visit occasionally. 5.9% of the respondents discuss with teachers, and 5.3% use other methods to access information. These findings indicate the various approaches postgraduate commerce students take to access the necessary information. Most respondents prefer discussing with friends and consulting with

library staff/professionals. Some respondents also mentioned discussing with teachers or using other methods. The data on library visit frequency shows that a significant percentage of respondents visit the library twice a week, indicating regular and frequent use of library resources. Others occasionally visit, suggesting varying levels of library usage among the respondents. These findings highlight the importance of peer interaction and support and the role of library staff and professionals in assisting postgraduate commerce students in accessing the information they need. They also emphasize the significance of promoting effective collaboration and communication channels within the academic community to facilitate information sharing and acquisition.

Table 4: Preferred Information Seeking Mode

Sr. No.	Preferred Information Seeking Mode	Respondents
1.	Print Mode	29 (17.1%)
2.	Electronic Mode	21 (12.4%)
3.	Both	112 (65.9%)

Out of the respondents, 21 (12.4%) preferred print mode, 112 (65.9%) preferred both print and electronic modes, and only 21 (12.4%) preferred electronic mode. These results emphasize the importance of providing diverse information sources and formats to meet the different preferences of postgraduate commerce students at Mangalore University. It also suggests that while electronic resources are significant, print resources are still relevant to many respondents. Knowing the preferred information-seeking mode is crucial for library services and resource allocation to ensure the required resources are available and accessible in the preferred formats.

Table 5: Frequency of Information Seeking

Sr. No.	Frequency	Respondents
1.	Daily	49 (28.8%)
2.	Occasionally	107 (62.9%)
3.	Not at all	10 (5.9%)

According to Table 5, most respondents (62.9%) seek information occasionally, while 28.8% seek information daily, and only 5.9% do not. These results indicate that postgraduate commerce students at Mangalore University have diverse information-seeking patterns. Most seek information when needed or based on academic requirements, while others engage in frequent and continuous information-seeking activities. However, a small percentage of respondents do not seek information at all. These findings are crucial for libraries and educational institutions to customize their services and resources to meet the needs of postgraduate commerce students. By understanding the frequency of information-seeking, they can provide the right resources, support, and guidance to facilitate effective and efficient information-seeking behaviors.

Table 6: Triggers For Information Seek

Sr. No.	Triggers	Respondents
1.	Acquisition of new knowledge	70 (41.2%)
2.	To be in tune with trending	6 (3.5%)
3.	All of the above	82 (48.2%)
4.	None of the above	5 (2.9%)

Table 6 presents the reasons why respondents seek information. Among the respondents, 70 (41.2%) said they seek new knowledge, 6 (3.5%) stay updated with current trends, and 5 (2.9%) chose none of the above. Meanwhile, most respondents in study 82 (48.2%) selected the above options. These findings reveal the various triggers that motivate postgraduate commerce students at Mangalore University to seek information. Many respondents seek information primarily to acquire new knowledge, indicating their strong desire for intellectual growth and learning. A smaller percentage seek information to stay updated with trends and current developments, reflecting their interest in staying relevant in their field of study. Notably, a considerable portion of respondents (48.2%) reported that all of the triggers apply to them, indicating that a combination of motivations drives their

information-seeking. Understanding these triggers provides insights into postgraduate commerce students' underlying goals and motivations. This knowledge can help libraries and other support mechanisms cater to these motivations and enhance the information-seeking experience for students.

Table 7: Library Visit

Sr. No.	Library Visit	Respondents
1.	Yes	165 (97.1%)
2.	No	5 (2.9%)

Table 7 showed 97.1% of the 170 study respondents visited the university library, while only 2.9% did not. These data direct that postgraduate commerce students at Mangalore University value the university library as an information resource for their academic needs.

Table 8: Purpose of Library Visit

Sr. No.	Purpose of Library Visit	Respondents
1.	To Read on Specific Subject of Study	100 (58.8%)
2.	To Borrow Library Materials	49 (28.8%)
3.	To Copy Reading Materials	20 (11.8%)
4.	To Read Newspapers	31 (18.2%)
5.	To Use Internet	5 (2.9%)
6.	Others	6 (3.5%)

A survey of 170 postgraduate commerce students at Mangalore University found that the library serves various purposes for them. Most respondents (58.8%) visit the library to read about specific study subjects, indicating a focus on academic reading and research. Borrowing library materials was also popular, with 28.8% of respondents using this service. Additionally, 18.2% of respondents read newspapers, while 11.8% visited the library to copy reading materials. Only a small percentage (2.9%) used the Internet, and 3.5% visited the library for other purposes. The "Others" category indicated that some respondents had different purposes for their library visits. Understanding the purposes of library visits is essential for the library staff to cater to the students' diverse information-seeking behaviors and needs.

Table 9: Frequency of Library Visit

S No	Frequency of Library Visits	Respondents
1.	Everyday	47 (27.6%)
2.	Once a week	40 (23.5%)
3.	Twice a week	42 (24.7%)
4.	Occasionally	39 (22.9%)
5.	Fortnightly	1 (0.6%)

The Table 9 shows that the frequency of library visits 27.6% visit the library daily, 23.5% visit twice a week, and another 23.5% visit once a week. Meanwhile, 22.9% visit occasionally and 0.6% visit fortnightly. The study results shows that the frequency of library visits varies among students.

Table 10: Level of Importance of Library Use

Sr. No.	Level of Importance	Respondents
1.	Very Important	110 (64.7%)
2.	Important	59 (34.7%)
3.	Not Important	4 (2.4%)

Most postgraduate commerce students at Mangalore University consider library use very important, with 64.7% of respondents indicating this level of importance, followed by 34.7% who chose "Important" and only 2.4% who said it was "not important".

Table 11: Information Sources Used in The Library

Sr. No.	Information Sources Used In Library	Respondents
1.	Internet facility	39 (22.9%)
2.	Textbooks/monographs	98 (57.6%)
3.	E-journals/E-books	20 (11.8%)
4.	Reference Materials	51 (30.0%)

Table 11 shows respondents' different sources of information used in the library. The majority of respondents, 57.6% in total, reported using textbooks/monographs as their primary source of information. This was followed by reference materials, used by 30.0% of respondents, and E-journals/E-books, used by 11.8%.

Table 12: Use Of Library Services

Sr. No.	Use of Library Services	Respondents
1.	Consultancy Service	23 (13.5%)
2.	Reference Service	125 (73.5%)
3.	Book Loan Service	11 (6.5%)
4.	Bibliography	12 (7.1%)

Table 12 shows use of library services out of 170 respondents, 125 (73.5%) used reference services, 23 (13.5%) used consultancy services, 11 (6.5%) used book loan services, and 20 (11.8%) used bibliography services.

Table 13: Use of Search Strategies

Sr. No.	Use of Search Strategies	Respondents
1.	Browse through shelves	64 (37.6%)
2.	Consult Bibliography	20 (11.8%)
3.	Utilization of index and abstract	12 (7.1%)
4.	Information from friends	39 (22.9%)
5.	Library staff	36 (21.2%)
6.	Manual card data logs	13 (7.6%)
7.	OPAC	16 (9.4%)
8.	Websites	29 (17.1%)

Table 13 shows the use of search strategies the majority of respondents in the study, 64 (37.6%), used browsing through shelves as their primary search strategy. Following this, 39 (22.9%) of respondents relied on information from friends, while 36 (21.2%) used library staff for assistance. Websites were used by 29 (17.1%) of respondents, while 20 (11.8%) of respondents consulted bibliographies, and 13 (7.6%) used manual card data logs. Only 12 (7.1%) of respondents utilized the index and abstract.

Table 14: Problem Encountered In Using Library Resources

S No	Problems	Respondents
1.	Insufficient internet access points	25 (14.7%)
2.	Opening hours	15 (8.8%)
3.	Space not enough	9 (5.3%)
4.	Lack of time	52 (30.6%)
5.	The short duration of book loan	34 (20.0%)
6.	Power outrage	4 (2.4%)
7.	Lack of library orientation	12 (7.1%)
8.	Obsolete book	27 (15.9%)

Table 14 shows problem encountered in using library resources. The results showed that the biggest problem was time, with 30.6% of respondents reporting this issue. The second most common problem was the short duration of book loans, with 22.9% of respondents stating this. Other issues included insufficient internet access points (14.7%), obsolete books (15.9%), limited opening hours

(8.8%), inadequate space for studying (2.4%), and power outages (reported by a smaller proportion of respondents).

Table 15: Satisfaction Of Library Services

Sr. No.	Satisfaction with Library Services	Respondents
1.	Averagely satisfied	91 (53.5%)
2.	Fully satisfied	68 (40.0%)
3.	Not satisfied	10 (5.9%)

Table 15 shows the Satisfaction of Library Services. In response to a survey about library services, 91 out of 170 respondents (53.5%) reported being moderately satisfied, 68 (40%) reported being fully satisfied, and 10 (5.9%) reported being dissatisfied. The majority of respondents, over half, expressed a moderate level of satisfaction. This suggests room for improvement in meeting their needs and enhancing their overall experience. However, a significant proportion of respondents, 40%, reported being fully satisfied with the library services. This is a positive reflection on the library's efforts to meet the needs of students. It is important to note that 5.9% of respondents expressed dissatisfaction with the services provided.

Table 16: Availability of Quality Information Through Library

Sr. No.	Availability	Respondents
1.	Strongly Agree	58 (34.1%)
2.	Agree	76 (44.7%)
3.	Neither agree nor disagree	26 (15.3%)
4.	Disagree	2 (1.2%)
5.	Strongly disagree	4 (2.4%)

According to Table 16, the majority of respondents in the study, 44.7%, agreed that the library provides access to quality information. An additional 34.1% strongly agreed with this statement, indicating a high confidence level in the library's ability to offer reliable and valuable resources. However, 15.3% of respondents neither agreed nor disagreed, suggesting a neutral stance. It is essential to understand the reasons behind this neutral response and explore potential ways to address any concerns or uncertainties they may have. A small percentage of respondents, 1.2%, disagreed with the statement, indicating that they perceive a lack of quality information in the library. Similarly, 2.4% of respondents strongly disagreed.

Table 17: Most Prefered Source for Updating Knowledge

Sr. No.	Most Preferred Source	Respondents
1.	Internet	32 (18.8%)
2.	Library	19 (11.2%)
3.	Both (the Internet and the Library)	118 (69.4%)

Based on the data presented in Table XVII, it appears that the majority of respondents prefer to use a combination of the internet and the library as their primary sources for updating their knowledge. Specifically, 18.8% of respondents preferred the Internet, while 11.2% preferred the library. However, most respondents (69.4%) used both sources.

Table 18: Helpfulness of Library for Academic Work

Sr. No.	Helpfulness	Respondents
1.	Very helpful	71 (41.8%)
2.	Helpful	94 (55.3%)
3.	Not helpful	2 (1.2%)

Table 18 the level of helpfulness of the library for academic work show that 55.3% of respondents found it helpful, 41.8% found it very helpful, and only 1.2% did not.

Table 19: Need for Library Orientation/Training

S No	Need for library orientation/ training	Respondents
1.	Yes	139 (81.8%)
2.	No	25 (14.7%)

Table 19 shows need for library orientation/ training. 81.8% said they required orientation or training for the library, while 14.7% did not feel the same.

Table 20: Problem Faced While Using Library Resources and Services

S No	Problem Faced	Yes	No
1.	Lack of Skills	48 (28.2%)	83 (48.82%)
2.	Inadequacy of recent publications and current journals	45 (26.5%)	82 (48.24%)
3.	Difficulties in locating the needed materials	86 (50.6%)	51 (30.00%)
4.	Insufficient space, material and equipment	40 (23.5%)	97 (57.06%)
5.	Incompetent and unqualified staff	22 (12.9%)	101(59.41%)
6.	Old, damaged, mutilated books and journals	87 (51.2%)	47 (27.65%)
7.	Lack of awareness about library services	56 (32.9%)	72 (42.35%)
8.	Improper guidance about the use of library resources and services	48 (28.2%)	80 (47.06%)
9.	Improper arrangement of books	34 (20.0%)	94 (55.29%)

Table 20 presents library users' various challenges while accessing library resources and services. The majority of respondents, about 50.6% of the total, found it difficult to locate the needed materials. In comparison, 32.9% of the users felt that they lacked awareness about the library services, while 28.2% opined that they lacked the necessary skills and guidance to use library resources and services effectively. Furthermore, 26.5% of the users felt that the library lacked current journals and recent publications, 23.5% experienced insufficient space, material, and equipment, 20.0% had issues with the improper arrangement of books, and 12.9% experienced incompetent and unqualified staff.

6. HERE ARE SOME SPECIFIC RECOMMENDATIONS THAT COULD BE MADE TO IMPROVE THE LIBRARY:

- Improve the organization and cataloguing of materials to make it easier for users to find what they need.
- Provide more training and resources to library users to help them develop their information literacy skills.
- Maintain a collection of up-to-date and well-preserved materials.
- Provide sufficient space, materials, and equipment to meet users' needs.
- Hire competent and qualified staff knowledgeable about the library's resources and services.
- Raise awareness about library and information services among users.
- Provide proper guidance about the use of library resources and services.
- Improve the arrangement of books to make them easier to find.
- By implementing these recommendations, libraries can better support the academic success of students and researchers.

7. DISCUSSION AND CONCLUSION

Libraries are essential for academic success, but several challenges need to be addressed to ensure they can fully support library users. These challenges include difficulty finding materials, lack of skills, outdated resources, and inadequate space. By resolving these issues, libraries can improve their support and resources for their users. The findings suggest that students would benefit from being given direction on using the resources and services offered by the library and information centre to satisfy their information needs. A successful library serves as a knowledge repository and a student cultural centre. Students develop the cognitive, behavioural, and affective structure necessary to deal meaningfully with information, make judgments of value and appropriateness about the information they encounter, and transform the relevant information into appropriate representations of their newly acquired identifications. A successful library is not just informative; it is transformative and formative,

promoting the formation, production, dissemination and use of knowledge and developing information values. At the same time, libraries must provide innovative, on-demand information sources and services while meeting students' academic and learning needs.

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Application of Web 2.0 Tools in Central University Libraries of Northeast India- A Study

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ABSTRACT

This paper deals with Web 2.0 and its tools in the context of libraries of the central universities of the North-eastern region of India. Change is an incessant process. The recent developments and advances in the internet and web technology have revolutionized the world with limitless interactivity and collaborative capabilities. Web 2.0 introduced the two-way collaboration platform, where instead of only consuming information the user can also contribute to information generation. In this era of content creation, a library website is also expected to be more than just a home page, but a collaborative library site that encourages the user to contribute and seek guidance from one for their research and study purpose. A content-based analysis of the 9 central university libraries of the North-eastern region of India has been presented in this paper.

Keywords: *Web 2.0, Internet, Library website, Institute, Organization.*

1. INTRODUCTION

The four walls of the library have been extended their boundaries to the doors of the internet. The reach of the information and the knowledge has gone from the user visiting the library to the user getting information on the fingertip. The change in the way of consumption has also changed the user participation from being consumers to the contributors. In this process the role of the library is huge as the library is considered as the source of information or knowledge so the prosper impact or change is obvious for the library. The Internet is the major or the ultimate source of information provider and is now provider of a platform to generate information via various tools. Web 2.0 is the synonym of the website with features that support user's information generation. These tools being the easiest way to start expanding the limits of the internet of reading only to read, write contribute for the user community. It provides the option for the libraries to expand its horizons and facilitate user participation in the library. The physical library in itself just provides a definite amount of sources of knowledge. For a physical library, a website or digital library is must. The digital library websites equipped with Web 2.0 tools can make a library a modern participatory library that encourages the user's participation through feedback to make a library better suited to the needs of the user. In this paper we have tried to know the status of the central university of the northeastern part of India in the adaptability of the Web 2.0 technologies.

Web 2.0 is an interactive and collaborative version of the web, an up scaled version that allows the contribution of its user. This two-way contribution makes the information more valuable and makes information customisable according to the users need, hence making it easy discoverable and easy retrieval. It provides an opportunity or scope for improvement in the information and easy and timely correction. User feedback in a specific format like rating, comments can help know the preferences of users and improve the library products and also market the products. For a library to satisfy its user's needs, the use of web 2.0 technology can be helpful. A library website can be used as a platform to represent its patron's original creation and market. In today's new era of Digital marketing and electronic formats of information, the use of an institution's library can be for promoting the user's research or literature.

2. ADVANTAGES AND DISADVANTAGES OF WEB 2.0

Web 2.0 is the seed of digital transformation. The use of internet for the people, has changed with the inclusion of the parameter of information on the internet by the people, this has shifted the use from mere viewing to interacting and contributing. This encouraged the participation of the users

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in the discussion. It lets the community grow to the global level. A community with people from all parts of the world can come together for a cause.
It has facilitated communication by making it easy and fast.
Sharing of information and making it accessible to its target audience has become easy. As the way of delivery of information can be different forms-video, image, document and others.
Web 2.0 is all about the user generating content for their end user, learning from the other user, and teaching other users. It promotes equality by providing a platform for all to contribute.

Among all the goods that web 2.0 is talked about there are also things to be careful about. "Information explosion" is the exact term that can be called for the abundance of information available that has been published and not easy to control. Web 2.0 can be called the reason for the rapid increase of information or overload of information. This has led to publishing all the unmonitored information and unrelevent information also.

The threat of misinformation to the user has also increased as the information contributed by the user may not always be correct as it does not have a supervisor every time. As any user can post any kind of information as availability of platforms is not a problem with the number of such tools.
The lists of the selected universities are mention below.

Table 1: Lists of the Selected Universities

Name of the University	Years of Establishment	Place	Website	Library Website
NEHU	1973	Meghalaya	www.nehu.ac.in	Library.nehu.ac.in
Manipur University	1980	Manipur	www.manipuruniv.ac.in	N/A
Rajiv Gandhi University	1984	Arunachal Pradesh	https://rgu.ac.in	N/A
Tripura University	1987	Tripura	https://tripurauniv.ac.in	N/A
Nagaland University	1989	Nagaland	https://nagalanduniversity.ac.in	https://library.nagalanduniversity.ac.in
Assam University	1994	Assam	http://www.aus.ac.in	N/A
Tezpur University	1994	Assam	http://www.tezu.ernet.in	N/A
Mizoram University	2001	Mizoram	https://mzu.edu.in	Lib.mzu.edu.in
Sikkim University	2007	Sikkim	https://cus.ac.in	https://library.cus.ac.in

3. OBJECTIVES OF THE PAPER

i) To find out the University library having maximum numbers of tools under Web 2.0.
ii) To find out the types of Web 2.0 tools used in the selected 9 University libraries.
iii) To find out the most used web 2.0 tools among the 9 University libraries.

4. METHODOLOGY

For the paper the required information are collected through the content analysis of the 9 University library websites and the universities are selected based on the central university of the North-eastern Region. There are 9 Central Universities available in the North-eastern region; all of them are actively consulted for the study.

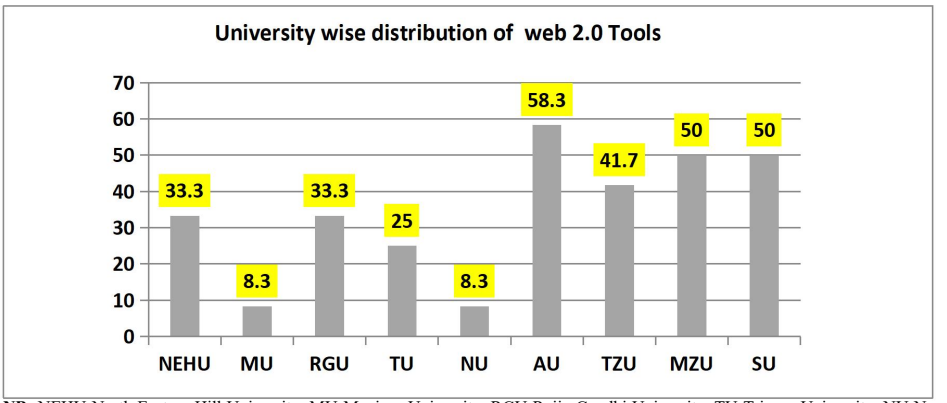
5. DATA ANALYSIS AND INTERPRETATION

Table 1: Distribution of web 2.0 tools available in nine University Libraries of Northeast Region

Web 2.0 Tools	NEHU	MU	RGU	TU	NU	AU	TZU	MZU	SU	Total
Rating	✓	-	-	✓	-	-	✓	-	✓	4
Comments	✓	-	-	✓	-	-	✓	-	✓	4
Place Hold	✓	-	-	✓	-	-	✓	-	✓	4

RSS	✓	-	-	-	-	✓	✓	-	✓	4
Ask a Librarian	-	-	-	-	✓	✓	✓	✓	✓	5
Facebook	-	-	✓	-	-	✓	-	✓	✓	4
Twitter	-	-	✓	-	-	✓	-	✓	-	3
Instagram	-	-	-	-	-	-	-	✓	-	1
YouTube	-	-	✓	-	-	✓	-	✓	-	3
LinkedIn	-	-	✓	-	-	✓	-	-	-	2
Google+	-	-	-	-	-	✓	-	-	-	1
Feedback	-	✓	-	-	-	-	-	✓	-	2
Total	4	1	4	3	1	7	5	6	6	-

NB: NEHU-North Eastern Hill University, MU-Manipur University, RGU-Rajiv Gandhi University, TU-Tripura University, NU-Nagaland University, AU-Assam University, TZU-Tezpur University, MZU-Mizoram University, SU-Sikkim University.



NB: NEHU-North Eastern Hill University, MU-Manipur University, RGU-Rajiv Gandhi University, TU-Tripura University, NU-Nagaland University, AU-Assam University, TZU-Tezpur University, MZU-Mizoram University, SU-Sikkim University.

Figure 1: University wise distribution of web 2.0 tools

From figure 1 we can see that the Assam University has the 58.3% distribution of web 2.0 tools in their library i.e. the highest number of Web 2.0 tools is used by Assam University and both the Manipur University and Nagaland University use only 8.3% each which is the lowest among all the universities.

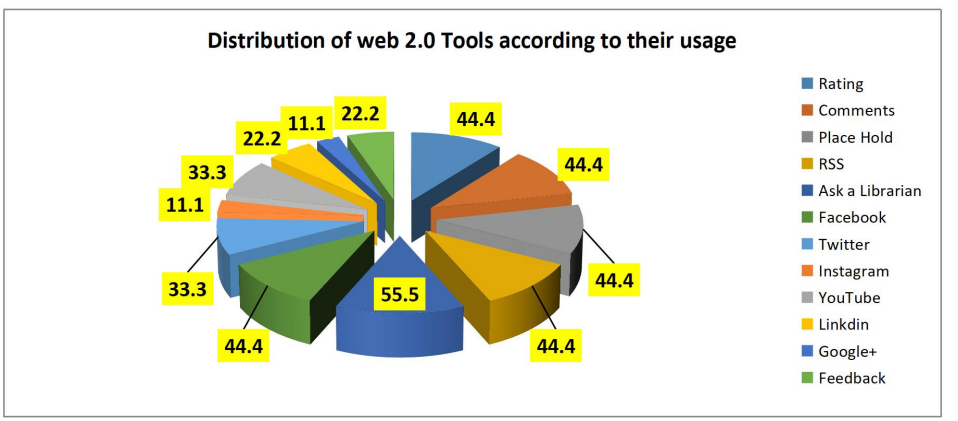


Figure 2: Distribution of Web 2.0 tools according to their usage

From the figure 2 we can see that the Ask a librarian is the mostly usable Web 2.0 tool among the other tools i.e. 55.5% and both the Instagram and LinkedIn is the rarely used Web 2.0 tool i.e. 11.1% each.

6. FINDINGS

After analyzing the above data following findings are found and based on it the conclusion is also given below. From Table 1 it is found that the Web 2.0 tools used by the nine Central University Libraries of the Northeast region are Social networking Tools like Facebook, Twitter, Google+, and LinkedIn, etc, Video Sharing tools like YouTube, Instagram etc and some others like comment, rating, place hold, Ask a Librarian, etc. From table 1 it is found that among the nine universities, only three universities use social networking tools i.e. RGU, AU, and MZU and rest of the six universities i.e. NEHU, MU, TU, NU, TZU, and SU not even use a single social networking tool. Assam University has a 58.3% distribution of Web 2.0 tools in their library i.e. the highest number of Web 2.0 tools is used by Assam University and both the Manipur University and Nagaland University use only 8.3% each which is the lowest among all the universities. The 'Ask a librarian' is the most used Web 2.0 tool among the other tools i.e. 55.5% and both Instagram and LinkedIn are the most rarely used Web 2.0 tool i.e. 11.1% each (Figure2).

7. CONCLUSION

In the age of digitization users' expectations for libraries are increasing. A traditional library website is now no longer satisfactory for the users; they need multilateral sharing of information between them and the information professionals. To recognize the user's needs and make them satisfy the library's need to apply Web 2.0 tools and techniques in the library websites. Web 2.0 can help the library to improve their services and also help to understand the need of the users. This study focuses on presenting the trend of using Web 2.0 tools and techniques among the nine Central University Libraries of the Northeast Region. It seems that Assam University has quite a good portion of these tools on their library website where as Manipur and Nagaland Universities are those that need to introduce more Web 2.0 tools for better services.

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Impact of Social Media on the Reading Habits of Children During COVID-19

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ABSTRACT

Background: Reading habits have always been a topic of concern for educators, as they have a direct impact on the educational development of society. With the advent of social media, there has been a shift in the way children consume information and spend their leisure time. The COVID-19 pandemic further exacerbated this trend, as children relied heavily on digital platforms for entertainment and education. Objectives: The objectives of the paper are to examine the changes in reading habits among children due to social media usage during the COVID-19 pandemic and to identify the potential consequences of these changes on their educational development. Method: The analysis in this article is based on survey method along with thorough examination of research papers that have explored the impact of social media on children's reading habits during the COVID-19 lockdown.

Keywords: *Addiction, COVID-19, information literacy, information seeking behavior, mental health, media distraction, online reading, reading habits, reading style, social media*

1. INTRODUCTION

A happy mind leads to a happy soul. Our minds are happy when we do something good, listen to something good, or read something good. In today's digital age, consumption of information and communication are done from the platform of social media. However, the excessive use of social media can have detrimental effects on children's cognitive development and overall well-being. It is crucial to explore the potential negative consequences of social media addiction and address the importance of fostering healthy reading habits and information seeking behavior in children. Reading is a process that we all engage in, knowingly or unknowingly, from early childhood. This habit is developed slowly by reading story books or learning interesting facts, which leads to entertainment and knowledge, hence becoming a part of our lives. When a child is forced to read something that is of no interest to him or her, the development of a reading habit deteriorates. It has been noted that successful people are good readers. A good reading habit has a great impact on the personality and success of any child. The onset of the lockdown during the COVID-19 pandemic affected the reading habits of all types of readers. The anxiety and mental stress caused during the lockdown had a tremendous impact on the education of children. The digital transformation of education during this time influenced reading habits as they shifted from print to non-print media (Chauhan and Lal 2012,102) (Panda and Sharma, 2021). The youngsters found this situation favorable for them, as they quickly adapt to any kind of new technology. Social media platforms became more accessible to all, which had no boundaries, and all countries were connected to each other during this pandemic. It helped me stay connected and learn many new ideas from all around the world.

2. HOW READING AFFECTS YOUR EMOTIONAL STATE

The Neuroscience of Reading Habits and How They Affect Your Emotional State Reading habits have a huge impact on your emotional state. Research has shown that reading can reduce stress and anxiety by providing an escape from reality and allowing individuals to immerse themselves in

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different worlds. Additionally, reading can also enhance empathy and emotional intelligence as it exposes readers to diverse perspectives and experiences. In fact, they can make you feel more content and happier. But it's not just the type of book that you read that affects your emotions. It's also how much time you spend reading in a day. (Owusu and Larson 2014) The neuroscience of reading habits is not all about how books affect our brains and bodies but also how they impact our emotions. "The Neuroscience of Reading Habits and How It Affects Your Emotional State" by Molly Albracht is about the impact of reading habits on emotional states. The article discusses what happens when we read, how much time in a day we spend reading, and how books impact our emotions. Albracht points out that the neuroscience behind what happens when we read and write is not fully understood. This is because we have a limited understanding of how the brain processes information, and it may be that the brain does not process language in the same way as it does other sensory stimuli. The reading process can be broken down into three stages: visual processing, lexical processing, and syntactic processing. Visual information is gathered from the retina by photoreceptors and sent to the brain via optic nerve fibers. The brain then converts this information into mental images. Lexical processing occurs when an individual identifies words in a sentence or passage. Syntactic processing takes place when an individual makes sense of these words in a sentence to form a coherent thought or idea.

3. LITERATURE REVIEW

A survey was carried out by Parikh et al. (2020) on the reading habits of library users during the lockdown of the COVID-19 pandemic. According to his findings, the lockdown did not increase the reading hours of the users, and e-resources were preferred to print materials. (Parikh, Vyas and Parikh 2020). A survey was conducted on the reading habits of Library and Information Science students at Annamalai University by Thanuskodi (2011). It was emphasized that the students studied the course materials provided by the University mostly because they had other household chores to do, which affected their reading. (Thanuskodi 2011,81). A study was carried out by Pal and Singh (2019) on the reading habits of postgraduate students at Khalsa College, Amritsar, which revealed that students had good reading habits and enjoyed reading in both print and non-print forms. Books, however, remain the preferred medium for reading among students, but social media distractions hamper reading habits. (Kaur and Surinder 2019,122-24). Vyas and Tandel (2020) carried out a study on the impact of lockdown on the reading habits of academic staff in India. The study shows that the readers liked to read in both print and non-print forms, though mobiles and laptops were frequently used for leisure reading and office work. (Vyas and Tandel 2020, 30-32). A study conducted by Packialakshmi et al. (2021) on The Reading Habits in the digital era during Lockdown among Adolescents revealed that 44% of readers were in the habit of reading newspapers. 49% of readers believed that reading would keep them updated during the lockdown, when all educational institutions were shut down. It also revealed that 83% of readers used smartphones, 10% used laptops, 3% used tablets, and only 1% used personal computers for reading during the lockdown. (Packialakshmi, Varghese and Thenesha 2021,2423-25). A case study conducted on two English medium schools on Reading Interests by Panigrahi and Panda, (1996) shows that reading is a skill that influences our literary skills, which enable us to analyze the information in a more non-judgmental manner. (Panigrahi and Panda 1996,60-62). Lakshmy Prakash et al. (2021) conducted a survey on the impact of reading habits on students in Kerala. It showed that there has been an improvement in the projects and assignments submitted with knowledge gained in specific fields. Digital reading was found favorable by the students. (Prakash, Somasundaran Chakkambath and Joseph 2021,286-87).

4. SOCIAL MEDIA: A NEW AGE OF ADDICTION?

Books are important to our society. They provide knowledge, perspective, and understanding of the world around them. However, with the rise of social media, there is a growing concern about its

addictive nature and its potential impact on reading habits. Many individuals are spending more time scrolling through their social media feeds than engaging with books, leading to a decline in reading habits and potentially limiting the benefits that books can provide to society. This is why promoting reading is a priority for the Department of Education. There are many ways schools and parents can promote reading among students, including by creating a school library and promoting literacy as an extracurricular activity called Book Club.

Social media has been a big topic of discussion for years now. Experts have been debating the pros and cons of social media and its detrimental effects on people. There are many who believe that social media can be a powerful tool to help people connect with each other, but there are also those who think that it is not as harmless as it seems. A new study by the University of Pittsburgh has found that social media addiction is linked to mental health problems in young adults. The study was conducted on more than 1,700 college students from 17 different universities in the United States. With the advancement of technology, reading habits are changing. The use of social media is now a part of their daily lives. Children are spending more time on social media than reading books. (Shaikh and Chaparro 2004, 877-78). This has a negative impact on their reading habits and leads to cognitive decline.

5. THE IMPACT OF SOCIAL MEDIA ON READING HABITS

Social media has become a major part of our lives. It has changed the way we communicate, interact, and spend our free time. Social media is also changing the way we read. With the increasing popularity of social media platforms, such as Facebook, Instagram, and Twitter, people are more inclined to consume short, bite-sized content rather than engage in long-form reading. This shift in reading habits can lead to a decrease in critical thinking skills and a lack of patience when it comes to delving into complex ideas found in books. Additionally, the constant distractions and notifications from social media can make it difficult for individuals to focus on reading for extended periods of time. The number of people who read books is declining, while the number of people who spend time on social media is increasing every day. It's not that people don't want to read anymore, they just find it more convenient to watch videos or scroll through their feeds on social media than to pick up a book and start reading it.

- **Is Social Media Diminishing Our Attention Span?**

The average person spends more than five years of their life on social media. It's not just a passing trend; it's a way of life for many people. But is social media diminishing our attention span? Studies have shown that excessive use of social media can indeed lead to shorter attention spans. The constant exposure to bite-sized content and instant gratification on social platforms has rewired our brains to seek quick and easily digestible information, making it harder for us to focus on longer and more complex tasks. Social media has become the go-to place for entertainment and information. We can watch videos, read articles, and connect with friends all in one place. But the downside is that we don't have to focus on anything in particular because there are so many other options at our fingertips. This can lead to a decrease in our attention span, which impacts us in many different ways. Reading habits are affected by digital distraction in many ways. Focus is hampered by various notifications popping up on smartphones, and frequent checking of messages on WhatsApp, Facebook, and other social media platforms hampers the efficiency of reading habits. (Sridhar 2021, 373-74).

- **Social Media and Self-Reflection**

Social media has become a huge part of our lives, and it has found its way into the workplace. A recent study found that more than half of people use social media for work. With this constant connection to the outside world, we can't help but be constantly reflecting on what we post about ourselves and what others are posting about us. We have a new responsibility to make sure that our posts are accurate, appropriate, and not misleading. This increased self-reflection can have both

positive and negative effects on our reading habits. On one hand, it can motivate us to seek out more diverse perspectives and engage with a wider range of content. On the other hand, it may also lead to a superficial approach to reading, where we prioritize quick consumption of information over deep understanding and critical thinking. Therefore, it is important to strike a balance between our online presence and the time we dedicate to reading and exploring different sources of knowledge. Social media is a window into who you are as a person, but it can also be a window into how you see yourself or how others see you. It's important to keep in mind the power of social media when posting information about yourself or your company, because there is always someone watching and judging what you do online. (Verma and Malviya 2010).

6. THE PANDEMIC EFFECT ON READING HABITS

At the end of every year, all of us across the world focus on welcoming the upcoming New Year through celebrations in various forms, including making New Year's resolutions and new plans. Unfortunately, the year 2020 had other plans for planet Earth, hence the outbreak of Pandemic COVID-19, which affected all of us across the world. We were not at all prepared for it and didn't know anything about it, which led to a chaotic environment. It affected all humans in all sectors of life, and to survive became the most important aspect, leaving everything else behind. The lockdown affected mental health and led to stress, anxiety, and depression. I am curiously waiting when all these will end!

All of us were restricted within the four walls of our apartments, anxiously trying to gain the latest information on the pandemic's effects by hooking up to the TV screen or mobile screen. A countrywide lockdown was announced by the Government of India with the closure of all sectors and the advice to maintain social distancing with no mass gatherings. The pandemic has given us some bad experiences, but also some good ones in the form of digitization. Digital education has become a priority for educators. There was a sudden shift in education from offline to online mode, which compelled all educators to be digitally literate. This led to a revolution not only in the education sector but in other sectors as well, like online grocery stores, eateries, etc. All basic needs were fulfilled slowly through online mode. Social platforms like Facebook, YouTube, Twitter, Instagram, and LinkedIn became common to all, which was not so common in developing countries. The digital literacy of educators opened up new opportunities for students to access quality education from anywhere in the world. Additionally, it highlighted the importance of bridging the digital divide and ensuring equal access to technology for all individuals, regardless of their socioeconomic background. The reading habit also got revolutionized, shifting from print to non-print versions. Podcast, storytelling. E-books, e-newspapers, etc. came to the rescue of all during lockdown.

The book reading trend is not something new. People have been reading books for centuries. But what is new is that the book reading trend has been increasing in recent years. The increase in the number of books being read and the reason behind it may be a result of our changing world. A world with more pandemics, and one that's constantly changing. (Adeymi 2021,163-65). One in five people read more books during pandemics due to the fear of being left out of society. They want to continue their lives as normal as possible, even if it means reading more books than usual or doing things they don't usually do when they are healthy and well-rested. The use of social media during COVID-19 can lead to an increase in the number of children who read books. It also has a positive impact on their reading habits and leads to better cognitive skills in the future. (Tanjung, Ridwan and Gultom 2017,153-55). One example of encouraging children to read:

The COVID-19 social media campaign is an initiative by the Egyptian State Library to encourage children to read books. The campaign encourages children to take a photo of their favorite book and share their reading photos on social media with the hashtag #Covid-19.

7. SURVEY

An online survey was conducted to understand the statement of the problem. The questionnaire consisted of 11 questions related to the topic. The survey form was circulated online through social links- WhatsApp groups and e-mail. Total of 76 responses were received. Maximum responses were of age group 18-19 (14.5%) *(Figure 1)*.

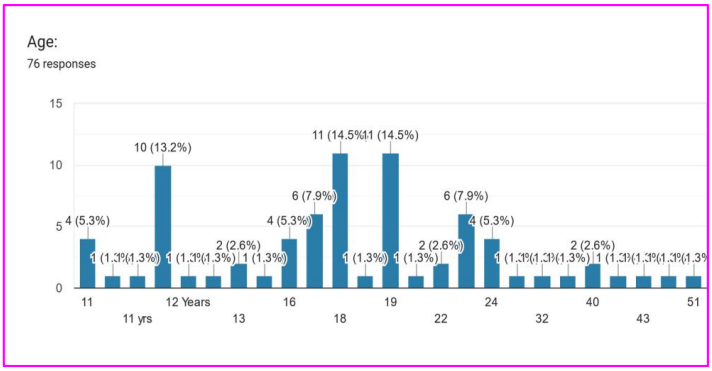

Figure 1

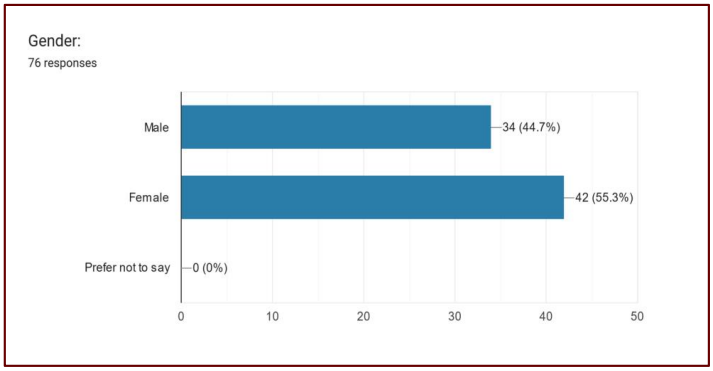

Figure 2

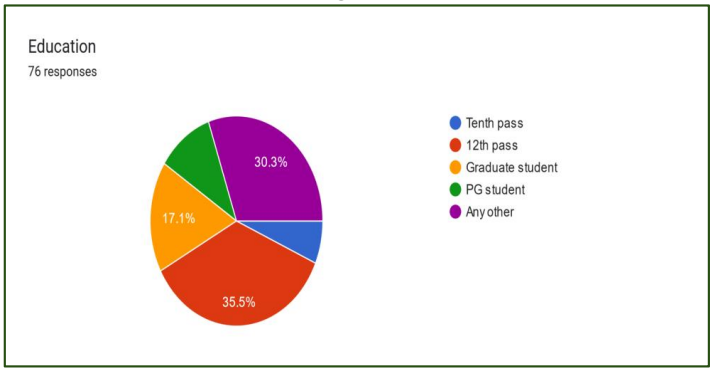

Figure 3

These Figure 2 and 3 shows the response of females (55.3%) was more than males(44.7%) and the 12th pass students responded more(35.5%) followed by 30.3% (any other) who didn't prefer to mention their education.

8. DATA ANALYSIS AND FINDINGS

YouTube had been the favorite social media usage(43.4%) followed by WhatsApp (28.9%).

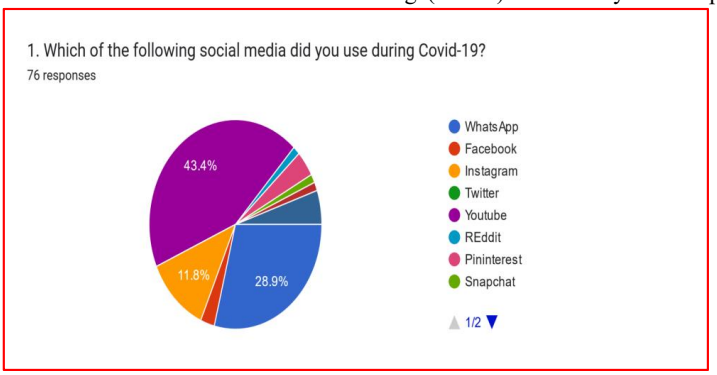

Figure 4

43.4% used social media as a favorite activity during covid-19 and 34.2% did something innovative followed by 32.9% watched the television.

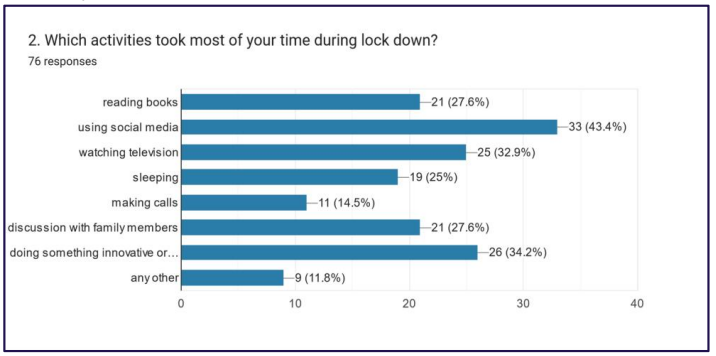

Figure 5

The use of mobile phones was recorded highly during this time(86.8%) as it is easy to handle, easily available and smartphones are having many new features which are required by students for their tasks to be completed.

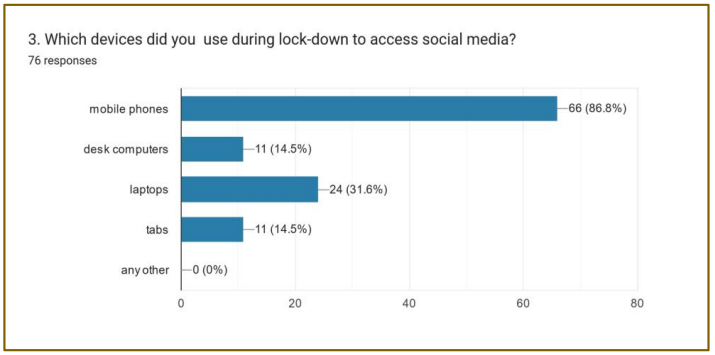

Figure 6

Social media was used daily by 82.9% of the responses and the main reason for using social media was for academic purposes (48.7%) followed by chatting with family and friends (23.7%).

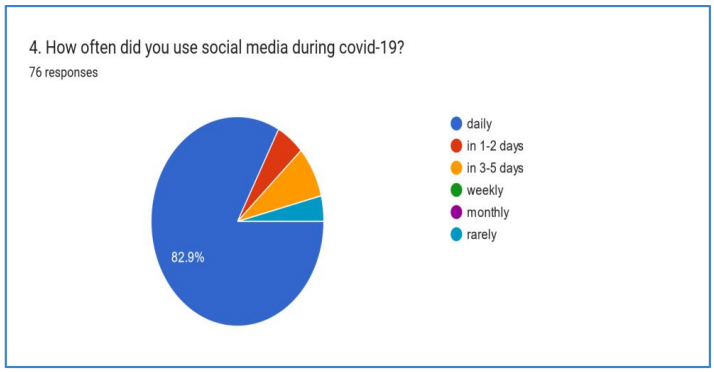

Figure 7

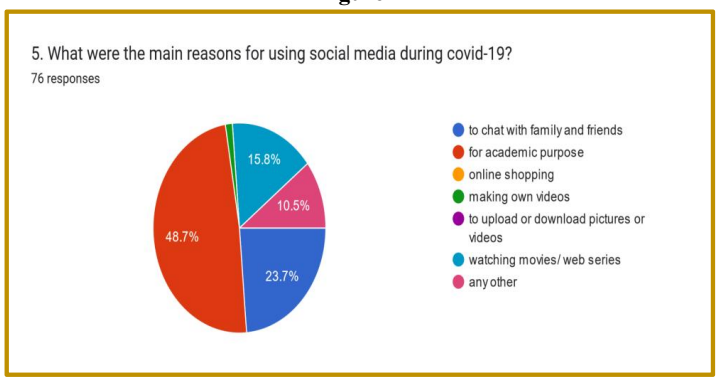

Figure 8

53.9% of students spent around two hours daily on reading and 31.6% spent about 3-4 hours daily on reading. 28.9% of respondents had read 1-2 books in a month and 26.3 % had mentioned that they had read 3-5 books in a month. Printed books were preferred by 25% for reading and 18.4% preferred e-books for reading. E-books were preferred (52.6%) as compared to printed books (47.4) as the reason maybe of the availability during covid-19. Books were mostly read to pass the examinations (28.9%); followed by 26.3% preferred books for academic knowledge. 26.3% strongly agree that social media had a negative impact on the reading habits during covid-19 and 36.8% agree with the above statement.

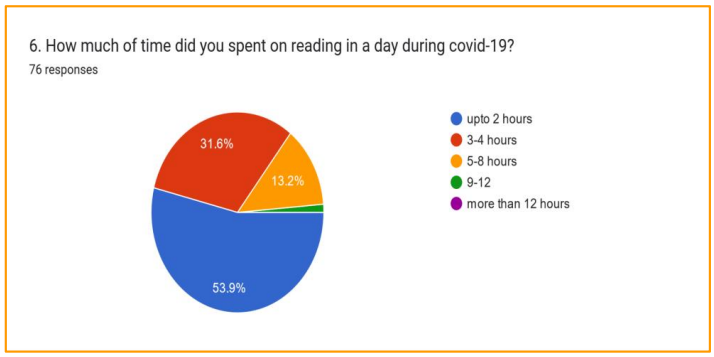

Figure 9

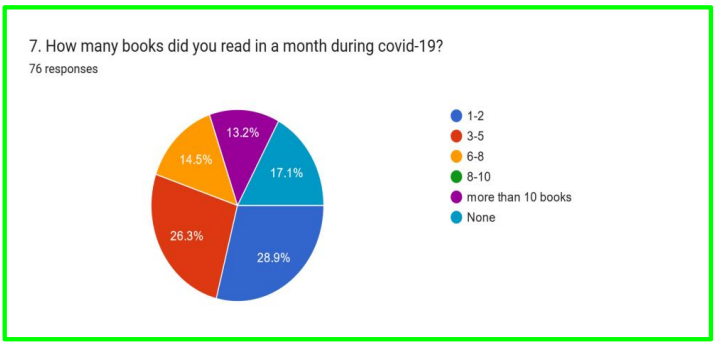

Figure 10

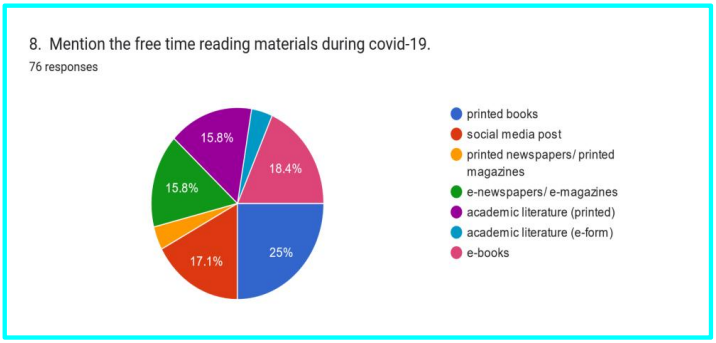

Figure 11

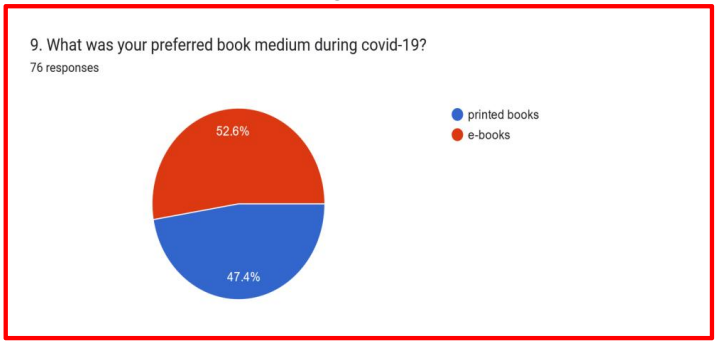

Figure 12

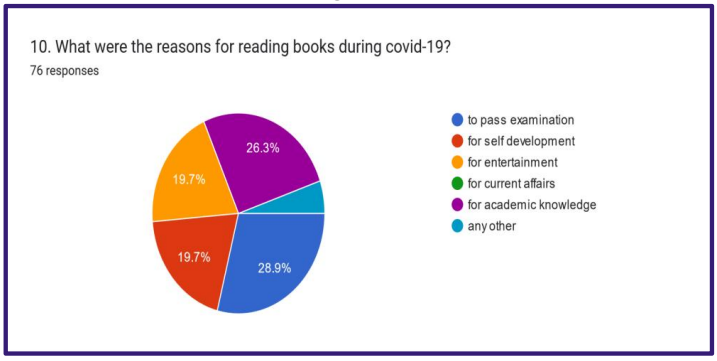

Figure 13

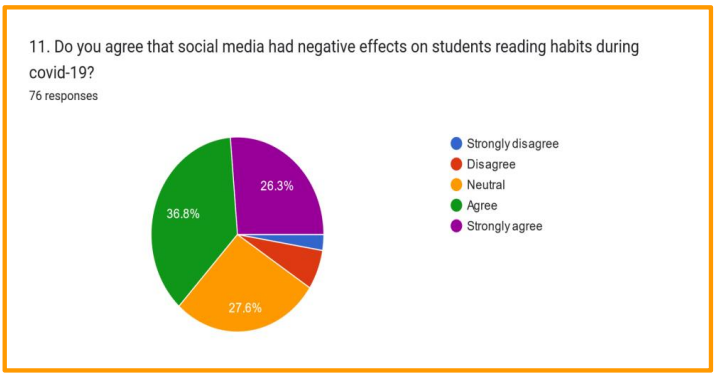

Figure 14

The survey shows mixed responses about social media and its impact on reading habits but it definitely has changed the way of thinking, learning, and our lifestyle. It had created an awareness storm making the use of digital resources now common.

9. DIGITAL READING

Digital reading has become increasingly popular among children, especially with the advancement of technology and the availability of e-books and online libraries. This form of reading not only provides convenience and accessibility, but it also allows children to explore a wide range of genres and topics from the comfort of their own devices. Additionally, digital reading often incorporates interactive elements such as animations and audio features, which can enhance a child's engagement and comprehension skills. Many online platforms are available, like Kindle, Nook, and Audible, which provide a wide range of books for children to read digitally. These platforms offer convenience and accessibility, allowing children to easily explore different genres and authors from the comfort of their own homes. Additionally, online reading can enhance a child's digital literacy skills and familiarity with technology, which are essential in today's digital age.

10. RECOMMENDATIONS

Reading habits are one of the most important aspects for success. Research has shown that children who develop a love for reading at a young age often excel academically and have better language skills. By utilizing online platforms, parents and educators can easily find recommendations tailored to a child's age, interests, and reading level, helping them discover new books that will captivate their imagination and foster a lifelong love for reading. Reading books and articles can help you learn new skills, stay current in your industry, and keep up with the latest trends. If you are not an avid reader, it’s time to start developing that habit. Developing a habit of reading can also enhance critical thinking abilities and improve overall cognitive function. Additionally, reading regularly can expand vocabulary and improve communication skills, making it easier to express ideas and articulate thoughts effectively. Below are some ways to get started reading more often:

- Read a book or article on your commute to work or school. This will eliminate any wasted time during your commute and give you something productive to do while you wait in line. Another way to incorporate reading into your daily routine is by setting aside dedicated time each day, such as before bed or during lunch breaks. Additionally, joining a book club or finding a reading buddy can provide accountability and make the experience more enjoyable.
- Keep a book or magazine in your car so that it is easy for you to read when waiting at the doctor’s office or sitting in traffic. You can also consider joining a book club or starting a reading

group with friends or colleagues who share similar interests. This will not only motivate you to read more but also provide opportunities for insightful discussions and exchanging recommendations. Additionally, make use of technology by downloading e-books or subscribing to online publications, allowing you to access a wide range of reading materials anytime, anywhere.

- Download a podcast app on your phone so that you can listen to audio versions of stories, etc. You can listen to podcasts on many different platforms, but an app is the easiest way to listen. There are a few different podcast apps that have their own strengths and weaknesses. Make sure you download a podcast app before you start listening to podcasts because it's easy to find one and more convenient than using something like iTunes or Spotify.
- Reading can be treated as a recreational activity, for our own entertainment, relaxation of the mind, and healing of the soul. (Gallik 1999,481-83). Similarly, listening to podcasts can also provide a similar form of relaxation and entertainment. With a wide range of topics and genres available, podcasts offer a unique way to engage with storytelling and expand our knowledge in an audio format. Whether you're commuting, exercising, or simply looking for a new form of entertainment, podcasts can be a great addition to your recreational activities.

11. CONCLUSION

The pandemic has definitely affected all of us around the world and in all ways, but humans develop new ways to survive. The digital era has been a boon, which has made all of us hi-tech, especially those who were not well aware of the facilities provided by Google and other sources. Reading habits have also been affected, but we can't say exactly whether they have increased or decreased during the pandemic as they are not measurable. It has shifted from print to non-print form, and today reading is done more in non-print form, like on the phone. Mobile phones have a great impact on the lives of humans, as they give us all the information required to sustain ourselves in daily life. It is one of the important life skills that not only enhances our knowledge but also helps to improve our social awareness, improve our decision-making skills, and teach us the moral and ethical values of life. (Jafre, Pour-Mohammadi and Jesmin 2011).

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Mapping the Landscape of Institutional Repositories Worldwide: Growth, Distribution, and Characteristics

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ABSTRACT

In recent years, Institutional Repositories (IRs) have become a popular model for scholarly publishing and communication, dissemination and preservation of information in the digital form. For these repositories to function properly, they must be sustainable, trusted, well-supported, and well-managed. The aim of this study is to examine the current status of Open Access Institutional Repositories (OAIRs) based on the data available on the Registry of Open Access Repositories (ROAR). This study presents the landscape of institutional repositories worldwide and covers various aspects of IRs, such as their growth and distribution across continents, historical trends, software options for creation and management, and the different types of repositories available. The study is based on data collected from the ROAR as of March 10, 2024 and the results reveal that a total of 4,808 repositories were registered in the ROAR globally. Europe leads with the highest number of repositories and the most popular software for creating and managing institutional repositories is DSpace. Additionally, it describes the collections available and presents some important observations related to institutional repositories.

Keywords: *Digital repositories, Institutional repositories, Digital archives, Registry of Open Access Repositories, Directory of Open Access Repositories*

1. INTRODUCTION

In today's digital world, researchers and academicians have a great opportunity to share their scholarly research output efficiently and conveniently through IRs. An institutional repository is a type of digital repository specifically created and managed by academic institutions. The content in an institutional repository typically consists of scholarly output produced by members of the institution, including research articles, theses, dissertations, conference papers, reports, and other materials. Institutional repositories are digital archives that store a wide range of scholarly works and intellectual outputs produced by universities or research institutions. These repositories serve different purposes, with some dedicated to educational resources for teaching and learning, while others focus on preserving and disseminating research findings, publications, data sets, and other academic materials created by the institution's scholarly community.

2. DIRECTORY OF OPEN ACCESS REPOSITORIES (DOAR)

Open-access repositories are essential in meeting the information needs of a vast community, particularly for users and researchers in developing countries. These repositories have become increasingly popular in various institutions, including libraries, government offices, information centers and industrial organizations. “Open access repository can be defined as an online database available without any access restrictions and that makes the full text of resources it contains freely and immediately” (Pinfield, 2005).

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OpenDOAR is a global Directory of Open Access Repositories that was launched in 2005 as a collaborative project between the University of Nottingham and Lund University. It was funded by OSI, Jisc, SPARC Europe, and Consortium of Research Libraries (CURL). The service hosts repositories that provide free, open access to academic resources and outputs, and each repository record within OpenDOAR has been carefully reviewed and processed by a member of the editorial team. OpenDOAR is maintained by SHERPA, and currently, it covers 5898 repositories (https://v2.sherpa.ac.uk/opendoar/).

3. REGISTRY OF OPEN ACCESS REPOSITORIES (ROAR)

ROAR is a parallel project to OpenDOAR and is based at Southampton University in the UK. It is a part of the EPrints.org network and aims to promote open access to research literature before and after peer review through author self-archiving in institutional EPrint archives. The main objective of ROAR is to maximize research impact and productivity by providing open access to research. Currently 4808 repositories are covered by ROAR (https://roar.eprints.org/).

4. BACKGROUND OF THE STUDY

Sarmah and Bhattacharjee examined the knowledge sharing practices of online institutional repositories in Indian research institutions, finding that 38 institutions have created web-based repositories for sharing their institutional knowledge. The study also reveals that the online repository of the Indian Academy of Sciences: Publications of Fellows is the largest in terms of size among the 38 repositories surveyed. Roy, Biswas, and Mukhopadhyay (2016) conducted a study to analyze the current state of Open Access Repositories (OARs) in the field of agriculture in Asian countries. The study examines the features of these repositories in terms of their types, contents, disciplines, languages covered, technical and operational issues, and policy matters. They compared and evaluated repositories against selected parameters and recommended that most IDRs are still in the pipeline or pilot stages of policy formulation, despite some institutions having well-designed, structured, and instructive policy documentation for the growth of agricultural repositories worldwide. Das and Singh (2017) focused on the current status of Chinese open access institutional repositories. The study aims to assess the current state of open-access institutional repositories in China by examining four key factors: the number of repositories, their types, subjects, contents, and software used. To achieve this objective, the researchers identified open-access institutional repositories in China by searching the Open DOAR database and the Chinese Academy of Sciences (CAS) being the major contributor (64.10%) to these repositories. DSpace is the most commonly used software (89.74%), and the majority of the content is in Chinese-English (61.54%) language.

Parabhoi and Dey (2019) analyzed the status of open access repositories in India and China, with a focus on institutional repositories. The study found that India has 79 repositories and China has 40 repositories registered in the OpenDOAR, with the majority being institutional repositories. The study also identifies the types of content available in these repositories, with journal articles being the most common. The study conducted by Elahi, Begum, and Munshi (2021) compares the open access repositories in Bangladesh and India, finding that India has a significantly higher number of repositories compared to Bangladesh. The repositories in India are more diverse in terms of content language, software used, and nature of content type and subject.Mahesh and Kumar (2022) conducted a study on the current status of Indian Open Access Institutional Repositories (OAIRs), using data from the Registry of Open Access Repositories (ROAR). The study revealed that there are only 60 functional repositories in India. Most of these repositories contain records of up to ten thousand, and DSpace is the most popular software used for setting up OAIRs in India.

While existing literature extensively explores the status and comparative analysis of open-access repositories worldwide, there is a lack of research on the present state of the Registry of Open

Access Repositories (ROAR) globally. Therefore, this study aims to provide a detailed analysis of the current state of the ROAR worldwide.

5. OBJECTIVES OF THE STUDY

The present study is conducted with the following objectives:

i) To explore the expansion and distribution of institutional repositories across different continents worldwide.
ii) To determine the growth rate of institutional repositories globally in the past ten years.
iii) To know the various software options that are available for creating and managing institutional repositories.
iv) To classify the types of repositories available and determine their respective numbers.

6. SCOPE OF THE STUDY

Since the aim of this study is to examine the current status of Open Access Institutional Repositories (OAIRs) based on the data available on the Registry of Open Access Repositories (ROAR), so it covers only the open-access repositories which are registered in ROAR.

7. METHODOLOGY USED

The data for the present study was collected from Registry of Open Access Repositories ROAR website (https://roar.eprints.org/) up to 10 March 2024. The necessary data about these open access repositories was compiled in MS Excel and presented in tabular and chart forms, depending on the objective of the study.

8. DATA ANALYSIS AND DISCUSSION

Table 1: Distribution of Institutional Repositories worldwide under ROAR

Continent Name	No. of IRs	Percentage (%)	Ranking
Africa	187	3.89	5
Asia	1071	22.89	2
Europe	1748	36.34	1
North America	1044	21.72	3
Oceania	100	2.08	6
South America	658	13.68	4
Total	4808	100	-

The data presented in Table 1 reveals a comprehensive overview of the distribution of institutional repositories across continents worldwide, as well as their respective rankings. The total number of institutional repositories worldwide is 4,808. Europe emerges as the leading continent in terms of the number with 1,748 (36.34%) repositories and securing the top rank. Following closely, Asia stands as the second-ranked continent with 1,071 (22.89%) repositories, while North America takes the third spot with 1,044 (21.72%) repositories. The number of repositories for South America, Africa and Oceania are lesser as compared to other continents. South America and Africa have 658 (13.68%) and 187(3.89%) repositories respectively, occupying the fourth and fifth ranks. Oceania, with a modest count of 100 (2.08%) repositories, brings up the rear as the sixth-ranked continent.

Table 2: Ten-year growth of IR worldwide under ROAR

Year	No. of IRs	Percentage (%)
2013	237	9.90
2014	390	16.27
2015	234	9.76

2016	264	11.01
2017	231	9.64
2018	148	6.18
2019	325	13.57
2020	236	9.86
2021	148	6.18
2022	111	4.6
2023	72	3.00
Total	2396	100

The analysis of data tabulated in Table 2 highlights the growth of institutional repositories worldwide, as tracked by the Registry of Open Access Repositories (ROAR), which has seen fluctuations over the past decade. The total number of repositories over the decade sums up to 2396. Beginning in 2013 with 237 (9.90%) repositories, the numbers surged in 2014 to 390 (16.27%) before experiencing a slight decline in 2015 to 234 (9.64%). However, the upward trend resumed in 2016 with 264 (11.01%) repositories and peaked in 2019 at 325 (13.57%). Subsequently, there was a notable decrease in 2020 to 236 (9.86%) repositories, followed by further declines in 2021 and 2022 to 148 (6.18%) and 111 (4.6%) repositories, respectively. This fluctuation may be indicative of various factors such as changes in institutional priorities, funding availability, or shifts in scholarly communication practices and due to COVID-19 pandemic.

Table 3: Software used for creating and managing repositories

Repository Software	No. of IRs	Percentage (%)
DSpace	2418	50.29
EPrints	741	15.41
Bepress	517	10.76
OPUS (Open Publications System)	98	2.04
Fedora	68	1.41
Open Journal System	48	1.00
ETD-db	30	0.62
CDS Invenio	29	0.6
HAL	27	0.56
DiVA	26	0.54
Other software	806	16.77
Total	4808	100

Table 3 reveals that there are various software options available for creating and managing institutional repositories. The most popular one is DSpace with 2416 (50.29%) installations, followed by EPrints with 741 (15.41%), and Bepress with 517 (10.76%). Other notable options include OPUS with 98 (2.04%) installations, Fedora with 68 (1.41%), and Open Journal System with 48 (1%). Less popular choices include ETD-db with 30 (0.62%) installations, CDS Invenio with 29 (0.6%), HAL with 27 (0.56%), and DiVA with 26 (0.54). In addition, there are various other software options (ARNO, DigiTool, DoKS, i-Tor, SciX, Zentity etc.) which collectively contribute to 806 (16.77%) installations.

Table 4: Types of repositories

Type of Repository	No. of IRs	Percentage (%)
Research Institutional or Departmental	3941	70.84
Research Multi-institution Repository	152	2.73
Research Multi-institution Repository	300	5.39
Research Multi-institution Repository	128	2.30
e-Theses	361	6.49

Database/A&I Index	74	1.33
Research Data	55	0.99
Open and Linked Data	43	0.77
Learning and Teaching Objects	78	1.40
Demonstration	20	0.36
Web Observatory	2	0.04
Other	408	7.34

Table 4 shows the different types of repositories available, and their numbers Research Institutional or Departmental are 3941(70.84%). Research Multi-institution Repository, there are 152(2.73%) whereas, the number of Research Multi-institution Repository is 300 (5.39%). 128(2.30%) e-journals/publications, 361 (6.49%) e-theses, 74(1.33%) Database/A&I indexes, 55 (0.99%) Research data, 43(0.77%) Open and linked data, 78(1.40%) Learning and teaching objects, 20 (0.36%) Demonstrations, 2(0.04%) web observatories, and other types of repositories, 408 (7.34%), cover a wide range of specialized platforms catering to specific needs and purposes within the academic and research community.

9. FINDINGS OF THE STUDY

The study provided insights into the growth, distribution, and characteristics of institutional repositories worldwide. Following are the significant findings of the study:

- Europe leads with the highest number of repositories (36.34%), followed by Asia (22.89%) and North America (21.72%).
- Examining the ten-year growth trend, fluctuations in the numbers of IRs are observed. Despite recent declines in 2021 and 2022, the decade's total growth sums up to 2,396 repositories, emphasizing the continued importance of IRs in facilitating open access to scholarly works.
- In terms of repository software, DSpace emerges as the most popular choice, followed by EPrints and Bepress. These platforms, along with others like OPUS and Fedora, offer robust solutions for managing digital collections and supporting open access initiatives.
- The classification of repositories by types highlights the diverse purposes they serve, including research dissemination, data management, publication hosting, and educational resource sharing. From institutional and multi-institutional repositories to specialized platforms for e-journals, e-theses, and learning objects, the ecosystem of IRs is broad and supports various aspects of scholarly communication and knowledge dissemination.

10. CONCLUSION

Institutional Repositories in recent years have become a popular model for scholarly publishing and communication, dissemination, and preservation of information in the digital form. The data collected and its analysis in the present study contributes to understanding the pivotal role of IRs in facilitating access to scholarly resources, preserving institutional knowledge, and fostering scholarly collaboration within academic communities. These insights underscore the significance of IRs in advancing open access initiatives, promoting knowledge dissemination, and enriching scholarly discourse globally.

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Electronic Resource in Medicine Consortium (NML-ERMED): A Collaborative Initiative for Effective Use of e-Resources in Medical Libraries

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ABSTRACT

Information and Communication Technology (ICT) has improved Library services and provided easy access to e-resources to users. Due to information explosion, the increasing cost of information resources, changing demands of users and most importantly inadequate Library budget force the Libraries to share their resources with each other's. Thus Library Consortium came into existence to subscribe and to share e-resources for the users. Consortia is a kind of cooperation among Libraries in which Libraries who have same goal and objectives, comes together to share their e-resources. Due to limited budget and rising the cost of e-resources Library Consortia is the alternative option to tide over the financial constraints. There are many Library Consortiums, like FORSA, e-ShodhSindhu, CeRA, CSIR Consotium, DELCON, ERMED, TIFR Consortium etc., available in different subjects. This paper focuses to elaborate about the ERMED consortium which is initiated by The Directorate General of Health Services (De. GHS), Ministry of Health and Family Welfare to provide e-resources to Medical Libraries, Government Medical Colleges, AIIMS and ICMR institutes in India. This paper aims to explore the objectives and benefits of ERMED consortium, publisher-wise e-journals and subject-wise e-journals covered under ERMED Consortium are studied in this paper. We also studied publisher-wise Highest Impact Factor Journals, indexed and Non-Indexed journals subscribed under ERMED Consortium. The benefits of the ERMED consortium are described in detail.

Keywords: *ERMED Consortium, National Medical Library, e-Resources, Medical Libraries, India*

1. INTRODUCTION

Libraries have been cooperating and collaborating on Library resources and services with each other for many years to fulfill the information needs of users. Initially, the concept of Library cooperation was started with the sharing of bibliographic data among Libraries. These exchanged and combined bibliographic data were called the Union Catalogue. Based on the exchange of bibliographic data, Libraries started to lend Library resources called Inter-Library Loan. Another similar concept developed was the Document Delivery Service which gives the facility to supply original documents, or their copies in print and another form on the request of users. Over time, a group of Libraries came together in a definite agreement to supply the information needs of the users and came to be known as Library Network. There are many Library networks like CALIBNET, DELNET, INFLIBNET, MANLIBNET etc. With the development of Information and Communication Technology, Libraries started to coordinate activities for the subscription of e-resources due to the increase in information resources and the crisis of Library budget which is called Library consortium. Library consortium plays an important role for sharing of electronic resources. It is an association of two or more individuals, organizations and governments to pool electronic resources to achieve a common goal (Mamta, 2023). The primary goal of the Consortium is to control and reduce the information cost, to improve resource sharing, to develop a network information environment and to share licensing issues with each other (Allen & Hirshon, 1998).

In recent, many Library consortia has been functioning well for providing and sharing e-resources in India like FORSA in Astronomy and Astrophysics, CeRA in Agriculture, ERMED in Medical Science, e-Shodh Sindhu for IITs, IIMs and Universities, DeLCON for science and technology, ICICI Knowledge Park for Banking, UDL consortia for IIITs, TIFR Consortium for

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Fundamental Research, HELINET for Health Science, UGC DAE Consortium for Atomic Energy etc. The consortium has benefits for time efficiency in access, cost-efficiency, consistency, durability, multi-user access and authorization etc.

There are many consortiums, has established to provide e-resources in medical science like HELINET Consortium, medIND, ERMED etc. HELINET consortium is the first consortium in Health science in India with the objective, networking of medical Libraries for resource sharing and e-journal consortium in medical academic institutes started by Rajiv Gandhi University of Health Science in Karnataka in 2002 (Rajiv Gandhi University of Health Sciences, 2024). Electronic Resources in Medicine (ERMED) is an important consortium, providing e-resources in medical science to all state and national medical colleges, AIIMS and ICMR institutes since 2008 (Kalika, 2015).

2. OBJECTIVES

The objective of this study is:

i) To understand the EDMED consortium working to provide the e-resources in Medical Science.
ii) To review the e-resources on subject-wise and publisher-wise subscribed under the ERMED consortium.
iii) To evaluate the publisher-wise Highest Impact Factor Journals.
iv) To study the e-journals based on Indexed and Non-Indexed journals covered under the ERMED Consortium.
v) To describe the benefits of ERMED consortium for medical Libraries.

3. METHODOLOGY

This is a review paper. ERMED consortium which is providing e-resources to medical Libraries free of cost is studied in this paper. All the data is collected from the NML-ERMED website to review this consortium and study it based on various parameters. E-journals based on Indexed and Non-indexed journals in Web of Science is studied in this paper. Web of Science database is used to know the impact factor of journals and indexing in that database.

4. ELECTRONIC RESOURCES IN MEDICINE CONSORTIUM (NML-ERMED)

The Directorate General of Health Services (Dte.GHS), Ministry of Health and Family Welfare initiated the NML-ERMED Consortium in 2008 to provide nationwide medical electronic information resources for the purpose to provide high-quality healthcare in India. AIIMS and other National and State funded medical institutes are the members to get benefit from this consortium. It was started to provide e-resources to the Indian Council of Medical Research (28 Institutes), the Directorate General of Health Services (10 Institutes) and AIIMS, New Delhi. At present approximately 74 medical colleges and 6 AIIMS are members of its consortium (NML-ERMED Consortium, 2024).

Table 1

S.N.	Particulars	Explanation
1.	Funded by	MOHFW, New Delhi
2.	Headquarter	National Medical Library (NML)
3.	Year	2008
4.	Resources	eJournals and ebooks
5.	Subject	Medical Journals
6.	Managing Director	Dir. (Prof.) Dr. B. Srinivas, Director, NML
7.	Members	AIIMS & National and State medical Colleges, ICMR Institutes
8.	Fees from Member Institutes	No
9.	Publishers included	Five Publishers are included: • British Medical Journal Publishing • Cambridge University Press • Lippincott Williams & Wilkins • Oxford University Press • John Wiley

10.	Journals included	235+ Journals
11.	Journal Coverage	Current and Archives of ejournals
12.	Access of ejournals	IP Basis & Customer ID

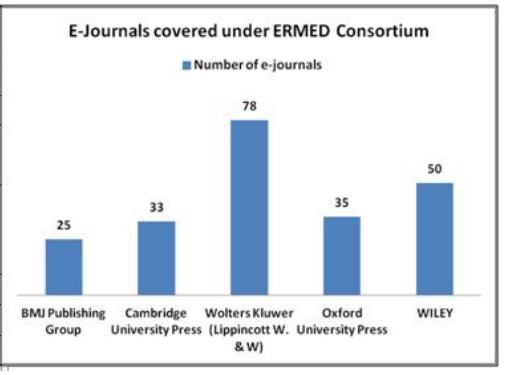
Current issues and back issues of e-journals are subscribed under the ERMED consortium. Apart from e-journals, approximately 193 e-books are also added. The link of e-books is given on the ERMED website. National Medical Library organizes training to all member institutes every year to provide awareness to the users about the access of information. The link of the previously organized training is provided on the ERMED website.

5. E-JOURNALS COVERED UNDER ERMED CONSORTIUM

The main objective of the consortium is to subscribe and provide e-resources to the member Libraries. The first and main step for any consortium is a selection of e-journals. The utilization of e-journals is completely depends on the selection of the right journals according to the demand of users. The list of e-journals may vary from time to time. At present ERMED consortium covers approximately 221 journals from five reputed publishers for the year 2023. A detail of subscribed e-journals from five publishers are given in Table 2 below:

Table 2: E-Journals covered under ERMED Consortium

S.N.	Name of the Publishers	No. of e-journals Covered
1.	BMJ Publishing Group	25
2.	Cambridge University Press	33
3.	Wolters Kluwer (Ovid Platform) Lippincott W. & W	78
4.	Oxford University Press	35
5.	WILEY	50
	Total	**221**



6. SUBJECT-WISE E-JOURNALS COVERED UNDER ERMED CONSORTIUM

ERMED consortium provides e-journals in medical science to all government and state medical institutes, research institutes. Based on list of journals available on the ERMED website, we found the following subject-wise list of e-journals as given below in Table 3. Most of the e-journals are subscribed sequentially in Medicine, Neurology, Public Health, Clinical study, Cardiovascular, Pediatrics and Psychiatrics etc.

Table 3: Subject-wise e-journals subscribed under ERMED Consortium

S.N.	Name Of The Subjects	Total Numbers of Journals
1.	Medicine	23
2.	Neurology	20
3.	Public Health	15
4.	Clinical	12
5.	Cardiovascular, Pediatrics, Psychiatrics	11
6.	Gynecology, Surgery	8
7.	Anesthesiology, Ophthalmology	7
8.	Gastroenterology, Pathology	6
9.	Epidemiology, Hepatology, Nutrition	5
10.	Cancer, Immunology, Orthopedic, Rheumatology	4

7. PUBLISHER-WISE HIGHEST IMPACT FACTOR JOURNALS SUBSCRIBED UNDER ERMED CONSORTIUM

Table 4 demonstrates the publisher-wise highest Impact Factor journals subscribed under the ERMED consortium. In the paper, we found that British Medical Journal published by BMJ Publishing Griup has the highest impact factor journal followed by European Heart Journal by Oxford University Press and many more.

Table 4: Publisher-wise Highest Impact Factor Journals

S.N.	Name of the Publishers	Name of the Highest Impact Factor Journal	Highest Impact Factor
1.	BMJ Publishing Group	British Medical Journal - International Edn	105.7
2.	Cambridge University Press	Behavioral and Brain Sciences	29.3
3.	Wolters Kluwer	Circulation	37.8
4.	Oxford University Press	European Heart Journal	39.3
5.	Wiley	Periodontology 2000	18.6

8. E-JOURNALS BASED ON INDEXED AND NON-INDEXED JOURNALS

In this paper we studied about the indexed and non-indexed journals based Web of Science database. Web of Science database is used to find the e-journals indexed or not indexed in that database. Based on that Table 5 shows the following result:

Table 5: Based on Indexed and Non-Indexed Journals

S.N.	Name of the Publishers	Total Number of Subscribed Journals	Indexed Journals	Non-Indexed Journals
1.	BMJ Publishing Group	25	24	1
2.	Cambridge University Press	33	32	1
3.	Wolters Kluwer	78	77	1
4.	Oxford University Press	35	35	-
5.	Wiley	50	50	-
	Total	**221**	218 (98%)	3 (2%)

9. BENEFITS OF ELECTRONIC RESOURCES IN MEDICINE CONSORTIUM (NML-ERMED):

- ERMED consortium is a hub of research information that provides comprehensive and updated knowledge. It helps the researchers to avoid duplication in their research work.
- With the increasing trend of Information and communication technology, user's demands are changing to access the information resources. Access of E-resources helps the users to get the information online.
- ERMED consortium helps the medical Libraries to solve the financial crisis for the subscription of resources to the users.
- Member institutes can access medical e-resources online at any time through an IP address and remote access.
- High Impact Factor journals from reputed publishers are covered.
- It helps to enhance and enrich the Library collection and the quality of Library Services.
- It saves the time and money of member institutes (Singh & Rao, 2008).
- There are no restrictions for downloading articles by the users at anytime from anywhere (Saini, 2017).
- Due to the information explosion, it is not possible to subscribe all e-resources by the Libraries. Consortium helps the Libraries to access a maximum number to e-resources free of cost.
- ERMED consortium assists the member Libraries if facing the access issues of e-resources.
- It helps to achieve Library goals as well as institute goals by fulfilling information needs of the users.
- ERMED subscribed quality journals with impact factors from reputed publishers which helps the researchers to get quality of research in their work (Gaur & Tripathi, 2012).
- Consortium functions on collective partnership of resources sharing which helps to build better communication and networks among different Libraries.
- Consortium is a cooperative task to reduce the cost of purchase of e-resources.

10. SUGGESTIONS

There are some suggestions are given below:

- ERMED should cover private medical colleges, private research institutes, colleges, universities to be member of this consortium, so that maximum users can benefited to the consortium.
- ERMED consortium included approximately 221 highest impact factor journals from reputed publishers but need to include more journal titles publishing in medical science.
- If the number of downloading of articles and access of e-journals are less used, NML cancel the membership. NML promote the use of e-resources rather than cancel the membership.
- Remote access through Login Id and password should also be provided for medical users.
- NML should provide the zone wise training to create awareness about the access of journals.

11. CONCLUSION

ERMED Consortium is an initiative to provide nationwide medical electronic information resources for the purpose to provide high-quality healthcare in India. It provides free access to e-resources to its member institutes; it includes high impacted medical journals from reputed publishers. In this paper, we study the publisher-wise e-journals covered under the ERMED Consortium and observe that Lippincott W & W has the highest number of journals with 78 titles subscribed under the ERMED consortium. This consortium is subscribing to most of the journals on medicine, neurology, public health, clinical study based journals, cardiovascular, pediatrics, psychiatrics, gynecology and surgery etc. Publisher-wise Highest Impact Factor Journals are studied in this paper and found that the British Medical Journal published by BMJ Publishing Group has highest Impact Factor. Approximately 98 percent of journals are indexed journals and indexed in the Web of Science database. Thus ERMED Consortium is playing a significant role among medical institutes in providing quality e-resources to the users and has proven that it's the only solution to progress and strengthen the sustainability of Libraries in the future.

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Utilization of Digital Resources and Awareness among Research Scholars at the University of Delhi, New Delhi: A Survey

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ABSTRACT

Documents have been produced in digital form for a very long time now. The exponential growth of digital documentation has changed people's perceptions about these over the years. Academic libraries have always strived to provide their patrons with the best possible resources, and the advent of the digital age has further accelerated this trend. An effort has been made to study the levels of satisfaction experienced by research academics in relation to these resources. This study encompasses the digital resources and services that are currently available at the University of Delhi in Delhi. Libraries may assist their patrons in making the most of these digital resources by showcasing them in a variety of way.

Keywords: *Digital Library, awareness, academic libraries, research*

1. INTRODUCTION

Documents have been produced in digital form for a very long time now. The exponential growth of digital documentation has changed people's perception about these over the years. Digital resources are becoming increasingly common, not only due to their numbers, but also because they can be accessed easily (Papy, 2008). The transition from an analog to digital environment can be considered as a cultural revolution since the physical aspect of objects is changing. Usage and demands of digital resources are also increasing whether it is used for research work or for study.

From the time they were first established, libraries' functions have evolved over time. Academic libraries have always strived to provide their patrons with the best possible resources, and the advent of the digital age has further accelerated this trend. University libraries, in particular, are making an effort to monitor and respond to developments in their field so that they can provide superior service to their patrons, who include students, faculty, and the general public.

2. UNIVERSITY OF DELHI

The University of Delhi is a premier university of the country with a venerable legacy and international acclaim for highest academic standards, diverse educational programmes, distinguished faculty, illustrious alumni, varied co-curricular activities and modern infrastructure. Over the many years of its existence, the University has sustained the highest global standards and best practices in higher education. Its long-term commitment to nation building and unflinching adherence to universal human values are reflected in its motto: 'Nishtha Dhriti Satyam' 'निष्ठा धृति सत्यम्' (Dedication, Steadfastness and Truth).

Established in 1922 as a unitary, teaching and residential University by the Act of the then Central Legislative Assembly, a strong commitment to excellence in teaching, research and social outreach has made the University a role-model and trend setter for other universities. The President of India is the Visitor, the Vice-President is the Chancellor and the Chief Justice of the Supreme Court of India is the Pro-Chancellor of the University. Beginning with three colleges and 750 students, it has grown as one of the largest universities in India with 16 faculties, over 80 academic departments, an equal number of colleges and over seven lakh students. Over 500 programmes offered by the University are approved by Academic and Executive Councils, out of which 209 programmes are being considered for NAAC accreditation purpose. The rest being run in colleges are separately accredited.

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Drawing students and faculty from across India and abroad, the University has emerged as a symbol of excellence, integrity and openness of mansa (thought), vaacha (speech) and karmana (action). A Multidisciplinary and Multilingual Peer-Reviewed Research Journal publishes original contributions in the field of Arts and Humanities. It also incorporates research reports and includes reviews of important Indian and foreign publications. Special issues on various aspects of Library, Philosophy, Linguistics, Sanskrit, GRS, Hindi Literature, Buddhism, are also published from time to time. It is published half-yearly in June and December every year. WE, is the academic endeavour of the faculties and research scholars of the Faculty of Arts, University of Delhi intend to propagate, promote and disseminate research, innovation and latest trends in the field of Arabic, Buddhist Studies, English, Germanic & Romance Studies, Hindi, Library & Information Science, Linguistics, Modern Indian Language & Literary Studies, Persian, Philosophy, Psychology, Punjabi, Sanskrit, Urdu and Slavonic & Finno-Ugrian Studies. The editors invite scholarly research articles and review studies related to the above-mentioned disciplines of knowledge.

3. OBJECTIVES OF THE STUDY

This study tries to investigate the awareness and use of digital resources as well as the satisfaction levels of research scholars from University of Delhi. As per its aim, the study intends to fulfill the following objectives:

i) To discover the importance of digital resources for research scholars.
ii) To assess the awareness and usage frequency of different types of digital resources among research scholars.
iii) To find out the purposes for using digital resources.
iv) To discover problems faced by the research scholars while accessing the digital resources.
v) To know the adequacy of information in digital resources.
vi) To suggest suitable suggestions to improve the digital resources and services for Research scholars

4. SCOPE AND LIMITATION

The purpose of this study is to investigate and analyse the utilisation of digital resources by research scholars working in a variety of fields at University of Delhi. An effort has been made to study the degrees of satisfaction experienced by research academics in relation to these. It includes the digital resources and services that are now available at the University of Delhi in Delhi.

5. LITERATURE REVIEW

The reviewed literature examines the utilization of electronic resources within academic settings, shedding light on various aspects of access, awareness, and usage patterns. Sudhier and Seethalekshmi (2011) explored e-resource usage among students and research scholars at the University of Kerala's Faculty of Arts, revealing a significant reliance on the internet for educational purposes. Thanuskodi and Ravi (2011) delved into the digital resource utilization by faculty and research scholars at Manonmaniam Sundaranar University, emphasizing the importance of library professionals' familiarity with relevant digital resources. Mahalakshmi (2014) evaluated central library usage in Chennai's higher education institutions, identifying faculty members' superior awareness of internet usage for research compared to students and highlighting challenges in accessing e-resources. Khan (2016) investigated the awareness and usage of digital resources at IIT Delhi library, highlighting research scholars' positive attitude toward utilizing e-resources and advocating for improved access facilities. Sivakami and Rajendran (2019) analyzed the awareness, access, and usage of e-resources among faculty members in Arts and Science Colleges in Erode District, emphasizing the significant awareness among respondents and their utilization of e-resources for educational purposes.

Ismael et al. (2021) examined the usage of digital educational resources during the COVID-19 pandemic, revealing a significant increase in overall usage, albeit with variations by resource type and region. Similarly, Veer and Panda (2021) investigated the usage statistics of e-resources during the pandemic, focusing specifically on Chandigarh University Library, highlighting the efficient utilization of available resources by students and faculty members.Puneeth (2021) explored the familiarity and usage of electronic resources among users of GKVK University of Agricultural

Sciences, Bangalore, revealing high usage rates and identified challenges such as irrelevant content and network issues. In contrast, Raju et al. (2021) studied the usage of e-resources by faculty members and students of S.R.K.R. Engineering College Central Library, Bhimavaram, emphasizing the positive impact of e-resources on teaching, learning, and research. Rekhraj and Brajesh (2022) investigated the motivation and satisfaction levels of undergraduate students at Indira Gandhi Krishi Vishwavidyalaya, Raipur, highlighting students' reliance on e-resources for coursework and leisure learning, as well as their satisfaction with resource availability and usability. Lastly, Veer et al. (2022) examined the awareness, use, satisfaction, and challenges regarding library resources at Dronacharya College of Engineering, with perspectives from both teachers and students. Their findings underscored the need for updated collections, expanded internet access, and awareness campaigns to enhance user satisfaction and effective resource utilization.

Collectively, these studies underscore the importance of electronic resources in academic settings, while also highlighting challenges such as content relevance, network issues, and the need for continuous updates and awareness campaigns to maximize user satisfaction and resource effectiveness.

6. METHODOLOGY

A questionnaire consisting of awareness, use, problems etc., has been designed and administered to collect data. The study comprised the research scholars of the various disciplines of University of Delhi. Altogether there are around 1500 research scholars in various departments, faculties, libraries and centres. Out of this, a sample of 150 research scholars was taken randomly. 150 questionnaires were distributed (offline and online) and tried to collect them during the period of 30 days (i.e. from 01.05.2023 to 01.06.2023). About 132 filled questionnaires were returned; out of which, 12 questionnaires were rejected from the ultimate sample as they were not properly filled. The total samples taken from 120 research scholars responded fairly. The analysis of the data obtained through the questionnaires provided an in-depth interpretation for fulfilling the objectives.

7. ANALYSIS

The analysis was done under two categories i.e. user profile and digital library resources services.

7.1. User Profile

In this category the gender and discipline of the research scholars were analysed. Figure 1 shows the gender of research scholar. In it 62.5% were male and 37.5% were female. The distribution of research scholars according to their gender is shown in Figure 1.

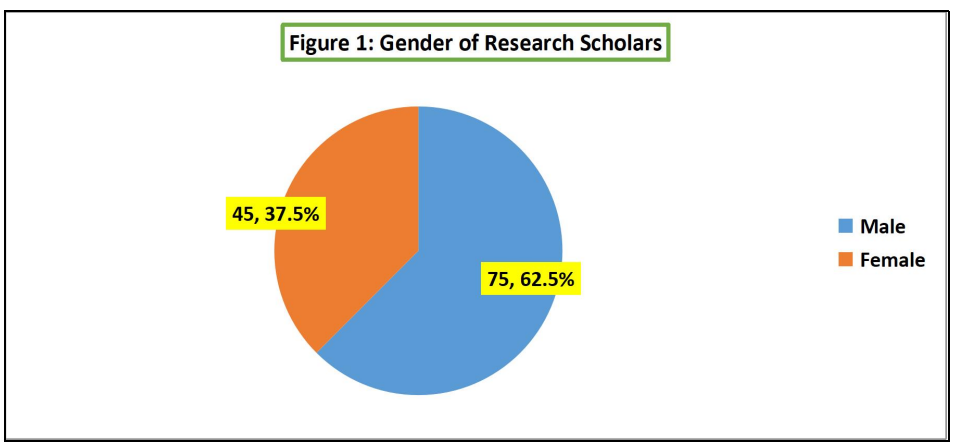

Figure 1: Represents information about the gender of research scholars in this study

7.2. Discipline of Research Scholars

The disciplines of research scholars were analysed. 30% scholars were from science stream, 6% from commerce, 32% from social science and 33% from humanities and languages. Figure 2 indicates this.

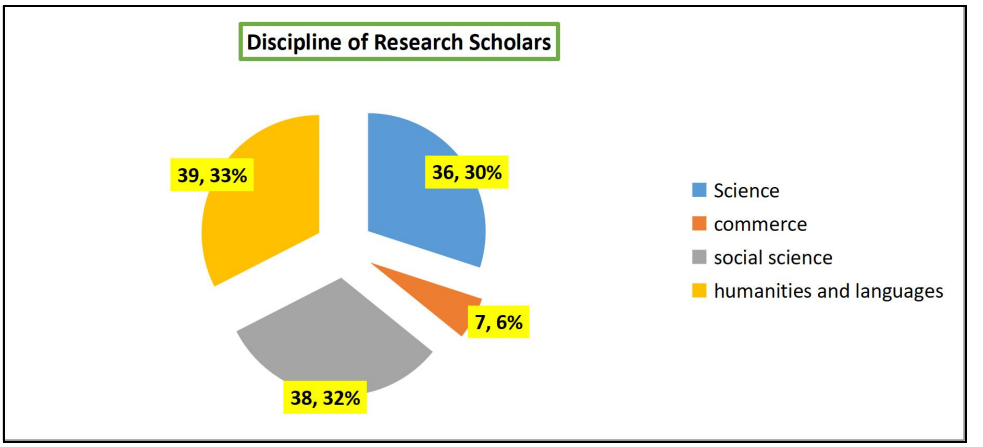

Figure 2: Discipline of Research Scholars

7.3. Awareness about digital library resources

Figure 3 shows the number of research scholars aware and unaware of digital resources. It is clear that a high number of scholars are aware of digital resources i.e. 92.5% and very few are unaware of it i.e.7.5%.

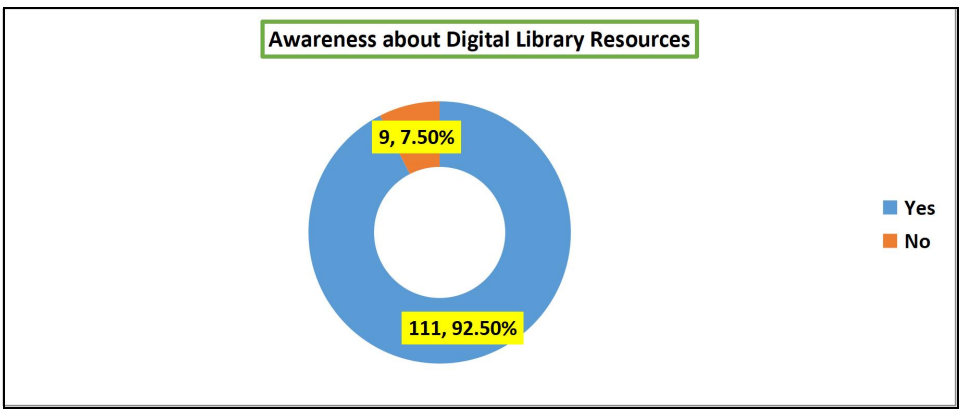

Figure 3: Awareness about Digital Library Resources

7.4. Frequency of using Digital Library Resources

Many research scholars use these resources on daily basis i.e.23.3%, while only 10.8 % never use them. Table 1 shows the frequency of usage of digital resources.

Table 1: Frequency of using digital Library resources

Frequency of using Digital Resources	No.	Percentage
Daily	28	23.3%
Twice a week	20	16.7%
Weekly	16	13.3%
Once in a month	21	17.5%

Rarely	22	18.3%
Never	13	10.8%

7.5. Preferred Information Resources

It is clear by the study that most of the student uses both print and digital resources for their work i.e. 75%. Very few (2.5%) uses print resources. Following figure 4 shows this.

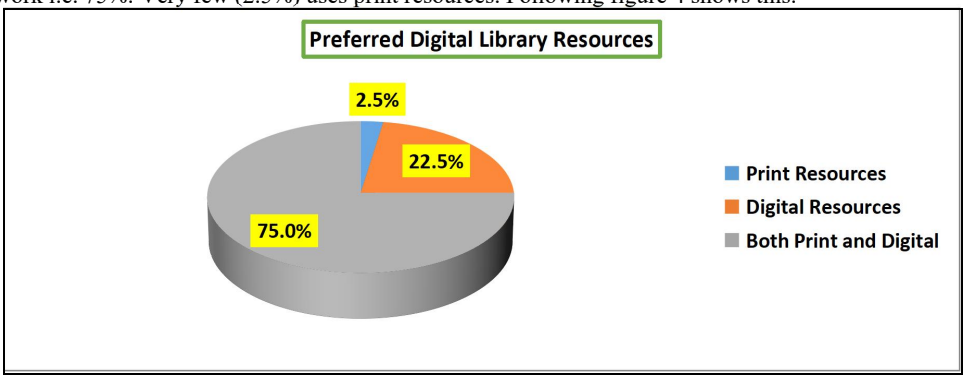

Figure 4: Preferred Digital Library Resources

7.6. Purpose of using digital resources

Most research scholars' purposes of using these resources are to get material for research (75%) and to update knowledge in research (64.2%). Some of them (11.7%) use these for paper publication. Table 2 shows their purpose of using these resources.

Table 2: Preferred Digital Library Resources

Purpose of using digital resources	No.	Percentage
To get material for research	90	75.0%
To update knowledge in research	77	64.2%
For paper publication	14	11.7%
Other	9	7.5%

7.7. Awareness and use of different type of digital resources

The below table indicates that the most known and used digital resource is E-Journal (92.5%), while E-Standard are least known (38.3%) and used. After E-Journal, E-Books are well known (89.2%) and used by the research scholars.

Table 3: Awareness and use of different type of digital

Digital Resources	Awareness				Frequency of use			
	Yes	Yes%	No	No%	Frequently	Sometimes	Rarely	Never
Course material	88	73.3%	32	26.7%	26	27	18	4
E-Books	107	89.2%	13	10.8%	43	34	7	10
E-Journals	111	92.5%	9	7.5%	64	19	5	2
E-Newspapers	90	75.0%	30	25.0%	27	30	17	6
E-Thesis/Dissertation	105	87.5%	15	12.5%	36	38	20	2
Indexing Database	71	59.2%	49	40.8%	29	23	15	43
Abstracting Database	64	53.3%	56	46.7%	17	17	17	34
Bibliographic Database	73	60.8%	47	39.2%	13	27	18	46
E-Standards	46	38.3%	74	61.7%	2	9	21	51

Institutional Repository	67	55.8%	53	44.2%	9	16	26	37
Subject Specific Portals	84	70.0%	46	38.3%	24	25	16	39

7.8. Awareness and use of Digital Library Services

Research scholars' awareness and usage of library services are shown in Table 4. E-mail assistance service is most known (67.5%) among them. Link to open resource educational sites follows it in awareness (65%) and usage. The least known is link to other libraries.

Table 4: Awareness and use of Digital Library Services

Digital Library Services	Awareness				Frequency of use			
	Yes	Yes%	No	No%	Frequently	Sometimes	Rarely	Never
E-mail assistance service	81	67.5%	39	32.5%	15	23	29	34
Web OPAC	59	49.2%	61	50.8%	6	24	7	44
Current awareness service	58	48.3%	62	51.7%	9	11	20	32
E-newspaper Clipping	65	54.2%	55	45.8%	4	24	10	42
Tutorials & help	69	57.5%	51	42.5%	10	18	8	16
Electronic document delivery	61	50.8%	59	49.2%	11	9	8	16
Single window search facility	58	48.3%	62	51.7%	15	16	8	12
Link to open resource educational sites	78	65.0%	42	35.0%	15	24	9	14
Link to other libraries	55	45.8%	65	54.2%	11	12	12	17
Feedback /queries	61	50.8%	59	49.2%	6	18	17	14

7.9. Awareness source of Digital Library Resources and Services

Table 5 indicates that 49.2% research scholars came to know about digital resources by their colleagues/friends, 43.3% by self exploring. Only some of them got this information from other sources.

Table 5: Awareness source of Digital Library Resources and Services

Sources of awareness about Digital Resources and services	No.	Percentage
Library Staff	30	25.0%
Self	52	43.3%
Library Web Site	27	22.5%
Faculty of your Department	34	28.3%
Orientation Program	40	33.3%
Colleagues/Friends	59	49.2%
Others	7	5.8%

7.10. Problems in access of Digital Resources/Services

Problems faced by research scholars are shown in Table 6. Most scholars (45%) emphasized that the lack of training doesn't let them use these resources and services efficiently. Least numbers (12.5%) face the problem of redundant information.

Table 6: Problems in access of Digital Resources/Services

Problems in access of Digital Resources &Services	No.	Percentage
Slow speed	26	21.7%
Redundant information	15	12.5%

Time consuming	22	18.3%
Not easy to search	28	23.3%
Not familiar with the system	26	21.7%
Not enough terminals to access the information	35	29.2%
Lack of training	54	45.0%
Other (please specify)	3	2.5%

7.11. Orientation Programs

As Figure 5 shows that research scholars emphasized on the problem of lack of training. One of the solutions of this problem is orientation programs. Figure 5 shows that 43% of scholars have attended these programs and 40.8% of them have not attended till now. 15.8% are not aware of these programs.

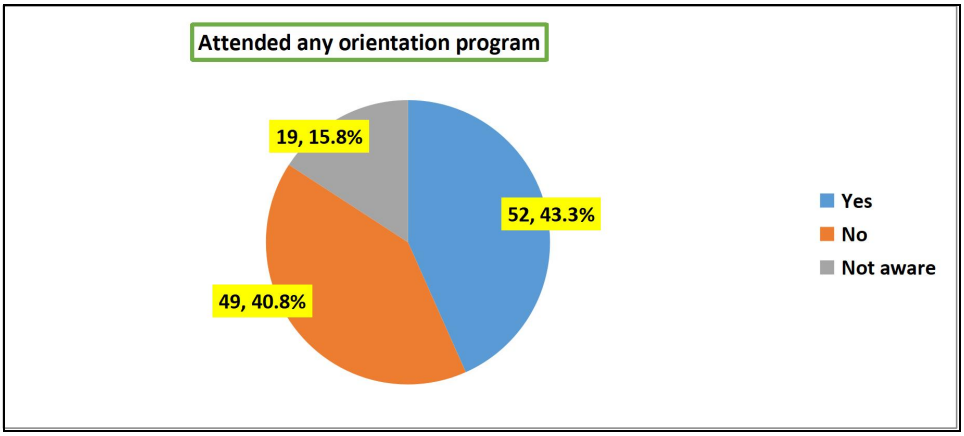

Figure 5: Attending any Orientation Programs

7.12. Desired Frequency of Orientation Programs

Below Figure 6 shows that 79.2% scholars want these orientation programs to be held on monthly basis while 10.8% and 10% want these programs to be held on fortnightly and weekly basis respectively.

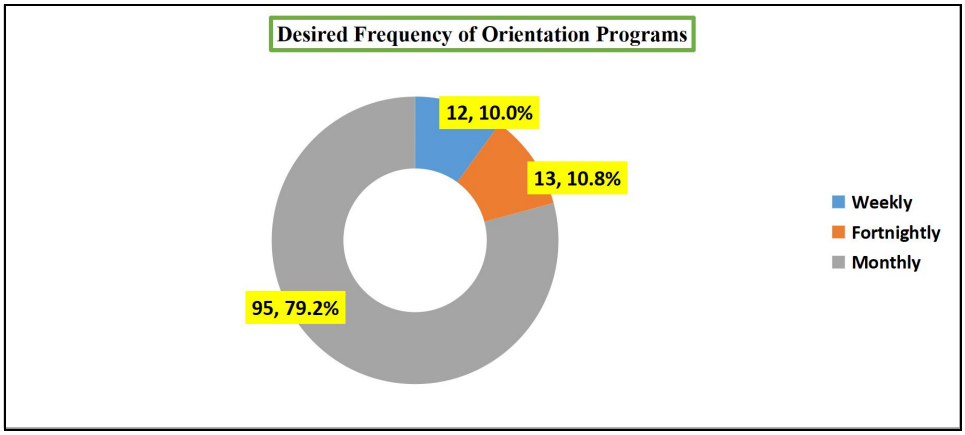

Figure 6: Desired Frequency of Orientation Programs

7.13. Satisfaction with Digital Resources / Services

Satisfaction level with the digital resources and services is shown in table 7. Partially satisfied research scholars are 45%. Only 15.8% are fully satisfied with these resources and services in this study. 23% are neutral and very few i.e.7.5% are dissatisfied with these.

Table 7: Satisfaction with Digital Resources / Services

Satisfaction with Digital Resources / Services	No.	Percentage
Fully Satisfied	19	15.8%
Partially Satisfied	54	45.0%
Neutral	28	23.3%
Dissatisfied	9	7.5%
No opinion	10	8.3%

8. FINDINGS

The findings of overall study are as follows:

- Most of the research scholars (92.5%) are familiar with the use of digital resources.
- About 23.3% research scholars are availing the digital resources on daily basis and 18.3% use them rarely.
- Most of the research scholars i.e. 75% prefer to use both printed and digital resources for their research.
- Majority of the research scholars (75%) are using digital resources to get material for research and 64.2% for updating their knowledge in research.
- Most of the research scholars are aware about e-journals (92.5%) and using them frequently i.e.53.3%. The second favorite for them is e-books, where 89.2% are aware of them and 35.8% use them frequently. At the third place was E-thesis/dissertation which is known by 87.5% scholars and 30% using it frequently.
- The most known digital service by research scholars is e-mail assistant service, 67.5% scholars know about it. Other digital services are not used by research scholars frequently. Majority of research scholars have never used them.
- Majority of the research scholars (49.2%) have learnt about the available digital resources through colleagues/friends. While 43.3% research scholars have explored it by themselves.
- The main barrier in access of these resources is lack of training for majority of the research scholars (45%). Many research scholars (29.2%) also faced the problem of unavailability of enough terminals.
- 43% of research scholars have attended one or more orientation programs. Most of the research scholars (79.2%) want these to be held on monthly basis.
- Majority of the research scholars (45%) are partially satisfied with digital resources and services. Only 15% are fully satisfied with these.

9. RECOMMENDATIONS

Based on the findings of this study an attempt has been made to suggest a few recommendations to improve the awareness and usage of digital resources among research scholars.

i) Awareness should be generated about the use of digital resources and services among the research scholars
ii) The library should purchase access to important journals for research scholars which are not accessible right now. There is a need of subscribing more and more e-journals and e-books for research scholars.
iii) Subscription to more and more databases like Cambridge, Taylor Francis, Oxford, CMIE etc. relevant for Researchers are required.
iv) Regular awareness sessions on using e-resources available in library for research scholars should take place and it should be notified properly in advance so that students can attend these programs according to their convenience.
v) More computer terminals should be installed in the library for easy access to research scholars.

vi) Online orientation program is needed for all researchers of all departments by the library.
vii) Lack of communication with research scholars should be bridged by the library about digital resources available here with the help of different means, so that these resources can be used at optimum level by the researchers.

10. CONCLUSION

One of the key features of a university education is research. It is the duty of universities to help their researchers succeed in their scholarly endeavours. Therefore, university libraries are making great efforts to collect as many digital resources as possible, as they are increasingly vital to modern scholarly work. However, merely obtaining them is insufficient. The maximum potential of these should be utilised. Users must be given the tools they need to locate and make effective use of these resources. Libraries may help their patrons make the most of their digital resources by showcasing them in a variety of ways. By informing people about the library's digital resources, we can help them overcome barriers to accessing the information they need.

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Streamlining Library Operations through Emerging Tools and Techniques: A Librarians' Point of View

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ABSTRACT

Given the pressing demands for more innovative library services offering and inadequate library manpower to sustain the said demands while ensuring that all areas of operations are going smoothly, the need to streamline operations is indeed imperative and is becoming an integral part of library operations to perform its functions and fulfill its obligations to its respective clients. Thus, the objective of this study is to identify the necessary tools and techniques that are being utilize in libraries as perceived by professional librarians who are working or had worked in library setting. It also aims to measure the extent of utilization of those tools and techniques in libraries and how these helps in streamlining operations. Several tools and techniques commonly or somehow used by the librarians in performing their duties and responsibilities were identified through the responses provided by the respondents. Relative to this, it is proven through the findings that there is a high positive correlation between streamlining library operations and the utilization of those identified tools and techniques. Thus, it is indeed imperative for the librarians to familiarized and equipped themselves with the basic concepts and features of these tools and techniques to ensure that the library operations are going smoothly, and its pace can cope up with libraries' emerging trends.

Keywords*: Library Operations, Library Tools, Library Techniques, Streamlining, Streamlining Operations.*

1. INTRODUCTION

"A rule of thumb is that a lousy process will consume ten times as many hours as thework itself requires." -Bill Gates

Streamlining is proven to be one of the most effective ways to simplify processes and procedures by eliminating redundancies and unnecessary tasks while retaining the quality of outputs, it is also given emphasis that "… streamlined business processes ensure better and predictable business outcomes. Continuous business improvement starts with understanding business processes and simplifying them" (How to Streamline Work Processes Efficiently, n.d.).

Furthermore, in accordance with the IRR of RA No. 11032 otherwise known as the "Ease of doing business and efficient government service delivery act of 2018" Rule 3, Section 1 of Reengineering of Systems and Procedures with regards to streamlining of government services states that: *"All agencies which provide government services shall undertake compliance cost analysis, conduct time and motion studies, undergo evaluation and improvement of all their government services, and reengineer the same, if deemed necessary, to reduce bureaucratic red tape and processing time, and to promote efficiency and simplicity of processes…"* Whereby, Section 2 focuses on the manifestation of the previous section through citizen's charter which was further explained under the Rule 4.

Library on the other hand, which usually suffers from fiscal black hole, budget cuts, and downsizing and thereby commonly results into "one-man librarian," streamlining seems to be the most effective solution among the librarians to possibly carry out the overall library operations alone

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while retaining the quality outputs and service delivery to their respective clients. Libraries must ensure that the aforementioned issues would not affect its operations and thereby librarians were obliged to use various tools and techniques to streamline their works. Moreover, familiarity on these tools and techniques were also included in various professional core competency-standards for librarians and information professionals such as *Competencies for Information Professionals of the 21st Century*, *Core competencies for 21st Century CARL librarians, Federal Librarian Competencies,* and *National Competency-Based Standards for Filipino Librarians* regulated by various prominent entities of librarianship profession.

However, librarians' awareness on these tools and techniques are usually very low as its usage are usually scattered in various libraries which for instance, a particular tool/technique that facilitates streamlining technical operation is being utilize in a particular library while other libraries are not even aware on this tool/technique. Thus, the goal of this study is to identify those tools and techniques that being utilize in libraries that facilitates streamlining operations and thereby prepare a comprehensive compilation of those tools and techniques to serve as a fundamental reference for librarians to perform their duties and responsibilities while ensuring efficient and productive operations. Furthermore, this study will also serve as: a fundamental reference for amateur librarians to perform their duties and responsibilities, a premier reference of library tools and techniques to streamline library operations, and a premier work on the compilation of tools and techniques that are useful for streamlining library operations.

The said tools and techniques were identified and were measured the extent of its utilization among the libraries and the extent of its helpfulness in streaming operations through the responses of professional librarians who are working in a library or had a work experience in library setting.

2. METHODOLOGY

2.1. Sample or Population of the Study and the Sampling Procedures

Professional librarians who are working or had an experience working in library setting were the respondent of this study. However, due to the very limited number of librarians and the aims of this study to gather more diverse responses, the researcher disregarded the concept of time and place when deciding on the respondents' age and location and thus, 15 librarians who are working or had worked in library setting were randomly selected through snowball sampling technique.

2.2. Data Gathering Procedures

Due to the very dispersed presence of librarians which made it impossible to find enough number of them within a certain geographical area, data were gathered through Google form as it is more convenient to get responses from far away librarians where the study is being conducted. Google form was sent to them to answer the questions it contains and got some responses on the same day while the others sent their response on the other day and on a day after. To ensure the validity and reliability of the tool used in data gathering, the said Google form was sent to the same respondents once again, a week after, to answer the same set of questions and the responses were obtained as the first set of responses was obtained.

2.3. Research Design

This study used descriptive-quantitative design through survey questionnaire for data gathering and the data were gathered from professional librarians who have work experience in library to obtain more reliable data as they have or had a first-hand experience and had the chance to discovered and observed the tools and techniques utilize by the library where they are belong or had been part. The tool used in data gathering was proven valid and reliable after undergoing validity and

reliability test using Pearson's formula.

2.4. Statistical Treatment of the Data

The given Pearson's formula below was used for validity and reliability test and is also used to test if there is a significant correlation between streamlining library operations and the utilization of those identified tools and techniques.

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

In addition, Microsoft excel spreadsheet was used to compute the mean and sum of X and Y values to be substituted to the given formula above.

3. RESULTS

The following figures elaborate the tools and techniques identified by the respondents. According to them, these tools and techniques were being utilize and observe in libraries where they had worked or have been working. Cataloging calculator as the most utilized tool and 5S as the most observed technique among the libraries.

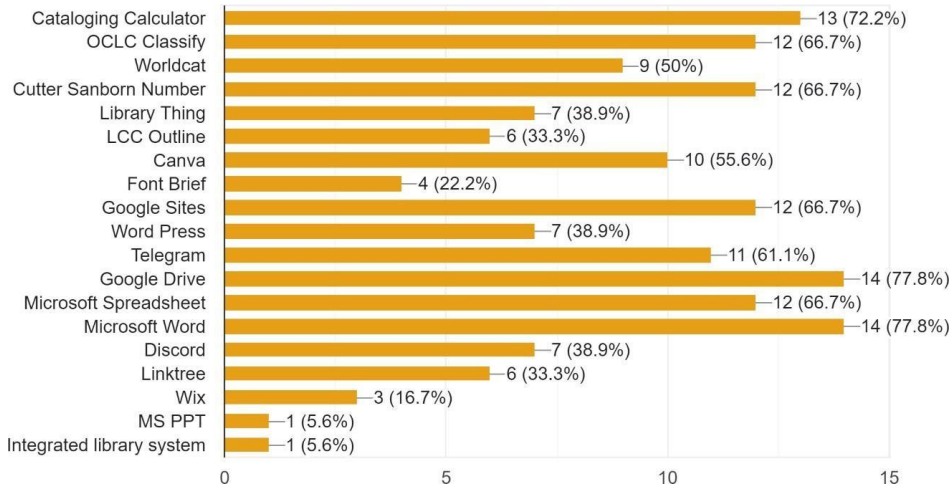

Figure 1: Tools

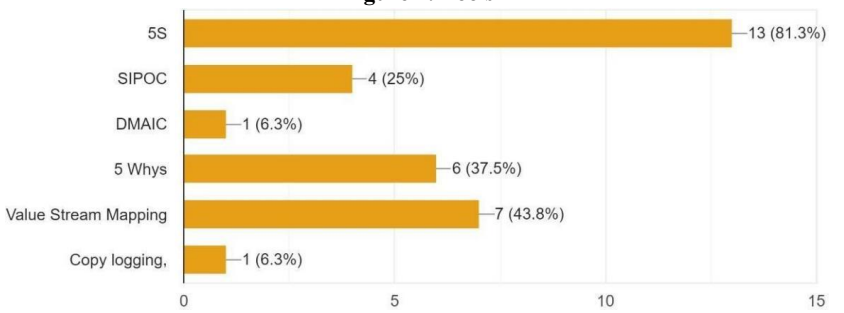

Figure 2: Techniques

As for the extent of the utilization of the aforementioned tools and techniques, the following figure shows that the average mean of its utilization in the library's major areas of operation namely:

technical, reader's, and administrative is 60.3331% or 80.4441% of the perfect score.

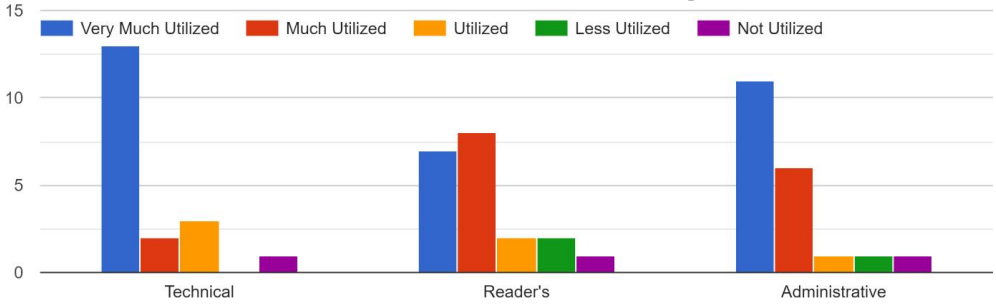

Figure 3: Extent of Utilization

As for the extent of its helpfulness in streamlining operations, the following figure shows that the average mean of its helpfulness in the library's major areas of operation namely: technical, reader's, and administrative is 64.3333% or 85.7777% of the perfect score.

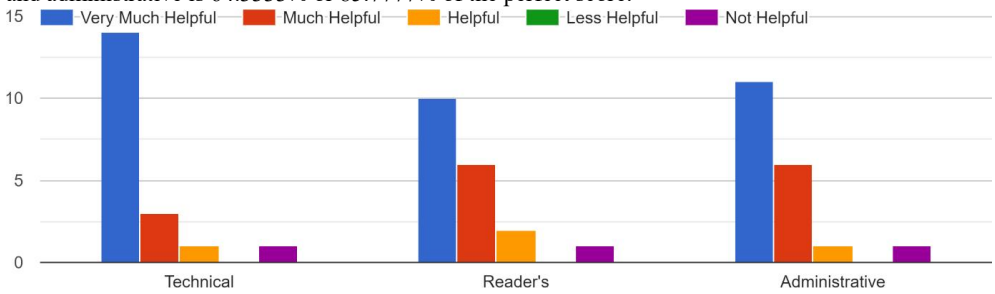

Figure 4: Extent of Helfulness

Upon the computation of the results, it shows that the identified tools and techniques enumerated in the figure 1 and 2 are very much utilized in libraries and are very much helpful in streamlining library operations with the correlational value of 0.8747 which indicates that there is a high positive correlation between streamlining library operations and the utilization of those identified tools and techniques.

4. CONCLUSION/RECOMMENDATIONS

The findings implies that by utilizing those tools and techniques can eliminate redundant and unnecessary tasks and thereby helps librarians to streamline operations. Thus, it is recommended for them to familiarize themselves on the said tools and techniques for them to ensure streamlined operations while retaining quality outputs and service delivery. Moreover, familiarization with the said tools and techniques were included in various professional core competency-standards for librarians and information professionals as regulated by various prominent entities of librarianship profession. Thus, integrating these essential competencies to the curriculum of the school of library and information science will helps the aspiring professional librarians to meet the said core competencies even before gaining experiences in library setting.

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The Role of Information Security Management Models and Frameworks in Safeguarding Academic Library

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ABSTRACT

In today's digital age, ensuring information security in academic library is crucial in safeguarding patron privacy and promoting safe access to information. This study examines the role of information security management models and frameworks in enhancing the security of academic library. By evaluating key security assessment models such as LISAM, RMIAS, NIST Cyber Security Frameworks, and CSAM, the study aims to provide valuable insights for library management and decision-makers. The analysis focuses on the relevance, compatibility, and effectiveness of these models in addressing the security requirements of academic libraries and mitigating potential risks. Through a critical assessment of existing literature and comparison of security models, this research underscores the significance of investing in security management to protect valuable resources and user data. By implementing robust security measures guided by these models, academic libraries can uphold confidentiality, ensure secure access to resources, and mitigate cybersecurity threats effectively.

Keywords: *Information Security, Management Models, Frameworks, Academic Library, Safeguarding*

1. INTRODUCTION

In today's digital era, anonymity holds significant importance for safeguarding privacy, enabling free expression, and promoting equitable access to information. Libraries as a part of this shift must actively cater to digital security of its patrons through various means. In order to achieve highest level of security it must uphold strict confidentiality policies to protect users' Personally Identifiable Information (PII) and ensure secure access to resources.

According to the ALA's Library Bill of Rights, Article VII, Libraries must emphasize on equitable access to its resources, regardless of individuals' backgrounds or beliefs, and supports intellectual freedom, promoting open discourse and the free exchange of ideas. With the digitalization of library services, ALA also addresses issues of digital privacy and security, advocating for robust data protection measures and policies to safeguard patron information in online environments (ALA, 1948).

Very recently, the British Library initially announced through its social media platform, X, that it was facing technical difficulties resulting in an IT outage. Later, on October 31st, it conformed that the disruption was indeed caused by a cyber-attack. Subsequently, a group known as Rhysida ransomware gang claimed accountability for the attack. They also proceeded to release internal human resources documents, potentially containing scanned copies of employee passports and employment contracts, on the dark web (Scroxton, 2024). Moreover, In August 2020, the Library of Congress reported a data breach that impacted its patrons. The breach involved unauthorized access to a Library of Congress account and potentially exposed personal information of users.

As per The Hindu report, in April 2017, the official websites of more than 10 educational institutions, such as University of Delhi, IIT Delhi, IIT-BHU, University of Kerala, and AMU, were altered by a group of hackers who purported to be from Pakistan (The Hindu, 2017). Thus, prioritizing security management in libraries is essential to mitigate such risks. Investing in security management ensures that libraries can continue to fulfill their mission of providing accessible and reliable resources to their communities without disruption or compromise.

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Chapter 16; S. Hasan, S. Kumar, S. Panda, K. N. Khan & G. Samdani (Eds); PP. 134-139; Synergy Books India, N.D.

2. SIGNIFICANCE OF THE STUDY

The study's primary goal is to evaluate the existing security models that can provide valuable insights for library management and decision-makers. The study aims at providing a targeted evaluation of the model's effectiveness in addressing the library's security requirements and mitigating potential risks.

3. OBJECTIVES OF THE STUDY

The study has been conducted on the basis of following objectives.

i) To investigate the relevance of the chosen security model and framework in protecting library assets and data,
ii) To assess the compatibility of the security model with the library's resources, operational need, and regulatory requirements.

4. METHODOLOGY

The study adopts an analytical stance, drawing from existing literature on information security models and their components concerning library security services. This paper provides a critical assessment of newly developed information security models and compares them with several older models. The selection of these models for analysis is based on their relevance and suitability for application within academic libraries. Essentially, it is a review paper that analyzes previously published research in the field. Emerald Insight, IEEE, SCOPUS, and Research Gate were used to conduct the literature search. 11 documents were chosen that served as the foundation for the paper.

5. MODELS UNDERTAKEN FOR THE STUDY

Following four Information Security Models pertinent to the academic setting have been chosen for this study:

i) Library Information Security Assessment Model (LISAM),
ii) Reference Model of Information Assurance and Security (RMIAS),
iii) NIST (National Institute of Standards and Technology) Cyber Security Frameworks,
iv) Cyber Security Audit Model (CSAM)

Table 1. Overview of the models and framework

Sr. No.	Model	Founder	Year	Parameters	Steps	Structure
1.	LISAM	Roesnita Binti Ismail	2012	5	5	Staircase
2.	RMIAS	Yulia Cherdantseva and Jeremy Hilton	2013	50	4	Cyclic
3.	NIST-CsF	National Institute of Standards and Technology	2014	5	5	Step-wise
4.	CSAM	Regner Sabillon, Jordi Serra-Ruiz, Victor Cavaller and Jeimy Cano	2017	18 (also includes various sub-domains, checklists and controls)	NA	Cyclic

6. SUMMARY OF SECURITY ASSESSMENT MODELS AND FRAMEWORKS

6.1. Library Information Security Assessment Model (LISAM)

This model presents an Organizational Information Security staircase pattern with 5 steps involved in it. This model, the first of its kind developed in Malaysia, is tailored specifically for library settings. It emphasizes that effective information security measures should be constructed as a combination of various measures, akin to building a staircase (J & Dawar, 2016). The model consists of 5 steps arranged in staircase pattern which illustrates that as one ascends the staircase, representing higher levels of security, the complexity of information system security management in a library also increases (Ismail, Assessing information security management in Malaysian academic libraries, 2012). Following are the five steps of the model:

- Technological Security Foundation,
- Information Security Policy,
- Procedures and Control,
- Administrative tools and methods,
- Awareness creation.

This model involves contextual analysis which helps in identifying the specific information security requirements and challenges faced by the library website, risk assessment, security policy development (These policies cover aspects such as access control, data protection, incident response, and compliance with relevant regulations), implementation of security controls (such as encryption, access controls, regular security updates), user awareness and training, etc., By following the principles and guidelines outlined in the LISAM model, academic libraries can establish a robust framework for securing their websites and protecting valuable resources and user data.

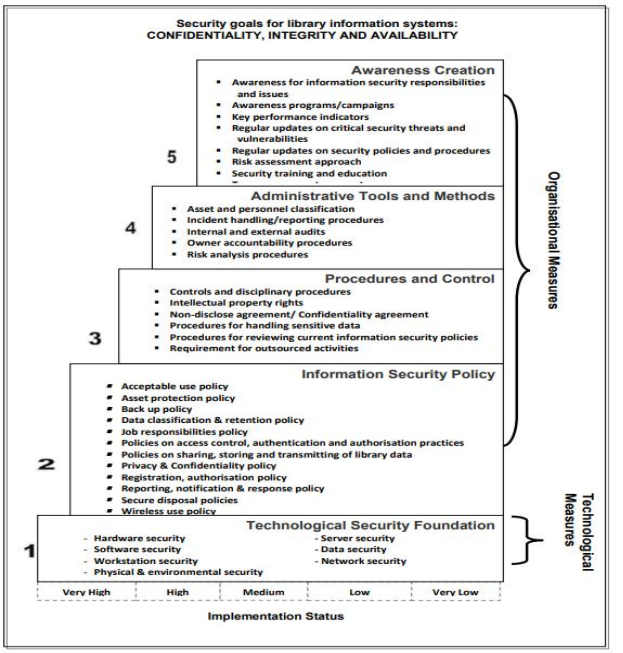


Figure 1: Library Information Security Assessment Model (LISAM)
(Ismail, Assessing information security management in Malaysian, 2012)

6.2. Reference Model of Information Assurance and Security

The RMIAS is a comprehensive model that addresses the evolving nature of Information Assurance & Security (IAS) by incorporating four dimensions:

i) **Information System Security Life Cycle -** this stage consists of 5 stages to ensure consistent incorporation and achievement of security goals for information assets,

ii) **Information Taxonomy -** This has four attributes namely form, state, location and sensitivity, which forms the basis for the specification and selection of security goals and countermeasures.,

iii) **Security Goals -** The model outlines 8 objectives for maintaining information security, emphasizing their consistent integration across the entire security process. However, the model's list of objectives and preventive measures isn't comprehensive and needs updating to adapt to future developments (J & Dawar, 2016)., and

iv) **Security Countermeasures -** Author incorporated four types of security countermeasures namely: Organizational, Human-oriented, Technical, and Legal. These security countermeasures work together to provide a comprehensive approach to information assurance and security,

addressing various aspects such as organizational practices, human behavior, technical solutions, and legal requirements.

By incorporating these four dimensions of RMIAS, organizations can ensure consistency and traceability of security measures throughout the security life cycle. This model can be applied to secure library, providing a structured approach so as to safeguard information assets and achieving security goals.

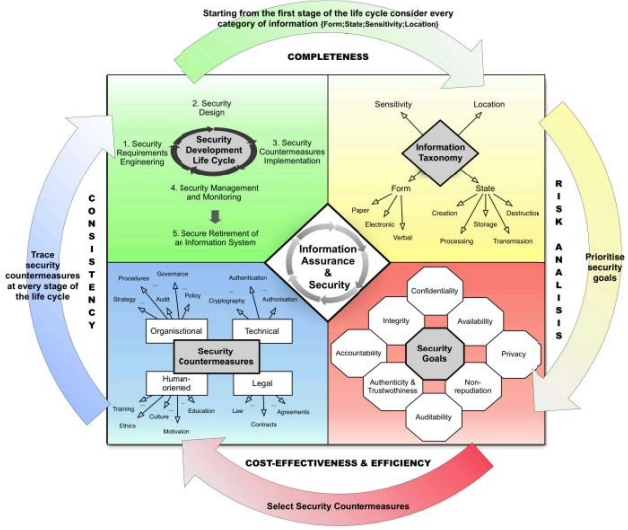


Figure 2: Reference Model of Information Assurance and Security (RMIAS) (Cherdantseva & Hilton, 2013)

The depiction of how the dimensions of RMIAS interact begins with the upper left quadrant. An organization identifies its present position in the security lifecycle, then proceeds through clock-wise direction to the remaining three dimensions before returning to advance to the subsequent stage of the lifecycle (Cherdantseva & Hilton, 2013).

6.3. NIST Cyber Security Frameworks

The common functionality in the NIST Cybersecurity Framework revolves around five core functions: Identify, Protect, Detect, Respond, and Recover. These functions provide a structured approach to managing cybersecurity risks and enhancing overall security measures (NIST, 2014)

Figure 3: NIST Cybersecurity Framework, Version 1.1 (NIST, 2014)

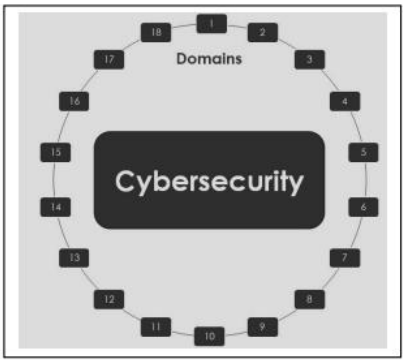
The framework offers a systematic methodology that can be tailored to the unique needs of library websites. The subsequent actions concerning security for library websites are outlined below:

i) Identify- Involves identifying assets, data and capabilities. Libraries can use this to assess their vulnerabilities and prioritize security measures (Banach, 2022).
ii) Protect- Access permissions and authorizations are managed. This includes controlling access to the website, using security software, encrypting data, conducting regular backups, and training staff on cybersecurity best practices.
iii) Detect- This involves monitoring for unauthorized access, investigating unusual activities, and checking for unauthorized users or connections (NIST, 2014).
iv) Respond- This includes notifying stakeholders, keeping operations running, reporting attacks, investigating incidents, and updating cybersecurity policies based on lessons learned
v) Recover- The Recover function involves restoring capabilities or services that were impaired due to cybersecurity incidents. Organizations must have recovery plans in place, coordinate restoration activities, and incorporate lessons learned into updated recovery strategies (N-Able, 2019).

NIST Cybersecurity Framework provides libraries with a structured approach to cybersecurity, helping them identify, protect, detect, respond to, and recover from cyber threats effectively.

6.4. Cyber Security Audit Model (CSAM)

The CSAM is designed to assess cybersecurity assurance, maturity, and readiness within organizations, while also gauging the efficacy of cybersecurity protocols for nations. It consists of 18 domains, with domain 1 specifically designed for Nation States and domains 2-18 applicable to any organization. Besides, it includes 26 sub-domains, 87 checklists, 169 controls, and 429 sub-controls, providing a detailed framework for assessing cybersecurity controls (Sabillon & al., 2017).



Domains	Domains
1- Nation States	10- Threat Intelligence
2- Governance and Strategy	11- Incident Management
3- Legal and Compliance	12- Digital Forensics
4- Cyber Assets	13- Awareness Education
5- Cyber Risks	14- Cyber Assurance
6- Frameworks and Regulations	15- Active Cyber Defense
7- Architecture and Networks	16- Evolving Technologies
8- Information, Systems and Applications	17- Disaster Recovery
9- Vulnerability Identification	18- Personnel

Fig. 2. The CyberSecurity Audit Model (CSAM) domains

Figure 4 & 5: Cybersecurity Audit Model and Domains, CSAM (Sabillon & al., 2017)

Libraries can implement this model by going through following steps:

- Identify and assess cybersecurity controls in library systems and networks to evaluate their effectiveness in protecting against cyber threats.
- Conduct a risk assessment to identify potential vulnerabilities and prioritize areas for improvement in library cybersecurity
- Evaluate the readiness of libraries to handle cyber threats and attacks by assessing their cybersecurity preparedness and response capabilities.

Table 2: Comparison of attributes considered in the information security assessment models and frameworks (J & Dawar, 2016)

Attributes → / Models ↓	Planning	Risk Assessment	Technical Security Procedure	Policy Guideline	Cost
LISAM	No	No	Yes	Yes	No
RMIAS	Yes	Yes	Yes	Yes	Yes

NIST	Yes	Yes	Yes	Yes	Yes
CSAM	Yes	Yes	Yes	Yes	Yes

7. CONCLUSION

The role of information security management models and frameworks in safeguarding academic library websites is paramount in today's digital landscape. By evaluating and comparing key security assessment models such as LISAM, RMIAS, NIST Cyber Security Frameworks, and CSAM, this study highlights the importance of adopting tailored security measures to protect patron privacy and ensure secure access to resources. The analysis underscores the need for libraries to prioritize security management to mitigate potential risks and uphold confidentiality policies, especially in the face of evolving cybersecurity threats. By leveraging the principles and guidelines outlined in these models, academic libraries can establish a robust framework for securing their websites, protecting valuable resources, and safeguarding user data. Moving forward, continued investment in information security and adherence to best practices will be essential for academic libraries to navigate the complex digital landscape and fulfill their mission of providing accessible and reliable resources to their communities.

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The Role of Libraries in Facilitating Student Clubs (SCs) and Quality Circles (QCs) in Accordance with the National Education Policy-2020

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ABSTRACT

The National Education Policy-2020 (NEP-2020) underscores the imperative of establishing high-quality higher education institutions, focusing on comprehensive student growth and alignment with the needs of the workforce. In this context, libraries emerge as indispensable facilitators, seamlessly connecting formal and informal learning realms. NEP-2020's emphasis on outcome-driven education and lifelong learning resonates deeply with library-backed endeavors like student clubs (SCs) and quality circles (QCs). Acting as hubs for knowledge dissemination and collaborative learning, libraries provide the fertile ground for SCs and QCs to flourish. Through the provision of a wide array of resources and the cultivation of an enriching learning atmosphere, libraries assume a pivotal role in fostering students' interdisciplinary competencies and problem-solving acumen. This paper delves into the intricate interplay between libraries, SCs, and QCs, shedding light on their collective impact in realizing NEP-2020's vision of delivering top-tier education and enhancing workforce preparedness. By examining the symbiotic relationship between these entities, it elucidates how libraries serve as catalysts for innovation and skill development, ultimately contributing to the holistic advancement of students and the attainment of educational excellence as envisaged by NEP-2020.

Keywords: *National Education Policy-2020 (NEP-2020), Higher Education Institutions, Student Clubs (SCs), Quality Circles (QCs), Libraries in Education, Lifelong Learning*

1. INTRODUCTION

The National Education Policy-2020 (NEP-2020) delineates a comprehensive vision for the enhancement of higher education institutions, emphasizing the holistic development of students and their alignment with the evolving needs of the workforce. A central tenet of NEP-2020 is the promotion of quality universities and colleges, underpinned by a commitment to nurturing students' capabilities and preparing them for meaningful contributions to the socio-economic fabric of the nation. Embracing the philosophy of outcome-based education, NEP-2020 underscores the imperative of fostering lifelong learning, critical thinking, and 21st-century skills among learners.

In line with NEP-2020's objectives, libraries emerge as indispensable enablers in the realization of quality education. Beyond their traditional roles, libraries serve as dynamic hubs for collaborative learning and innovation, providing students with access to diverse resources and fostering an enriching learning environment. Leveraging libraries as focal points, initiatives such as student clubs (SCs) and quality circles (QCs) gain momentum, offering platforms for students to engage in experiential learning, problem-solving, and skill development.

Student clubs and quality circles, mentored and supported by facilitators, provide avenues for students to address personal and academic challenges, share ideas, and collaborate on solutions. These informal learning environments complement formal educational structures, offering flexibility and openness conducive to exploring diverse perspectives and enhancing learning outcomes.

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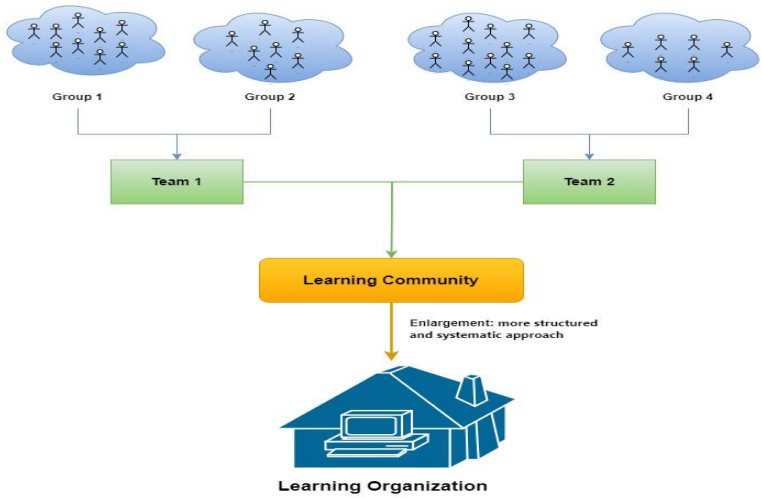

Figure 1: Growth of Student clubs (SCs) and Quality circles (QCs)

Moreover, professionally managed SCs and QCs create ecosystems wherein students harness their latent potential and channel their energies towards personal and professional growth. By fostering interdisciplinary skills, soft skills, and adaptability, SCs and QCs play a pivotal role in preparing students for the complexities of the modern workforce, equipping them to thrive as entrepreneurs and change agents.

This paper explores the symbiotic relationship between libraries, SCs, and QCs, elucidating how libraries serve as catalysts for the synergistic development of students. Further it highlights the transformative impact of library-supported initiatives on student learning experiences, thereby contributing to the realization of NEP-2020's vision of quality education and workforce readiness.

2. LITERATURE REVIEW

In the past literature, various studies have explored the utilization of quality circles in higher education institutions to enhance learning quality and problem-solving skills among students.

Schmidt et al. (2006) introduced the concept of Student Feedback Committees (SFCs) in large undergraduate classes to promote student involvement in course improvement. The implementation of SFCs provided a mechanism for continuous feedback, benefiting both the teaching team and the students. Libraries contributed to this approach by providing resources for research and supporting data-driven decision-making. **Raj and Kumar (2012)** highlighted the role of Class Quality Circles (CQCs) in promoting holistic student development in educational institutions. These circles facilitated systematic problem-solving and life skills development among students. Libraries could support CQCs by offering resources on problem-solving methodologies and organizing training sessions for facilitators. **Faridi et al. (2012)** discussed the agility and responsiveness of universities in adapting to changing educational paradigms. Student Quality Circles (SQCs) were identified as a bottom-up approach to improving teaching and learning processes. Libraries played a crucial role in providing access to information and communication technologies (ICT) to support SQC initiatives. **Moosa and Mir (2020)** critically analyzed the implementation of Students Quality Circles (SQCs) in Asian countries, emphasizing their role in preparing students for the corporate world. The study identified success factors and provided guidelines for educators and administrators. Libraries could assist by offering research materials on best practices and facilitating knowledge-sharing sessions. **Chutia et al. (2021)** conducted an interventional study on Classroom Quality Circles (QCs) among first-year MBBS students, focusing on enhancing the learning experience. The introduction of QCs led to improvements in teaching–learning strategies and student satisfaction. Libraries could aid this process by providing resources on active learning methodologies and organizing workshops on student engagement.

But none of these studies try to find a synergies between SCs and QCs according to the NEP 2020 guidelines; but **Gupta (2023)** uniquely investigated their synergy within the NEP 2020 framework. Gupta highlighted SCs and QCs' role in complementing formal learning, discussed their key characteristics and benefits, and advocated for scientific approaches in their implementation. Additionally, Gupta suggested areas for their application and ways to enhance their impact on student development.

The present study focuses on the synergies between SCs and QCs, specifically examining the role of libraries in facilitating this interaction.

3. STUDY OBJECTIVES

The objectives of this study are to:

i) Conceptualize Student Clubs (SCs) and Quality Circles (QCs).
ii) Explore the synergies between libraries, SCs, and QCs.
iii) Investigate the role of libraries in supporting the principles of learning used in SCs and QCs.
iv) Assess the contributions of libraries to SCs and QCs approaches.
v) Examine the tools used in SCs and QCs and how libraries can enrich them.
vi) Identify challenges in implementing SCs and QCs in HEIs and propose library solutions.

4. CONCEPTUALIZING STUDENT CLUBS (SCS) AND QUALITY CIRCLES (QCS)

In alignment with the provisions of the National Education Policy-2020 (NEP-2020), higher education institutions (HEIs) are mandated to establish mechanisms for student-led club activities, fostering engagement across various domains such as science, mathematics, literature, and community service. These clubs, driven by student interests and institutional priorities, serve as platforms for the cultivation of soft skills essential for producing competent and globally competitive graduates. Ishak et al. (2021) underscores the role of SCs in nurturing critical thinking, entrepreneurship, and lifelong learning among students through engagement in live projects. Moreover, research by Hales et al. (2021) and Bircher (2012) highlights the transformative impact of club activities in facilitating professional communication and holistic student development.

Quality Circles (QCs) emerge as innovative pedagogical tools in the higher education landscape, designed to empower students as proactive learners and problem-solvers. Defined as small, voluntary teams facilitated by institutions, QCs supplement formal learning processes by fostering participatory learning in real-world problem-solving contexts. Chapagain emphasizes the role of student QCs in nurturing holistic personalities, employing systematic approaches to develop pro-social competencies. Saaid (2020) underscores the function of QCs in enhancing teacher-student communication and promoting stakeholder involvement, while Dhage (2019) highlights their role in fostering student responsibility for learning outcomes.

4.1. Characteristics of SCs and QCs

Student clubs (SCs) and quality circles (QCs) exhibit five primary characteristics essential to their effectiveness:

i) **Voluntary Membership:** SCs and QCs offer voluntary participation, fostering interdisciplinary collaboration and skill development.
ii) **Autonomy:** SCs and QCs operate autonomously, promoting innovation, flexibility, and mutual support.
iii) **Participatory Approach:** Emphasizing peer collaboration, SCs and QCs facilitate self-directed learning and ownership among participants.
iv) **Multidisciplinary Engagement:** SCs and QCs encourage diverse participation, enhancing problem-solving capabilities with varied perspectives.
v) **Empowerment:** Members receive training and resources, enabling effective teamwork and continuous improvement.

4.2. Benefits of SCs and QCs in Higher Education Learning

The advantages of SCs and QCs have been documented in both the production and service industries. In the education sector, the impacts of SCs and QCs are observed across various stages. These benefits include:

i) **Enhanced Collaborative Learning:** SCs and QCs foster teamwork and peer-to-peer knowledge sharing, enriching understanding.
ii) **Holistic Skill Development:** Participation in SCs and QCs hones communication, leadership, and critical thinking skills.
iii) **Experiential Learning Opportunities:** SCs and QCs offer hands-on projects to reinforce theoretical concepts.
iv) **Personal Growth and Confidence Building:** Involvement in SCs and QCs cultivates leadership and self-efficacy.
v) **Networking and Professional Development:** SCs and QCs facilitate connections with peers and industry professionals.
vi) **Promotion of Diversity and Inclusion:** SCs and QCs embrace diversity, fostering cross-cultural understanding and collaboration.

4.3. Continuous Learning Enhancement in SCs and QCs Members

To foster continuous learning, SCs and QCs leverage diverse approaches, including:
i) Self Learning: Empowering individuals to explore and pursue knowledge independently.
ii) Peer Learning: Cultivating a culture of knowledge exchange and mutual support among peers.
iii) Team Learning: Promoting collaboration and synergy within structured team environments.
iv) Collaborative Learning: Encouraging collective problem-solving and group project engagement.
v) Cooperative Learning: Facilitating cooperative efforts towards shared learning objectives, fostering a sense of community and collective growth.

4.4. Skills Developed by SCs and QCs

Skills developed by SCs and QCs encompass a broad spectrum of real-world scenarios, accumulating through diverse campus and extracurricular activities. The development and level of skills hinge on the topic and method chosen, spanning cognitive, affective, and psychomotor domains (Kaplan & Kies, 1995; Kuhar & Sabljić, 2016; Siddiky, 2020), necessitating effective training in suitable approaches and techniques.

i) **Cognitive skills:** Utilizing techniques like group discussion and critical questioning fosters critical thinking, communication, and analytical abilities.
ii) **Affective skills:** Engaging in activities like role play and mentoring cultivates etiquette, social responsibility, and concern for the environment.
iii) **Psychomotor skills:** Participating in projects, internships, and cultural events hones skills such as organization, maintenance, and physical coordination required for various tasks.

5. Synergies Between Libraries, SCs, and QCs

When considering the utilization of libraries for student development, SCs capitalize on student potential, while QCs enhance problem-solving skills, leveraging libraries' resources and services. Table 1 delineates these synergies across various domains.

Table 1: Synergies Between Libraries, Student Clubs (SCs) and Quality Circles (QCs)

SN	Domain	Synergies
1	Knowledge Hub	Libraries serve as central repositories of information, providing SCs and QCs with access to diverse resources, including books, journals, and digital databases, enriching their learning experiences.
2	Learning Environment	Libraries offer conducive spaces for SCs and QCs to meet, collaborate, and engage in discussions, fostering a culture of shared learning and innovation.
3	Resource Support	Libraries offer guidance and assistance in research methodologies, information retrieval, and data analysis, empowering SCs and QCs to conduct effective projects and initiatives.
4	Skill Development	Libraries provide workshops, seminars, and training sessions on research skills, critical thinking, and presentation techniques, enhancing the capabilities of SCs and QCs members.
5	Networking Opportunities	Libraries host events, guest lectures, and networking sessions, connecting SCs and QCs with industry professionals and experts, facilitating knowledge exchange and mentorship.

6	Continuous Improvement	Libraries support SCs and QCs in evaluating their projects, providing feedback, and identifying areas for improvement, fostering a culture of continuous learning and growth.
7	Innovation Hub	Libraries serve as hubs for creativity and innovation, offering access to emerging technologies, maker spaces, and entrepreneurial resources, inspiring SCs and QCs to explore new ideas and solutions.

By leveraging the synergies between libraries, SCs, and QCs, higher education institutions can create dynamic learning ecosystems that empower students to excel academically, professionally, and personally.

6. Role of Libraries in Supporting Principles of Learning Used in SCs and QCs

The learning occurs within real-world work scenarios in a participative manner, as well as in problem-solving and innovation contexts, utilizing diverse learning principles. The following are 10 principles of learning employed in SCs and QCs, along with the role of libraries in supporting these principles.

Table 2: Learning Principles in SCs and QCs and Library Support

SN	Principles	Description	Role of Libraries
1	Scaffolding	Providing support and guidance to learners as they develop new skills or knowledge.	Libraries can offer resources such as reference materials, tutorials, and librarian assistance to scaffold learning processes.
2	Reflection	Encouraging learners to review and analyze their experiences to deepen understanding and improve performance.	Libraries can provide quiet spaces and resources for reflective activities, such as journals or digital reflection tools.
3	Observational Learning	Learning by observing others' actions and outcomes.	Libraries can host events, workshops, or displays showcasing exemplary work or demonstrations relevant to SCs and QCs.
4	Mutual Learning	Collaborative learning where participants share knowledge and experiences with each other.	Libraries can facilitate group study spaces and access to online collaborative tools for mutual learning activities.
5	Self Learning	Empowering learners to take initiative and responsibility for their own learning process.	Libraries can curate self-help resources, online courses, and tutorials accessible anytime to support self-directed learning.
6	Assessment	Evaluating learners' progress and understanding through various methods.	Libraries can provide access to assessment materials, past papers, and exam preparation resources relevant to SCs and QCs' learning objectives.
7	Experimenting for Learning	Encouraging learners to explore and test new ideas or approaches.	Libraries can offer access to experimental equipment, maker spaces, or digital resources for hands-on learning experiences.
8	Struggle for Learning	Embracing challenges and setbacks as opportunities for growth and learning.	Libraries can provide resources on resilience, growth mindset, and coping strategies to support learners during difficult learning moments.
9	Reinforcement	Providing positive feedback or rewards to strengthen desired learning behaviors.	Libraries can recognize achievements and milestones within SCs and QCs through displays, awards, or acknowledgments of accomplishments.
10	Constructive Feedback	Offering specific and actionable feedback to learners to improve performance.	Libraries can provide guidelines and resources on giving and receiving feedback effectively, fostering a culture of constructive criticism within SCs and QCs.

7. Contributions of Libraries to SCs and QCs Approaches

The systematically devised approaches enhance the efficacy, efficiency, productivity, and influence of SCs and QCs within HEIs. These approaches, outlined succinctly in Table 3, are accompanied by the roles libraries play in facilitating their implementation.

Table 3: Library Contributions to SCs and QCs Approaches

SN	Approaches	Description	Library Contributions
1	Collaborative	Members from diverse backgrounds tackle multidisciplinary problems, leveraging various techniques such as conferences, seminars, and panel discussions.	Libraries facilitate collaborative approaches by providing access to relevant resources and hosting events conducive to knowledge sharing.
2	Cooperative	Members share roles and responsibilities, working synchronously to explore problems deeply and reach effective solutions.	Libraries support cooperative efforts by offering research materials and facilitating group study spaces for collaborative problem-solving.
3	Consultative	Members seek expert opinions and consensus to address academic, personal, and support-related issues through consultative meetings and workshops.	Libraries aid consultative approaches by providing access to reference materials and organizing workshops on relevant topics.
4	Democratic	Empowered members make decisions under institutional policies and guidelines for the benefit of all stakeholders.	Libraries contribute to democratic processes by ensuring access to information necessary for informed decision-making.
5	Voluntary	SCs and QCs are open to all students, faculty, and staff, fostering autonomy and creativity.	Libraries enhance voluntary participation by offering resources and support tailored to the interests and needs of members.
6	Statutory	Institutions prioritize core areas such as technology use and research, forming statutory clubs to promote awareness and best practices.	Libraries assist in statutory club initiatives by providing resources and support aligned with institutional goals and missions.

8. Tools Used in SCs and QCs and Library Enrichment

Various tools are utilized within SCs and QCs to facilitate problem-solving, decision-making, and project management processes. Libraries play a crucial role in enriching the effectiveness of these tools by providing access to relevant resources and support materials.

Table 4: Tools Used in SCs and QCs and Library Enrichment

SN	Tools	Description	Library Enrichment
1	Brainstorming Sessions	Encouraging free-flowing idea generation among members.	Libraries can offer access to a wide range of resources, including books, journals, and online databases, to stimulate brainstorming sessions and inspire innovative thinking.
2	SWOT Analysis	Assessing strengths, weaknesses, opportunities, and threats to devise effective strategies.	Libraries can provide access to business journals, market reports, and case studies, offering valuable insights for conducting SWOT analyses.
3	Mind Mapping	Visualizing connections and relationships between ideas and concepts.	Libraries can offer access to mind mapping software and resources on creative thinking and problem-solving techniques.
4	Fishbone Diagrams	Identifying root causes of problems through visual representation.	Libraries can provide access to books and online resources on root cause analysis and quality improvement methodologies.
5	Quality Function Deployment (QFD)	Translating customer needs into specific product or service requirements.	Libraries can offer access to academic journals and textbooks on QFD methodologies, aiding members in understanding and implementing this tool effectively.
6	Pareto Analysis	Prioritizing problems or issues based on their significance.	Libraries can provide access to statistical software and resources on Pareto analysis, facilitating data-driven decision-making within SCs and QCs.

9. Challenges and Library Solutions for Implementing SCs and QCs in HEIs

Challenges of Implementations of SCs and QCs in Higher Education Institutions (HEIs):

9.1. Awareness and Understanding:

- Lack of awareness among stakeholders about the purpose and benefits of SCs and QCs.
- Limited understanding of how SCs and QCs can contribute to academic and professional development.

Library Support:

- Hosting workshops, seminars, and informational sessions to educate stakeholders about the significance of SCs and QCs.
- Providing access to literature and research materials that highlight the effectiveness of SCs and QCs in enhancing learning outcomes.

9.2. Resistance to Change:

- Resistance from faculty and staff members accustomed to traditional teaching and learning methods.
- Reluctance to adopt new approaches and methodologies.

Library Support:

- Offering resources and case studies showcasing successful implementations of SCs and QCs in other institutions.
- Providing access to literature on change management and strategies for overcoming resistance to change.

9.3. Limited Participation:

- Difficulty in engaging students, faculty, and staff in SCs and QCs activities.
- Challenges in motivating individuals to actively contribute and participate.

Library Support:

- Organizing events and forums within the library space to promote SCs and QCs and encourage participation.
- Offering incentives such as access to exclusive resources or recognition for active involvement in SCs and QCs initiatives.

9.4. Resource Constraints:

- Limited financial resources to support the implementation and sustenance of SCs and QCs.
- Inadequate access to technology, facilities, and infrastructure.

Library Support:

- Providing access to online resources, databases, and research materials that support SCs and QCs activities.
- Offering technology and infrastructure support, such as access to computers, meeting rooms, and multimedia equipment, within the library premises.

10. Future Directions and Implications

10.1. Impact on Student Learning Outcomes:

- SCs and QCs have the potential to significantly enhance student learning outcomes by fostering collaborative problem-solving, critical thinking, and interdisciplinary skills.
- These initiatives promote active engagement, self-directed learning, and the application of theoretical knowledge to real-world scenarios.
- As students participate in SCs and QCs, they develop essential competencies such as communication, teamwork, and leadership, which are crucial for success in academic and professional settings.

10.2. Alignment with NEP-2020 Goals and Objectives:

- SCs and QCs align closely with the objectives outlined in the National Education Policy-2020 (NEP-2020), which emphasizes holistic student development and outcome-based education.
- These initiatives promote lifelong learning, innovation, and the acquisition of 21st-century skills, all of which are central tenets of NEP-2020.
- By encouraging active participation and collaboration, SCs and QCs contribute to the creation of a dynamic learning environment that prepares students for the challenges of the modern world.

- Furthermore, SCs and QCs support NEP-2020's vision of quality education by promoting continuous improvement and ensuring that graduates are equipped with the knowledge and skills needed to excel in their chosen fields.

11. CONCLUSION

The integration of Student Clubs (SCs) and Quality Circles (QCs) within Higher Education Institutions (HEIs) presents a promising avenue for fostering holistic student development and achieving the objectives outlined in the National Education Policy-2020 (NEP-2020). Through collaborative problem-solving, interdisciplinary engagement, and a focus on lifelong learning, SCs and QCs empower students to become proactive learners and adaptable professionals. The support provided by libraries in facilitating access to resources, promoting awareness, and fostering a conducive learning environment further enhances the effectiveness of these initiatives. As we look to the future, the continued implementation of SCs and QCs holds immense potential for transforming the educational landscape and equipping students with the skills and competencies needed to thrive in a rapidly evolving world.

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Comparative Studies of Print vs. Electronic Resources in Undergraduate Colleges: A Case Study of Bhagini Nivedita College, University of Delhi

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ABSTRACT

This paper presents a comparative analysis of the utilization of print and electronic resources among undergraduate students and faculty members at Bhagini Nivedita College. The study aims to identify user preferences and challenges encountered while accessing these resources. Through surveys and interviews, the research reveals that while there is a prevailing preference for print resources, there are also notable issues associated with both print and electronic mediums. This paper underscores the significance of understanding user behaviors and challenges in optimizing resource accessibility in academic settings.

Keywords: *Print Resources, Electronic Resources, Undergraduate Students, Bhagini Nivedita College*

1. INTRODUCTION

Established in 1993, Bhagini Nivedita College (BNC) stands as a proud constituent college of the University of Delhi, embodying a commitment to women's education in the rural and semi-urban outskirts of South West Delhi. Named in honor of Sister Nivedita, a devoted disciple of Swami Vivekananda renowned for her tireless dedication to the advancement of women's education, BNC's serene campus nestled near village Kair, adjacent to Najafgarh, exudes a tranquil ambiance amidst verdant landscapes. The college embarked on its educational odyssey with humble beginnings, offering B.A (Pass) and B.A (Hons.) Hindi programs in its inaugural year. Over the years, BNC has expanded its academic repertoire, pioneering the introduction of diverse courses. Notably, in 1996-97, B.Com (Pass) was integrated into its curriculum, followed by the groundbreaking inception of the Apparel Design and Construction course in 1997, marking a pioneering stride in Delhi University's academic landscape. A significant transformation occurred in 2004 with the replacement of the B A (Pass) course with the more comprehensive B.A. Programme, accompanied by the introduction of a myriad of application-oriented courses. The college further diversified its offerings, evolving into a multifaceted institution with the introduction of the B.Sc Physical Sciences course in 2007, thereby embracing arts, commerce, and science disciplines under its aegis. In a landmark move towards academic reform, BNC embraced the semester system in 2010, facilitating a structured learning environment conducive to holistic skill development. This transition marked a departure from the traditional annual mode, aligning the college with contemporary pedagogical paradigms. Embracing innovation, the college adopted the Four Year Undergraduate Programme (FYUP) in 2013-14, ushering in a new era of interdisciplinary education. However, following directives from the University Grants Commission (UGC), FYUP was subsequently rolled back in 2014-15, leading to the phased discontinuation of Honours courses by 2015-16. Presently, BNC stands as a beacon of academic excellence, offering a comprehensive array of undergraduate programs spanning arts, commerce, and science domains. From B.A Honours in Hindi, History, and Political Science to B.Sc Honours in Home Science and Physics, alongside versatile programs like B.A Programme and B.Com

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Programme, the college ensures diverse avenues for intellectual exploration. Driven by a commitment to nurturing holistic development, BNC boasts a distinguished faculty comprising 76 members dedicated to imparting knowledge and fostering academic inquiry. Complemented by a diligent non-teaching staff of around 40, the college boasts state-of-the-art laboratories, robust infrastructure, and a conducive learning environment conducive to scholarly pursuits and sporting endeavors alike. Since its inception, BNC has etched a resplendent legacy of academic prowess and sporting achievements, underscoring its enduring commitment to excellence in education and holistic student development.

2. UNIVERSITY LIBRARY

Throughout the annals of history, the intertwining of education and libraries has been evident, serving as pivotal conduits for disseminating knowledge and fostering scholarly endeavors. Academic libraries, in particular, stand as vital bastions for teaching, learning, and research by furnishing essential resources. Revered as central hubs of learning, they have been lauded in historical texts and hailed as indispensable components of education, particularly within higher educational institutions. In contemporary times, educational libraries act as dynamic intermediaries between learners and an extensive repository of information, effectively bridging the chasm between classroom instruction and a wealth of informational reservoirs.

The trajectory of human knowledge preservation has undergone notable transformations, notably catalyzed by the advent of movable type printing in the 15th century, revolutionizing the contents of libraries. While traditional paper documents once reigned supreme, advancements in science and technology have ushered in an epoch where electronic multimedia assumes a pivotal role in knowledge preservation across diverse library typologies, including public, academic, and specialized domains.

Since time immemorial, humanity has recognized the imperative of information storage through myriad means, with shifts in reading materials significantly impacting educational accessibility and democratization. This evolution has not only spurred libraries to procure new media but has also augmented their role in actively bolstering academic programs across educational establishments. Notably, the University Library stands as a vibrant and inclusive nucleus of knowledge and resources, catering comprehensively to the heterogeneous needs of its student cohort.
Boasting an expansive collection exceeding 25,000 books, encompassing 7,000 textbooks, and subscriptions to 54 periodicals and 12 newspapers, the library furnishes a fertile ground for academic exploration. Noteworthy among its attributes is its steadfast commitment to accessibility and contemporary technology. Through the Online Public Access Catalog (OPAC), students can effortlessly peruse and locate requisite books, facilitating streamlined browsing and retrieval. Furthermore, integration with N-List and the Delhi University Library System exponentially broadens the spectrum of available resources, ensuring access to cutting-edge research and academic materials irrespective of geographical constraints.

Additionally, the University Library espouses inclusivity and support for differently abled students, providing round-the-clock access to specialized services such as audio CDs, Braille books, and reference assistance. Specially equipped laptops with enhanced features are furnished to visually or physically challenged students, coupled with waivers for insurance fees, emblematic of the institution's commitment to dismantling educational barriers.

The library also solicits feedback and suggestions from its users via a dedicated suggestion box, ensuring responsiveness to the evolving needs of the student community. Regular publications showcasing new acquisitions keep students abreast of the latest additions to the collection, cultivating a culture of perpetual learning and exploration.

3. OBJECTIVES OF THE STUDY

i) To find out the awareness about print and e-resources.
ii) To study the purpose of visiting library.
iii) To analyze frequency in using print and electronic resources among faculties and student.
iv) To find out the purpose of using print and electronic resources.
v) To find out the preferred information source used by undergraduate students.
vi) To find out problems encountered in the use of different information sources.

4. METHODOLOGY

The research methodology employed in this study involves the utilization of a survey method, facilitated by the preparation of a structured questionnaire to gather data from users. To ensure representativeness, a simple random sampling technique was employed for the selection of samples. With a total undergraduate student population of 2000, a sample size of 200 students was selected. This approach allows for the collection of diverse perspectives and ensures that the findings can be generalized to the larger population with confidence. By employing rigorous sampling methods and structured data collection instruments, the study aims to provide valuable insights into the preferences, experiences, and needs of the target audience, thereby contributing to informed decision-making and the enhancement of services offered.

5. ICT & LIBRARY

Information and Communication Technology (ICT) has revolutionized library services and operations, transforming traditional libraries into dynamic hubs of digital information. Through ICT, libraries now offer access to vast online databases, e-books, and digital journals, expanding the breadth and depth of available resources for users. Additionally, ICT facilitates seamless information retrieval and dissemination, enabling users to access academic materials from anywhere with an internet connection. The integration of ICT in libraries enhances user experience, streamlines administrative tasks, and fosters collaboration among researchers and scholars, thus reshaping the role of libraries in the digital age.

Moreover, ICT enables libraries to implement innovative services and initiatives to meet the evolving needs of users. Virtual reference services, digital literacy programs, and online tutorials are examples of ICT-driven initiatives that enhance user engagement and support lifelong learning. Furthermore, ICT facilitates the preservation and digitization of rare and valuable archival materials, ensuring their accessibility to future generations. By harnessing the power of ICT, libraries can fulfill their mission of providing equitable access to information and fostering intellectual growth and innovation within communities.

However, the integration of ICT in libraries also presents challenges such as digital divide, privacy concerns, and information overload. Addressing these challenges requires proactive measures, including digital literacy initiatives, privacy protection policies, and effective information management strategies. Moreover, continuous investment in ICT infrastructure and staff training is essential to ensure the effective implementation and utilization of digital technologies in libraries. Despite these challenges, ICT remains a powerful tool for transforming libraries into vibrant centers of knowledge and learning, serving diverse communities in the digital age.

6. ANALYSIS AND INTERPRETATION OF DATA

After scrutinizing the feedback collected from the questionnaire, the primary objective was to distinguish between print and electronic formats as the main categories of resources. This differentiation is pivotal given that the hybrid library being studied provides users access to both types of resources. Upon identifying the utilization patterns and preferences for various resource formats,

the focus shifted towards understanding the preferences of users, a critical aspect as it directly correlates with the increased utilization of the respective resource. It's important to note that this survey analyzed data collected from both teachers and undergraduate students within the college community, ensuring a comprehensive understanding of preferences across different user groups.

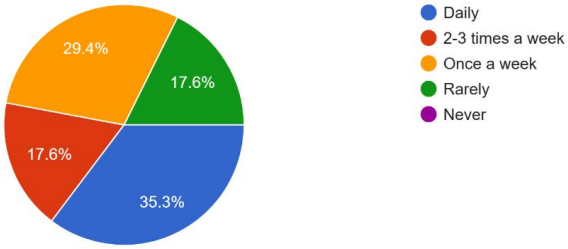

Figure 1: How often do the you visit the college library for academic purpose?

The chart presented above illustrates the frequency with which respondents visit the college library. This data serves as a testament to the significance of the library within our educational institutions, despite the pervasive technologization and the widespread availability of resources online. It underscores the continued relevance and importance of physical library spaces, demonstrating that they remain deeply ingrained in the academic routine of students and faculty members alike.

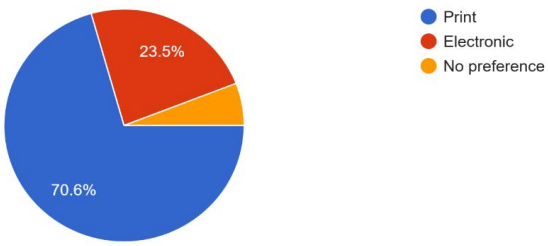

Figure 2: When accessing academic resources for your studies, which format do you prefer?

This question delves into the preferred format of academic resources among respondents, shedding light on their inclinations amidst the myriad options available. It seeks to discern whether individuals gravitate towards traditional print materials or opt for the convenience and versatility of electronic formats. By understanding these preferences, we gain valuable insights into the evolving landscape of academic resource consumption and the ways in which individuals adapt to technological advancements in the pursuit of knowledge.

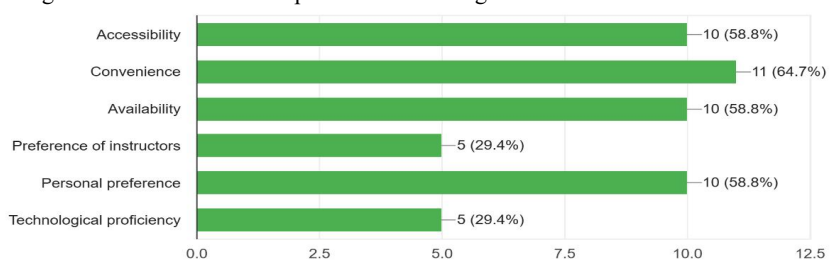

Figure 3: What factors influence your choice of format for accessing academic resources?

Various factors influence individuals' choice of format when accessing academic resources. These considerations encompass a spectrum of practical, logistical, and personal preferences. Practical factors such as accessibility and convenience play a significant role, with individuals often opting for formats that offer ease of access and portability. Logistical considerations, including the availability of resources in a particular format and the speed of retrieval, also sway decision-making. Moreover, personal preferences, such as reading preferences, comfort levels with technology, and individual learning styles, contribute to the choice of format. Additionally, factors like environmental consciousness and cost-effectiveness may influence decisions, prompting individuals to opt for digital formats to reduce paper consumption or to take advantage of free online resources. Indeed, convenience of usage emerges as the primary reason for respondents opting for their choice, as it aligns with their need for efficient access to academic materials tailored to their specific needs and preferences.

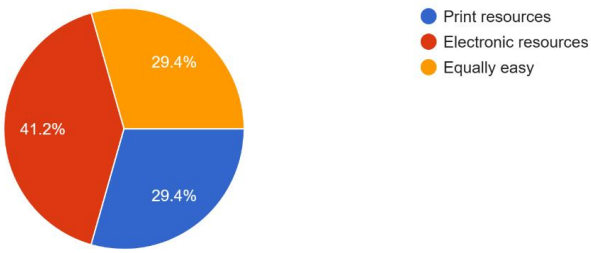

Figure 4: Do you find it easier to locate relevant information using print resources or electronic resources?

This inquiry probes into individuals' perceptions regarding the ease of locating pertinent information across different formats. It aims to discern whether respondents perceive traditional print resources or electronic resources as more efficient in facilitating information retrieval. The responses garnered from this question indicate a prevailing trend: the majority of respondents express a preference for electronic media. This preference likely stems from the convenience and accessibility afforded by digital platforms, which often feature advanced search functionalities and rapid access to a vast array of resources. Consequently, respondents may find electronic resources to be more user-friendly and conducive to efficient information discovery, aligning with contemporary trends favoring digitalization in academia and beyond.

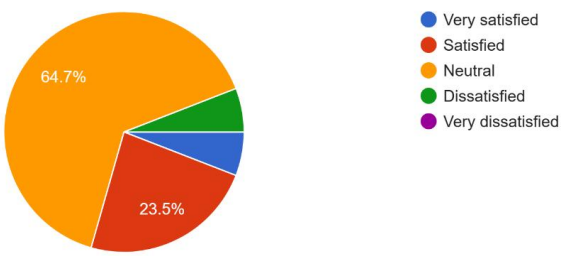

Figure 5: How satisfied are you with the availability of electronic resources (e-books, databases, online journals) provided by the college?

This inquiry delves into respondents' perceptions of the comprehensiveness and accessibility of electronic resources offered by the institution. The feedback gathered from this question aids in

gauging the effectiveness of the college's efforts in catering to the evolving needs of the academic community in the digital age.

Responses to this query are crucial indicators of the extent to which students and faculty members perceive the college's electronic resources as meeting their scholarly requirements.

7. FINDINGS & SOLUTIONS

A survey conducted within the college revealed a significant preference for utilizing digital/electronic resources among approximately 70.6% of the college community during their time in the library. Among the respondents who favored electronic resources, the primary reason cited was convenience. This preference underscores the growing reliance on digital platforms for accessing academic materials and highlights the need for colleges to adapt their library services to meet evolving technological demands.

Further analysis of the survey data revealed additional insights into the preferences and behaviors of college members regarding library resources. A notable finding was that the availability of a wide range of digital resources, including e-books, databases, and online journals, significantly influenced the decision to opt for electronic formats. Respondents appreciated the ease of access, the ability to search for specific topics or titles quickly, and the convenience of accessing materials from any location with internet connectivity.

In response to these findings, college can implement several strategies to enhance the availability and usability of digital resources within their libraries. Firstly, institutions can invest in expanding their electronic resource collections, ensuring they cover a broad spectrum of disciplines and cater to diverse research interests. Collaborating with publishers and subscribing to comprehensive database platforms can provide students and faculty with access to a wealth of scholarly materials.

Additionally, college can focus on improving the user experience of their digital library interfaces. This includes optimizing search functionalities, organizing resources into easily navigable categories, and providing user-friendly access points within the library premises. Investing in robust internet infrastructure and ensuring seamless connectivity within library spaces can further enhance the accessibility and usability of digital resources.

Furthermore, colleges can offer training sessions or workshops to educate students and faculty on effectively utilizing electronic resources for academic research and study purposes. These sessions can cover topics such as advanced search techniques, citation management tools, and strategies for evaluating the credibility of online sources. Even though the availability of information online, users have faith on the traditional library and would continue using the sources. Particularly, the traditional library would continue supporting academic aim, even in the ICT era, which suggest the value of having hybrid academic libraries

Many respondents have also suggested the areas of improvement of library resources and services and these include:

i) Diversification of Digital Resource
ii) Enhancement of User Support Services
iii) Modernization of Library Facilities

8. CONCLUSUON

The evolving landscape of information and communication technology (ICT) has transformed the traditional role of libraries within universities. While ICT has facilitated remote access to academic content, breaking down physical barriers and enabling users to find information online, the feedback received from users suggests a continued preference for print resources over electronic ones. This preference underscores the enduring importance of libraries as repositories of knowledge within

society. Libraries have historically served as custodians of information, gathering and disseminating knowledge in various formats to meet the needs of information seekers. Despite the rapid growth of ICT, users have not forsaken their interest in print resources, highlighting the continued relevance of traditional library collections. However, libraries are adapting to the digital age by embracing hybrid models, integrating both print and electronic resources to better serve the diverse needs of their users. As such, academic libraries are evolving into hybrid libraries, leveraging technology to enhance accessibility and provide a comprehensive array of resources. This transition reflects the dynamic nature of libraries as they continue to fulfill their vital role in supporting teaching, learning, and research within universities.

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Use and Impact of the Modern ICT in SKIMS Medical College, Bemina, Jammu & Kashmir

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ABSTRACT

The role of Medical libraries and librarianship are always changing with the development of new technological gadgets and advancement in medical sciences. The emergence of Information & Communication Technology (ICT) has left a great impression on the growth and development of Medical institutions and their libraries worldwide. Today, the library & information science world is witnessing the ongoing transformation in the availability and accessibility of resources and services at a speed of nanoseconds. Thus, it is important to know the status and usage of ICT in Medical College Libraries. The present study is an attempt to examine the use and impact of the modern ICT in SKIMS Medical College Library. In addition the study also aims to attain the following objectives- To find out the current status of library automation in the SKIMS medical college library, to study the use of ICT and e-resources by medical students, , to determine attitude of medical students towards ICT enabled library, to find out the level of awareness of using these digital information resources; To find out the level of satisfaction of users for existing ICT facilities, to find out the problems faced by library users and staff related to ICT. To fulfill the objectives a small structured questionnaire was distributed among the UG and PG medical students who are visiting the Central library frequently and library professionals through Google form to collect the desired data. Besides this, content analysis was also used to gather the previous data about the topic. The result highlights that librarians support ICT applications in their campuses by maintaining different resources and giving access to various online resources. Most of the respondents believed that ICT is essential for their medical education and research. The findings of the study also reveal that the librarians at the beginning face multiple challenges to support and promote ICT because of the lack of proper training, infrastructure and network facility. At the end, the paper also provides some suggestions for strengthen the healthcare education and research by using ICT.

Key words: *Technological gadgets, Information & Communication Technology (ICT), e-resources*

1. INTRODUCTION

Every second, information is published in various formats through different applications of information technologies. Throughout history, the introduction of information and communication technologies has affected globally on social, cultural,political aspects of life. The emergence of Information & Communication Technology (ICT) is one of the wonderful gifts of modern science and technology and has left a great impression on the growth and development of libraries and information networks worldwide. Today ICT has created many opportunities and challenges in the provision of library and information services in the health sector around the world. The rapid delivery of knowledge-based resources is having an impact on clinicians, researchers, faculty, medical students, pharmicists work and other health related professionals. It is critical for the development and administration of healthcare services to have timely access to accurate and relevant medical information. With web-accessible databases and resources, users can easily search and identify online full-text journals, books, and other sources, and the information is instantly available at the point of

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Chapter 19; S. Hasan, S. Kumar, S. Panda, K. N. Khan & G. Samdani (Eds); PP. 155-161; Synergy Books India, N.D.

need. The users are now becoming more are more versant with technology which has created the environment where the user itself is the creator of the content. The libraries and information networks are playing a vital role in this ICT based society to provide authentically and managed information to their users. The libraries of medical colleges are special kind of libraries and the users of libraries are medical students, teachers, allied staff members and patients, where it is important that the authentic, reliable and more pinpointed information be provided without delay at their doorsteps as the information is concerned to the health of the people. Today, the health and medical educational information resources are very expensive so every library cannot fulfill the needs of the users; moreover, there are other constraints in availability and accessibility of these resources like limited storage capacity, manpower, and day-by-day hike in prices of information resources. Thus, the medical college libraries networks came into existence to solve these problems. The modern medical libraries have started joining hands with various networks to meet the demands of their users.

2. LITERATURE SURVEY

The medical college libraries have a crucial role to play directly in the promotion of medical education and health care and indirectly in various health welfare programmes. An attempt is made to examine how far the medical college libraries of Gujarat have been fulfilling there objectives in recent information and communication technological era. A survey was conducted to find out whether these libraries are fully equipped, to serve the user community in modern ICT era? It also examines how ICT infrastructure facility is available in medical colleges of Gujarat to promote this new proposed adventure of the information network for the betterment of user services and resource sharing. In reply to the question asked about the proposed network of medical college libraries of Gujarat, 61% of the respondents were strongly believe that it will be helpful 23% of librarians agreed that whereas 8% of librarians were neutral and 8% of librarians were not agreed that means majority of librarians feels that the proposed network will help in resource sharing says (Rani & Lal, 2019). Bhatt (2017) conducted a study to find the status of automation and model networking of medical college libraries in Gujarat State of India and exhibits that the medical education aims at developing medical manpower suitable to the needs of the country. Ali, and Gatiti (2020), the COVID-19 pandemic situation in Pakistan highlighted the role of librarian in the educational institutions. The librarian should provide the library services through digital mode along with the traditional library services for the facilitation of users in the schools, colleges, universities & other academic institutions. A recent study conducted by Kalita, Hira (2021) says that Medical colleges are the most essential and responsible institution which has been providing the mankind services to the entire world. During this present situation the medical professionals have been providing their selfishness and tireless services to save the life of the people of this society from the deadly Corona virus. Shariful and Nizamul (2007) in their study discusses about the factors that have contributed to bring about the change from traditional to ICT based library operations. They further added that ICT is needed in libraries for the following two reasons i.e. in terms of various problems faced by the traditional library system and in terms of various facilities provided by computers and related technologies. Krubu and Osawaru (2012) conducted a survey research on the impact of Information and Communication Technology in Nigerian University Libraries. The study draws the impact of ICT on use internet resources, online resources and information and storage retrieval. The intention of the study was to determine the level of automation, the usefulness of ICT resources and the essential skills for using ICT resources. The study exposed that ICT has a massive impact based on its effectiveness (Talab & Tajafari 2012). carried out the survey to recognize and evaluate the impact of ICT on training human resources of library in two university libraries i.e. from India and Iran. The study revealed that ICT training program for library staff was inadequate. Usual training program of ICT should be initiated for library human resources to keep up with ICT rapid development.

3. SCOPE AND OBJECTIVES OF THE STUDY

The scope of the study is limited to the SKIMS Medical College Library. The main objective of the study is to examine use and impact of the modern ICT in SKIMS Medical College Library. In addition the study also aims to attain the following objectives

i) To find out the current status of library automation in the SKIMS medical college library
ii) To study the use of ICT and e-resources by medical students
iii) To determine attitude of medical students towards ICT enabled library,
iv) To find out the level of awareness of using these digital information resources;
v) To find out the purpose and frequency of use of ICT
vi) To find out the level of satisfaction of users for existing ICT facilities,
vii) To find out the problems faced by library users and staff related to ICT.

4. METHODOLOGY

To fulfil the objectives a small structured questionnaire was distributed among the UG and PG medical students who are visiting the Central library frequently and library professionals through Google form to collect the desired data. Besides this, content analysis was also used to gather the previous data about the topic. The result highlights that librarians support ICT applications in their campuses by maintaining different resources and giving access to various online resources. Most of the respondents believed that ICT is essential for their medical education and research.

5. DATA ANALYSIS AND PRESENTATION:

Analysis has been done according to questions of the questionnaire. Simple statistical calculations, tables and figures have been used in analyzing of the collected data. Analysis of the collected data is provided under the following heads.

Table 1: Gender wise and Course wise Distribution of Library Users

Gender	Male		Female		Total Respondents	
Library Users	**Nos.**	**%**	**Nos.**	**%**	**Nos.**	**%**
UG Students	120	48	80	32	200	80
PG Students	30	12	20	8	50	20
Total Respondents	150	60	100	40	250	100

The Table 1 shows the responses of UG students and PG students of SKIMS Medical College as well as gender wise distribution. Among the total number of 250 respondents, 60% were male and 40% were female. As well as out of 250 respondents, 80 % were UG students and 20% were PG students.

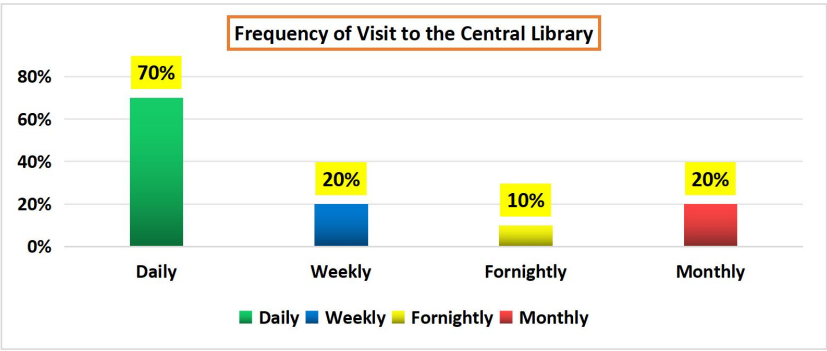

Figure 1: Frequency of Visit to the Central Library

The Figure 1 reveals that frequency of visit of users to the central library is varied. Nearly 70% of the users are such who visited the Central Library on daily basis, followed by 20% users who visited the library weekly, 10% users visited fortnightly, and 20% users visited monthly.

Table 2: Classification scheme and Software used

Schemes	Software used for automation	Automation Status
DDC 21st	KOHA	90%

Table 2 shows that the SKIMS Medical College Library uses DDC 21st edition to classify the books and are using KOHA as library automation software. The table also shows that 90% of the library collection is automated.

Table 3: Modules of automation

Modules	Whether Automated or not
Circulation	Yes
Cataloguing	Yes
Serial control	Yes
OPAC	Yes

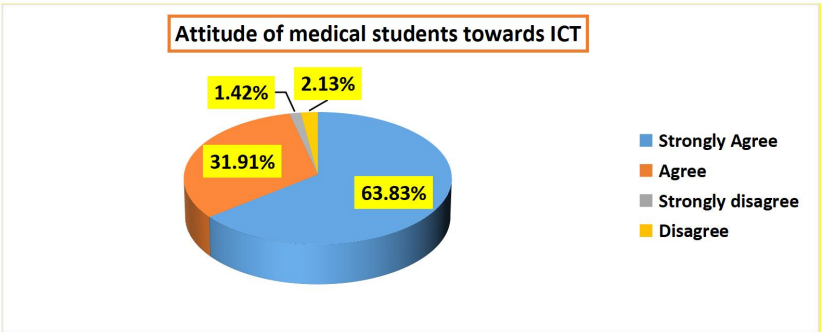

Figure 2: Attitude of medical students towards ICT enabled library

The Figure 2 shows that all respondents were believed that ICT is essential for medical education and research. Out of 250 respondents, 63.83% respondents were strongly agreed and 31.91% respondents were agreed that the ICT is essential for medical education and research, whereas few respondents were mildly disagreed and strongly disagreed as 2.13%, and 1.42% respectively

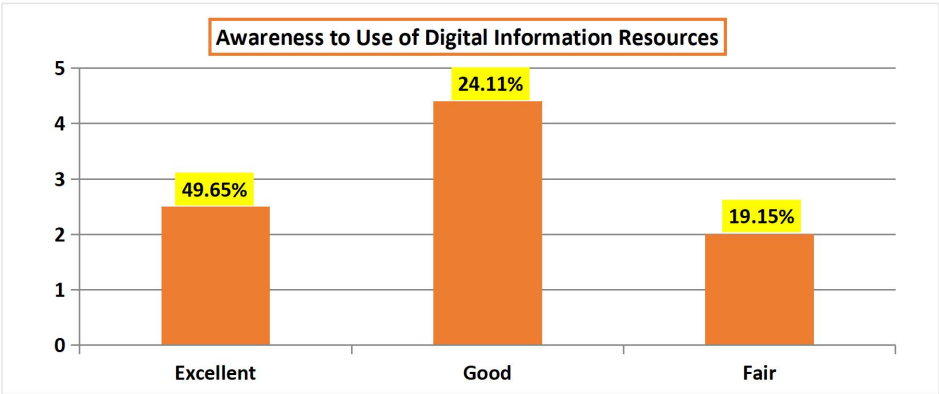

Figure 3: Awareness to Use of Digital Information Resources

The Figure 3 depicts that majority of respondents mentioned their level of awareness of using digital information resources positive. Out of 250 respondents, 49.65% respondents mentioned using ICT as Excellent, whereas 24.11% respondents mentioned good and 19.15% respondents mentioned it as fair.

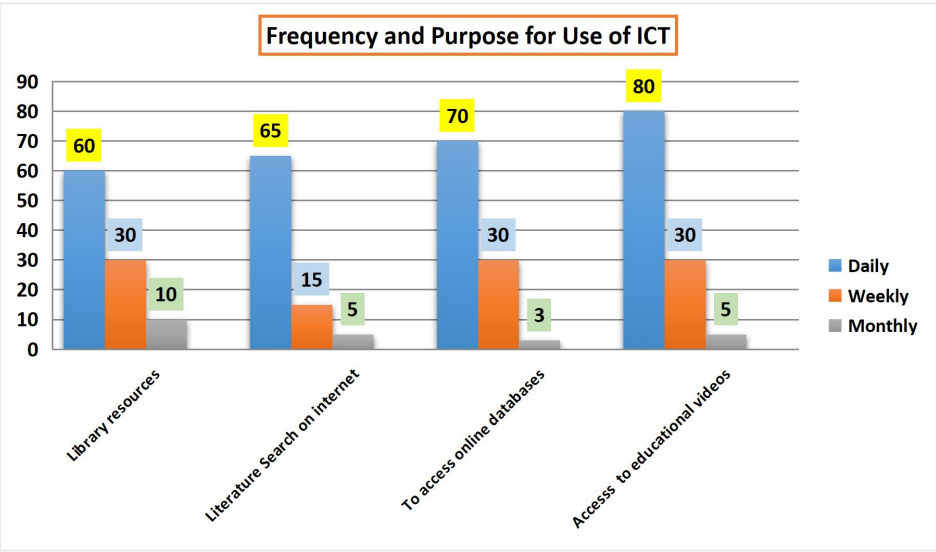

Figure 4: Frequency and Purpose for Use of ICT

The Figure 4 shows that usage of ICT for various purposes preferred frequency was daily followed by weekly. The Figure illustrated that average daily 60%, weekly 30%, monthly 10% respondents are using ICT to access library resources; similarly 65%, 15% and 5% of the respondents use ICT for the Literature search on internet on daily, weekly and monthly basis. Further 70%, 30% and 3 % of the respondents use ICT tools to access online database for their medical education and 80%,30% and 5% of the respondents use ICT to watch online educational videos on daily, weekly and monthly basis.

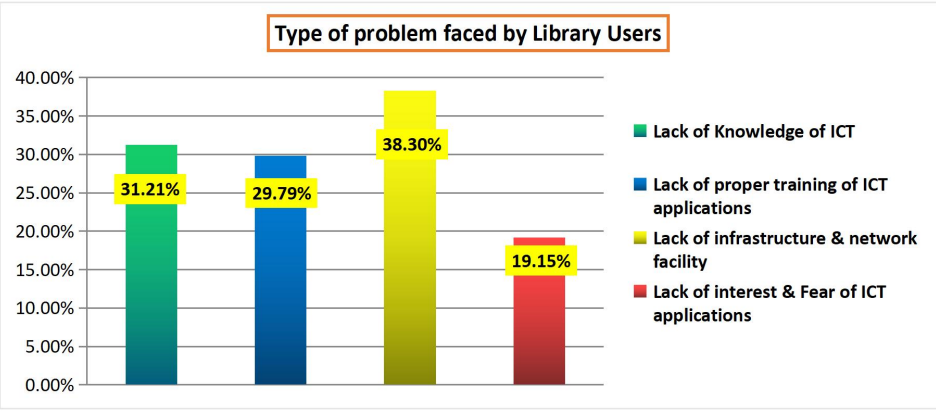

Figure 5: Problem Faced in ICT Use

The Figure 5 shows that 31.21% respondents were faced the problem of lack of knowledge of ICT, 29.79% respondents were suffered from lack of proper training of ICT applications and 38.30% respondents were faced lack of infrastructure and network facility, whereas 19.15% respondents were faced problem related to lack of interest among library staff as well as fear of ICT applications

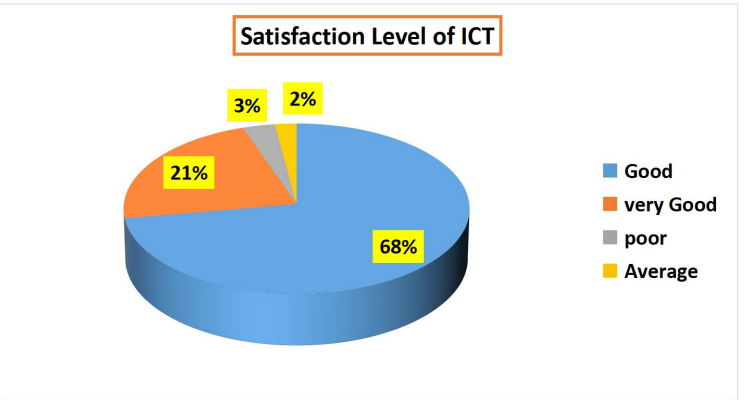

Figure 6: Satisfaction Level of Users for Existing ICT Facilities

Figure 6 reveals that the satisfaction level of use of ICT that 68% respondents were good, 21% respondents were very good, 6% respondents were average, 2% of them poor satisfied, and 3% respondents were very poor satisfied about the level of satisfaction using existing ICT facilities

6. FINDINGS AND DISCUSSION

After a careful analysis and interpretation of the data, the following major findings were noted:

i) Nearly 70% of users were visited to the Central library premises daily. It shows most of the users are using library for various services like circulation, reference, internet and reading facility etc.

ii) More than 90% of the respondents agreed and believed that ICT is essential for medical education and research. The students recognized that ICT tools and techniques should be a part of medical education and research.

iii) 90% of respondents believed that ICT enabled Library services are required and considered it as an integral part of medical education.

iv) The result also shows that usage of ICT for various purposes, the preferred frequency was daily and followed by weekly

v) The highest numbers of the respondents use ICT to watch online educational videos on daily, weekly and monthly basis.

vi) The study showed that nearly one third of users faced problems in use of ICT due to lack of infrastructure and network facility

vii) Most of users are satisfied with use of ICT and existing ICT facilities. The majority of respondents agreed positively about the impact of ICT on library uses and its services.

viii) Needs to established proper internet connection in central library to reduce problem of internet connectivity. Extend Wi-Fi facility in campus to access internet and local area network to decrease problem about accessibility.

7. CONCLUSION

ICT are the part and parcel for the Library and Information Centre's especially medical libraries. Medical libraries are an important part of health care organizations. In the field of medical

science development or invention is growing day by day. So the library professionals of the medical organization should be well informed about the latest technology to provide the latest information effectively and efficiently among the medical communities.LIS professionals should be ready to continuously learn new technological skills and effectively utilize modern technologies. Today, ICT provide gateway to access global resources, hence library have to deliver need based innovative user services to improve user satisfaction and to gain user appreciation along with employer recognition. ICT help to enhance the value of library, status and library job satisfaction. All through, the study made an attempt to examine the usage of ICT services by medical students at central library of SKIMS Medical College & Hospital, Bemina, J&K. The study found that ICT will play major role in medical education and research to provide information to the users. The study also found that most users were privileged to access the huge medical literature available in electronic format. Therefore, the role of librarians and library professionals are shifting from an intermediary to a facilitator.

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Academic Library Resources to Support Entrepreneurship Initiatives

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ABSTRACT

Academic libraries offer a wealth of resources to support entrepreneurship initiatives. These resources include books, journals, databases, and online tools that provide information on various aspects of entrepreneurship, such as business planning, marketing, finance, and management. Libraries also host events and workshops related to entrepreneurship and provide access to specialized collections and services, such as incubators and mentorship programs. By utilizing these resources, entrepreneurs can gain the knowledge and skills they need to successfully launch and grow their businesses. This paper aims to identify and aggregate the variety of resources available on entrepreneurship and how libraries can build their collection to support entrepreneurial initiatives.

Keywords: *Academic Libraries, Entrepreneurship, Library Resources, Collection Development*

1. INTRODUCTION

Entrepreneurship is a Concept

Entrepreneurship refers to the process of identifying opportunities, taking calculated risks, and creating a new business. It involves envisioning a new idea and bringing it to life, often by developing a product or service and building a team to help execute the vision. Entrepreneurship can be achieved by anyone with passion, creativity, and determination, regardless of their background or previous experience. Successful entrepreneurs are innovative problem solvers who can pivot when faced with challenges and stay motivated through setbacks.

In the process of identifying opportunities, business thinkers (entrepreneurs) look at symbiotic relationships and rely on various sources and services including family business options. In the dynamic landscape of contemporary education and business, the symbiotic relationship between academia and entrepreneurship has become increasingly evident. Academic libraries, traditionally known as repositories of knowledge, have evolved into dynamic hubs that not only disseminate information but also actively foster innovation and entrepreneurial spirit. At the heart of this transformation lies the academic library, a multifaceted resource center that plays a pivotal role in supporting entrepreneurship initiatives within the academic community.

As the relationship of information, academic libraries have adapted to meet the evolving needs of students, faculty, and researchers, recognizing the growing importance of entrepreneurship in driving economic development and societal progress. This adaptation involves curating a diverse array of resources that extend beyond traditional textbooks and scholarly articles, encompassing a rich tapestry of materials designed to inspire, educate, and empower aspiring entrepreneurs.

This exploration delves into the myriad ways in which academic libraries serve as catalysts for entrepreneurship initiatives. From comprehensive business databases and industry reports to specialized workshops and networking opportunities, these libraries are pivotal in creating an ecosystem where academic rigor converges with practical application. As we navigate the intersections of academia and entrepreneurship, it becomes evident that the academic library stands as a cornerstone, providing the necessary tools, information, and collaborative spaces essential for cultivating the next generation of innovators and business leaders. This exploration will unravel the diverse dimensions of academic library resources that contribute to and shape the entrepreneurial landscape within educational institutions.

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Chapter 20; S. Hasan, S. Kumar, S. Panda, K. N. Khan & G. Samdani (Eds); PP. 162-166; Synergy Books India, N.D.

2. LIBRARY RESOURCES FOR ENTREPRENEURIAL INITIATIVES

Library resources for entrepreneurial initiatives are essential in providing the necessary knowledge, tools, and support for individuals venturing into the world of entrepreneurship. Here are some key library resources that can significantly aid in fostering entrepreneurial endeavors:

2.1. Business Databases:

Business databases are essential resources for entrepreneurs looking to start a business. These databases provide valuable information on market trends and industry-specific data that can help entrepreneurs make informed decisions. Subscription-based databases offer a variety and wealth of information about demographic profiles, financial reports, and industry-specific data. Databases such as IBISWorld, Statista, and Business Source Complete provide access to a vast array of business-related content (Benjamin et al., 1999). CMIE ProwessIQ, CMIE Economic Outlook, Tracxn, Primedatabase, Capitaline Databases, and Marketline Database are some of the key business databases that provide statistical and contextual data related to different companies and are being used globally for business decision-making.

2.2. Business Plans and Case Studies:

Libraries often house a collection of business plans and case studies from successful entrepreneurs. These resources serve as valuable templates and guides for understanding real-world business challenges and solutions.

Table 1

Name of the Publisher	Scope & Coverage	Access Mode
Harvard Business Publishing	The HBS cases are based on research and come from a variety of industries and disciplines, including Accounting Business & Government Relations, Business Ethics, Economics, Entrepreneurship, Finance, General Management, Human Resource Management, Information Technology, International Business, Marketing, Negotiation, Operations Management, Organizational Behaviour, Sales, Service Management, Social Enterprise, Strategy.	https://hbsp.harvard.edu/cases/
Darden Publishing	Darden offers a range of case studies, textbooks, and other educational materials to help professionals learn new skills and stay up-to-date in their fields. Some of their most popular case studies cover topics such as business strategy, marketing, and leadership.	https://store.darden.virginia.edu/
Ivy Publishing – Ivy Business School	Ivey Publishing is the leader in providing business case studies with a global perspective. With over 39000 products in the Ivey collection	https://www.iveypublishing.ca/
Emerald Publishing	The Emerald Publishing is known for its high-quality journals, books, and conferences. Publishing a business case involves presenting a real-world problem and proposing a solution that the organization has implemented successfully	https://www.emeraldgrouppublishing.com/explore-our-content/case-studies
Sage Business Cases	Sage Business Cases is a digital collection of business cases tailored to library needs - providing faculty, students, and researchers with unlimited access to more than 6,150 authoritative cases	https://sk.sagepub.com/cases
Indian School of Business Cases	Indian School of Business (ISB), Its cases cover a wide range of industries, including technology, healthcare, finance, and retail, and are based on real-world scenarios that enable students to apply theoretical concepts to practical problems.	https://cases.isb.edu/

The above resources are large-scale business case studies publishing brought out by major publishers. Other than these, Individual business schools also publish case studies on different areas. An example includes Indian Institute Management Bangalore (IIMB) (*https://www.iimb.ac.in/iimb-research/case-studies*), Indian Institute of Ahmedabad Cases (*https://cases.iima.ac.in/*), Indian Institute of Management Cases (*https://application.iimcal.ac.in/case-studies-lists*). Many other management schools also publish case studies and make it available in the public domain or privately.

2.3. Entrepreneurial Books and Journals:

Libraries maintain a collection of books in various disciplines. The institute imparts entrepreneurial courses and builds library collections mandatorily to develop a business mindset. A dedicated section featuring books on entrepreneurship, business strategy, and start-up success stories can be a treasure trove of insights. Kamien (2010) argued that potential entrepreneurs should have access to access to books that give learning to well-known lessons about successful entrepreneurs and motivate them by learning by doing principles. Print and electronic journals like the Harvard Business Review and Entrepreneurship Theory and Practice contribute cutting-edge research and practical knowledge.

2.4. Intellectual Property Resources:

In the dynamic landscape of entrepreneurship, leveraging intellectual property (IP) resources is essential for fostering innovation and safeguarding business interests. Entrepreneurs can capitalize on various intellectual property tools, such as patents, trademarks, copyrights, and trade secrets, to protect their unique ideas, products, and brand identities. Access to a robust set of intellectual property resources empowers entrepreneurs to establish a competitive edge, attract investors, and navigate the complexities of the market. Additionally, staying informed about IP laws, engaging with relevant authorities, and considering strategic partnerships can further enhance the effectiveness of intellectual property management, fostering a conducive environment for sustained entrepreneurial success. Libraries offer resources on intellectual property, including patents, trademarks, and copyrights. Understanding and protecting intellectual property is crucial for entrepreneurs, and these resources guide the legal aspects of innovation. The below table identifies some of the key IP-related resources quite helpful in entrepreneurial activities.

Table 2

Sr. No	IP Resources	Link
1	IP India	https://www.ipindia.gov.in/
2	US Patent & Trademark Office	https://www.uspto.gov/
3	European Patent Office	https://www.epo.org/en
4	Japan Patent Office	https://www.jpo.go.jp/e/
5	IP Australia	https://www.ipaustralia.gov.au/
6	Korean Intellectual Property Office	https://www.kipo.go.kr/en
7	China Intellectual Property Administration	https://english.cnipa.gov.cn/
8	Eurasian Patent Organization	https://www.eapo.org/en/
9	World Intellectual Property Organization (WIPO)	https://www.wipo.int/

Patents play a crucial role in entrepreneurship by providing legal protection for inventions. They grant inventors exclusive rights to their inventions for a limited period, typically 20 years. This exclusive period allows entrepreneurs to profit from their inventions without fear of others copying or stealing them leading to economic growth (Gould & Gruben, 1996; Somaya & Teece (2021). Many libraries provide access to online learning platforms such as Lynda.com or Coursera, which offer courses on entrepreneurship, business development, and leadership skills.

2.5. Market Research Reports:

Access to market research reports can be instrumental in understanding industry landscapes, consumer behaviour, and emerging trends. Libraries often subscribe to services that provide comprehensive market intelligence. Librarian collaboration with business entrepreneurs quite helpful in assessing the needs of market research reports to make decisions on initial preparation for entrepreneurial activities (Fieldman, 2014). The key resources which are quite helpful in analysis of markets are cited below.

Table 3

Sr. No.	Resource Details	Scope
1	ABI Inform	Industry Focussed Market Research Reports
2	Business Source Complete	Includes Market Research Reports with more strength on consumer research
3	EIU CityData	EIU CityData is a market-leading database of global pricing information
4	EMIS International	Collection of news and financial information for over 100 emerging market countries in Africa & the Middle East, Central and Eastern Europe, Southeast Europe, Central Asia (Caucasus) and Asia, and Latin America
5	Euromonitor	Provides data analysis in the form of country, company, industry, economies, and consumer reports
6	Bloomberg Financial Data	Bloomberg is a financial data and software provider that offers a range of tools for analytical, risk management, and trading purposes.

2.6. Networking Events and Workshops:

Libraries frequently organize networking events, workshops, and seminars with industry experts and successful entrepreneurs. These events offer opportunities for aspiring entrepreneurs to connect with mentors and gain practical insights. Hackathon, ideathons, Pitching, and innovation competitions are some of the examples that provide foundations for entrepreneurial activities (Rusko et al., 2017).

2.7. Access to Funding and Grants Information:

Entrepreneurs can access funding and grants from various sources, such as government agencies, venture capitalists, angel investors, and foundations. Libraries may compile information on funding opportunities, grants, and venture capital resources, helping entrepreneurs explore financial avenues for their projects. Some of the key agencies in India support entrepreneurs by funding the projects for their start-ups.

Table 4

Sr. No.	Source	Name of Scheme
1	Ministry of Electronics & Information Technology Scheme	Support for International Patent Protection in Electronics & Information Technology (SIP-EIT)
2	Ministry of Science & Technology Scheme	High Risk - High Reward Research
3	Ministry of Finance Scheme	Sustainable Finance Scheme
4	Ministry of Food Processing Scheme	Research & Development in Processed Food
5	Ministry of MSME Scheme	Enhancement of Competitiveness in the Indian Capital goods Sector
6	Ministry of Textile Scheme	Research and Development in Textile
7	Ministry of Commerce and Industry Scheme	Participation in International Fairs and Exhibitions with Tea Board
8	Ministry of Defence Scheme	Technology Development Fund
9	MeiTY Startup Hub	Gen-Next Support for Innovative Startups (GENESIS)
10	ATAL Innovation Mission	Rapid Innovation and Start-up Expansion (RISE)
11	BIRAC Supports for Startups	Social Innovation programme for Products: Affordable & Relevant to Societal Health

(Source: https://www.startupindia.gov.in/content/sih/en/government-schemes.html)

2.8. Technology and Innovation Labs:

Some libraries house technology and innovation labs that provide access to cutting-edge tools and equipment, fostering a hands-on, collaborative environment for entrepreneurial projects. Now-a-days the trends of incorporating maker space in the library is increasing very fast. Many successful

cases illustrates that the academic libraries with innovation labs within library can foster experimental scholarly communication through partnership (Fletcher, 2021; Hernández-Pérez et al. 2022).

2.9. Librarian Expertise:

Librarians are valuable resources themselves. They can guide individuals in navigating the available resources, conducting effective research, and maximizing the use of library services, outreach activities, and developing strategic plans are essential to support entrepreneurial initiatives (McDonald, 2010; Leonard & Clementson, 2012).

In leveraging these resources, aspiring entrepreneurs can tap into a comprehensive knowledge base that extends beyond traditional academic materials, equipping them with the skills and insights needed to navigate the challenges of the business world.

3. CONCLUSION

It is pertinent that there are quantum resources available for use by entrepreneurial activities. The availability of the resources can be categorized into databases, statistical databases, journals, market research reports, intellectual property management, and business plan and cases. Identification of the resources at the right time of the need is crucial for libraries to serve their users better. Along with the resources, networking events, seminars, and workshops, are quite useful.

Academic libraries can play a crucial role in supporting entrepreneurship by providing access to relevant resources, skills training, and networking opportunities. Libraries can partner with other entities such as incubators, startup accelerators, and business schools to create a comprehensive ecosystem that supports entrepreneurship. Moreover, libraries can advise on new technologies, such as data and analytics tools, to provide data-driven insights for entrepreneurs. Overall, the paper highlights the need for academic libraries to adopt a proactive approach in supporting entrepreneurship, by providing the necessary resources and services to empower entrepreneurs to achieve their goals.

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Media and Information Literacy Empowers Knowledge Democracy and Education 4.0: An Overview

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ABSTRACT

We are going through the industrial revolution 4.0 in the media world. The formal and informal teaching and learning process is becoming attractive and interactive through multiple media formats. The technologies of media communication, education, and entertainment are centered on students and ordinary citizens. The changes in technology, media, and society require media and information literacy to develop critical thinking and media skills that will enhance democratization and civic participation. Learning is a process, and the economy is a system. The base of nation-building is the economy, and the economy depends on products and services. In the present scenario, teaching and learning are becoming ICT-oriented. Thus, digital content is a product, and innovation-by-learning is a service to society. Innovation comes out of learning. Modern media society is providing an edgeless media platform for learning, sharing, and understanding new ideas for innovations. In the digital world, huge amounts of information are available in various formats of media, but it has no value if people are not able to critically evaluate the media messages for the appropriate outcome. This is the reason Media and Information Literacy (now named the MIL Alliance) is considered to empower the nation's knowledge, democracy and education.

Keywords: *Media and Information Literacy, Knowledge Democracy, Education 4.0, Media Technologies*

1. INTRODUCTION

Education 4.0 as per Caballero-Morales et al. (2020) and Costan et al. (2021) is a pedagogical method that is in line with the Fourth Industrial Revolution. It integrates a personalised, technology-aware, dynamic approach to learning. It makes use of technology to provide people the abilities and information need to prosper in a world that is changing all the time. Now days the teaching and learning methods in education are based on media technologies, viz., mobile phones, digital radio, kindles, the internet, and applications like Facebook, Whatsapp, etc. The technological revolution enhanced Education 4.0 with robotics, artificial intelligence, blockchain technology, the Internet of Things (IoT), digital storytelling, virtual reality (VR), and augmented reality (AR), as well as kinetic bikes, RFID (radio-frequency identification), and smart technology. The implementation of current and emerging technologies combined with innovative pedagogical procedures and best practices is known as Education 4.0 (Miranda et al., 2021).

The Ministry of Education, Government of India has launched a number of programmes to adopt this new educational paradigm like SWAYAM, E-Pathshala, DIKSHA, National Digital Library of India, The National Mission on Education through Information and Communication Technology (NMEICT). The concept of Education 4.0 is still in its early stages to be implemented in education system in India, but it has the potential to revolutionize the way we learn and teach. It is an exciting concept that could have a major impact on the future of education. The government of India is also actively working to promote education 4.0 in the country. The new education policy, i.e., National Education Policy (NEP) 2020, aims to promote the use of technology in education so as to provide students with the skills they need to empower themselves in the digital economy.

The new learning methods, innovative educational and management tools, and smart infrastructure with new and emerging ICTs will improve knowledge generation and information transfer processes (Miranda et al., 2021). Although there is a need to address challenges like lack of ICT infrastructure in educational institutions, access to technology, lack of digital literacy and skills and training for teachers, the digital divide, data privacy, and security, The exponential growth of

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media information and its extensive use, the focus on lifelong learning, and the demand for highly skilled teachers and trainers are required to make students more media literate. It is supposed that students are prime users of media technologies and are accessing the desired information through a variety of media formats.

In institutions, library and academic culture are equally responsible for developing students' critical thinking skills to access, analyze, evaluate, and use media messages to develop themselves into future media teachers and trainers. MIL is inevitable to survive and thrive in the digital world. It enhances the insight of individuals and communities to build competitive societal intellectual capabilities and equal opportunities for everyone in a digital democratic society.

Media and information literacy are being tooted and hyped globally. The Universal Declaration of Human Rights Article 19 of the United Nations states that 'Everyone has the right to freedom of opinion and expression; this right includes the freedom to hold opinions without interference and to seek, receive, and impart information and ideas through any media, regardless of frontiers'. Media and Information Literacy (MIL) (now named the MIL Alliance) equips citizens with the competencies needed to seek and enjoy the full benefits of human rights. Media literacy is justified by recognizing the vital role of information in the development of democracy, cultural participation, and active citizenship. Media literacy is also justified by acknowledging the sheer quantity of media exposure in the lives of children and youth, where entertainment and popular culture messages serve as agents of socialization.

Concerns about global workforce development also drive an interest in media literacy, where digital communication tools are beginning to be used to engage the literacy development of underemployed or unemployed youth. Media literacy is increasingly a part of literacy education in both informal and formal settings. (Hobbs, 2007) Modern media technologies, viz., mobile phones, digital radio, kindles, the internet, and applications like Facebook, Whatsapp, etc., are strong tools for the practice to survive with human rights. Media has its own magnetism to connect with information through media messages.

The best part of modern media is that it has been used by all communities, from greengrocers to students of higher education to research scholars. The media ill-iterate community is operating the media unknowingly through trial and error methods and using it enthusiastically for entertainment and communication purposes, while the students are using the media as a handy information tool to enhance and empower their knowledge to survive in this cutthroat competitive world. The purpose of being information and media literate is to engage in a digital society; one needs to be able to use, understand, inquire, create, communicate, and think critically. The exponential growth of digital information and its extensive use, the focus on lifelong learning, and the demand for highly skilled teachers and trainers are required to make the students more literate about how to access relevant information by using different media and to emphasize developing their intrinsic skills to enhance their capability to make the right approach to succeed in their academic and professional endeavors.

Students are major users of media technologies and are benefiting from accessing desired information through a variety of media formats and search engines. Students are increasingly dependent on the web for their educational material needs, like assignments, syllabus content, project work, questionnaires, etc. Media and information literacy is a fierce concept in society and particularly in education. Various kinds of definitions have evolved so far since the concept came into existence.

Information literacy is a means to "empower people in all walks of life to seek, evaluate, use, and create information effectively to achieve their personal, social, occupational, and educational goals" (Alexandria Proclamation, 2005). Whereas, media literacy implies having access to the media, understanding the media, and creating or expressing oneself uses the media (Buckingham, Livingstone, 2005).

2. MEDIA AND INFORMATION LITERACY (NOW NAMED AS THE MIL ALLIANCE)

The first systematic definition of media literacy was propounded in 1978 by Sirkka Minkinken as "media literacy aims to improve skills in cognitive, ethical, philosophical, and aesthetic issues" Conceptually, media and information literacy (MIL) is a fusion of many types of literacy, and their competency values, viz., access, evaluation, and use, are the same and are evaluated more or less

with the same indicators. Media messages encode information in different formats, viz., printed, electronic, digital, images, sound, etc.

Media literacy is the process of decoding messages into meaningful information and applying critical thinking and evaluation for the benefit of an individual's knowledge. Information literacy and media literacy are traditionally seen as separate and distinct fields. UNESCO's strategy brings together these two fields as a combined set of competencies (knowledge, skills, and attitude) necessary for life and work today. MIL considers all forms of media and other information providers, such as libraries, archives, museums, and the Internet, irrespective of the technologies used. It has also been explained in a European Commission study on current trends and approaches to media literacy in Europe that the aim of media literacy is to increase awareness of the many forms of media messages encountered in everyday life. It should help citizens recognize how the media filters their perceptions and beliefs, shapes popular culture, and influences personal choices. It should empower them with critical thinking and creative problem-solving skills to make them judicious consumers and producers of content.

3. GLOBAL PERSPECTIVES OF MIL

The Alexandria Proclamation (2005) stated that information literacy empowers people from all walks of life to seek, evaluate, use, and create information effectively to achieve their personal, social, occupational, and educational goals. Media literacy is the ability to understand and evaluate embedded information in various kinds of formats and gadgets like audio and visual symbols received via television, radio, computers, newspapers, magazines, and, of course, advertisements every day and to create personal meanings from them, which depends on an individual's insight.

According to Gloria J. Leckie and Anne Fullerton (1999), stated that Media and information literacy is self-directed learning. Horton and Forest Woody (2007) expressed that a media literate person should have enough understanding and skills to evaluate the information in various kinds of formats, e.g., PDF, HTML, text format, JPEG, JIF, etc., and they should have the ability to extract the actual message from media.

Lian, and Theng (2011) described that Singapore youth's awareness of media literacy skills is more exposed to new media as an entertainment and communication choice, and the overall level of skills acquired was fair. The students were developing media literacy skills more for media consumption than creative expression and production. Whereas, research findings of Moraes et al. (2022) show that increased use of augmented reality, simulation, the Internet of Things, and virtual reality is more prevalent at higher education levels.

However, these students were not comfortable with rapidly changing technologies, resulting in a lack of media production skills to enable them to produce meaningful media content confidently. The Paris Declaration 'Media and Information Literacy in the Digital Era' held in Paris from May 27–28, 2014, emphasized that MIL is the need of the hour in the digital world where digital information is overloaded. Social media is creating an environment for public participation globally in this digital age. The growth of digital content with new media technologies is an ever-growing process; simultaneously, media and information literacy awareness are imperative to educate the citizens for knowledge democracy.

The declaration highlights the global participation of stakeholders, which includes media, information, and ICT companies' involvement in media and information literacy through corporate social responsibility (CSR), the contributions of journalists, libraries, audio-visual authorities, the MIL research community, civil society, etc., to fill the media and information literacy gap and utilize the media effectively and ethically.

4. USES OF MEDIA TECHNOLOGIES

Media literacy relates to all media, including television, radio, mobile phone, recorded music, print media, the Internet and other new digital communication technologies. The use of computers is common. Mobile cell phones, the internet, and social media technologies are changing the scenario of education as well as the social system. The pedagogical practices are also being revolutionized due to the excessive use of digital content and media advertisements. Teaching through media aids in enhancing the intrinsic skills, capabilities, and attitudes of the students to access, evaluate, and use the

information. Media literacy students' approach is more appropriate for accessing the information and applying critical thinking to the information retrieved.

A trend in social media is becoming popular and spreading throughout society in general and academics in particular. Social connection and interaction via web-based social networking technologies are being multiplied, along with information sharing through multi-way communication. Face book, Twitter, YouTube, Linkedin, Myspace, whats Apps messages and LIS links are some of the well-known interfaces / facilities which allows users to use, produce and reproduce information.
Social media resources and educational media resources are being used for social and academic purposes, respectively. Academic media resources, viz. notice boards, content management systems, e-learning suites, etc., are restricted to the general public for sharing and creating information on their own. However, social media technologies in the education system may be fruitful for sharing information in the academic system.

Every day, new contents are uploaded, and the listed courses are repeated five times in a day so that learners can choose the timing of their convenience. This robust system is enhancing the credibility of the courses, especially when the Choice-Based Credit System (CBCS) education model is being followed in the institutions for improving the knowledge, skills, and attitude of the learners. This very special education at all levels, from standard 9th to postgraduate, is for the learners located remotely, with IT infrastructure disadvantaged and deprived of joining the mainstream of learning due to other reasons. In the present scenario, numerous media formats are being used to access the information with a variety of tools and technologies.

In this perspective, SWAYAM, a MOOC developed by the Ministry of HRD, is a milestone in the arena of academic improvement on three fundamental principles of education policy: access, equity, and quality. The service is being provided to the public through 32 DTH channels called 'SWAYAM Prabha' dedicated to telecasting the courses.

5. ABUSE OF MEDIA TECHNOLOGIES

Frequent use of media technologies and digital content is not a certification that the person is media literate. Lack of awareness of MIL causes harm to a person if he or she is not able to analyze the information, whether it is retrieved from an official or unofficial source.
There is huge digital information available over the web that misguides and misleads the students. Media information has its own merits and demerits. Various kinds of commercial frauds in education, like admission, placement, training, immigration, foreign collaboration, and educational awards, are flourishing due to a lack of media literacy.

Advertisement agencies are producing discomposed media messages through the advertisement of duplicate products and fake services on behalf of the fraud companies. Misleading and misguiding messages and information about students' education environments is dangerous for their future endeavors. Hence, this needs a special kind of awareness to access, evaluate, and use information, which is called media and information literacy.

6. CONCLUSION AND SUGGESTIONS

In modern society, media has an impact on empowering people's tacit knowledge. Media and information literacy is an emerging field, as students are devoting 5 to 6 hours daily to exploring information and are also media dependent for their course material, communication, information sharing, discussions, entertainment, day-to day activities, etc. The significance of being information and media literate is to engage in a digital society; one needs to be able to use, understand, inquire, create, communicate, and think critically.

The transformative nature of media and information literacy includes creative works and creating new knowledge; to publish and collaborate responsibly requires ethical, cultural, and social understanding. The introduction of media and information literacy curricula in the formal education system makes individuals independent in using relevant information at the right time through the right media by applying the right critical thinking. A suitable culture needs to develop by motivating individuals and groups in society to access accurate and timely, trusted information from the media. Create an environment where a holistic approach to media and literacy is highlighted.

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Societal Impact of Library and Information Science Concepts in Dewey Decimal Classification Scheme: Reflected in INB

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ABSTRACT

The study delves into the evolving landscape of Indian publications within the realm of library and information science, acknowledging books as reflections of societal shifts. It focuses on the Dewey Decimal Classification (DDC) Scheme, a pivotal organizational tool for knowledge. With a spotlight on class 020 (Library and Information Science), the research examines its progression from the 21st to the 23rd edition of DDC, exploring how technological advancements have influenced its expansion and terminological alterations. By scrutinizing books listed in the Indian National Bibliography (INB) from 2011 to 2020, the study unveils the societal impact on classification systems and the emergence of new concepts. Methodologically, the research thoroughly analyzes the 21st, 22nd, and 23rd editions of the DDC scheme, elucidating the changes therein. Findings indicate a noticeable evolution in library and information science concepts, evident in the increased usage of terms like semantic web and information retrieval, mirroring technological progress and shifting content dimensions in documents.

Keywords: *Dewey Decimal Classification, Library and Information Science, Indian National Bibliography (INB)*

1. INTRODUCTION

Books are the mirror of society. Book represents the thinking process of authors which comes from the practical life. Keerthika, S. (2018) "Society forms the bond of association between man and man through communicating that the poet or writers to pursues." As per Keerthika, S., the purpose of literature is to influence human thought and feelings. Literature portrays involvement of people, culture. One can observe the society through literature. Literature records real event from real experienced life and converts into fiction and presents it in front of society. It acts as an interpreter of society and societal change. Society came from the Latin term 'Socius' means friendship or companionship. Society refers to the collection of individuals. Relationship is an important factor of society. According to Melver "society is a web of social relationships" (MacIver, 1931). Maclver also says that society is also build on the basis of social likeness, kinship. Religion is the essential elements to constitute society. Social change is associated with 'evolution' and 'progress'. Sociology indicates rapid change in society. Changes of society means changes of culture, social structure, art, religion, values, human behavior etc. Progress indicates direction of change and has certain goal. Evolution indicates modification of part. Sarvaes, J (2011) articulated that social change mainly noticed in developing countries. He pointed out social change as significant change of structured social action or culture in given society and community. Sarvaes specified in his article the dimension of social change and divided into four types-Space, Content, Time, Impact. Books are the reflection of societal development, technological advancement and other specific changes. Publications interpret the current condition and situation of a particular country.

The tool is used to arrange publication is Dewey Decimal Classification Scheme, is an almost enumerative classification scheme that was first published in the United States by Melvil Louis Kossuth Dewey in 1876. Dewey Decimal Classification (DDC) scheme is continuously revised with knowledge and it is knowledge organization (Mitchell, 2001). The DDC is updated continuously in the Dewey editorial office at the Library of Congress under an agreement between OCLC Forest Press and the Library of Congress. The scheme was expanded through number building, increasing

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intention, interoperability translation, association with categorized content, and mapping to another subject scheme. More than 138 countries used this widely used classification scheme for their libraries (Mitchell, et.al. 1996). Schedules and tables are reviewed, revised, and evaluated by Decimal Classification Editorial Policy (EPC). The degree of change varies depending on priorities and current thoughts. The arrangement of schedules, classes, and tables is also changed with revision. Manual is arranged in Volume 4 of 21st edition whereas in 22nd edition it was situated in Volume 1. 000 class was denoted in 21st edition as Generalities class but in 22ndedition, it was named as Computer Science, information and general works and in 23rd 000 were as Computer Science, Information & General works. The term "Paranormal phenomena" was removed from the 100 class. 500 class in 21st edition denoted as Natural sciences and mathematics but in 22nd edition 500 class reflected as Science. 22nd edition somewhat emphasized agglomeration.The term auxiliary disciplines were also removed from the 900 class in the 22ndedition. Addition and removal of entries in DDC may have particular reason. The new arrival of topic is being added and obsolete topic is being removed from classification scheme.

Indian National Bibliography has been taken for this study where year-wise publication of Indian books listed and that is available for public annually and also in monthly volume. Only annual volume was considered for research. Indian National Bibliography is an authoritative bibliographical record of Indian publication covering bibliographical description in 14 languages, published by Central Reference Library, Ministry of Culture, Government of India. It reflects cultural diversity of Indian language. INB plays very important role in the world. It is very popular among few common bibliographies. As per Maitrayee Ghosh (2009) "bibliography is affected by degree of sluggishness" means it is not up-to-date, which implies delayed in entry in INB. She also highlighted INB as incomplete bibliography. All publications in India are not under coverage of INB. There are some importance of INB that are mentioned in the website of INB. It is a record of country's intellectual output and a source of material of subject bibliographies. It is a book selection tool for librarian and wide publicity for books and publishers. It provides guides in classification also. It represents the changes of social structure by examining the changes the area of book mostly published. Consequence upon the social change, publication of books has been done, content of the book reflected socio cultural political views of society. Prof John Feather, Pro-Vice-Chancellor at Loughborough University wrote an article "Book Publishing and Social Change" in 1997 where he said "Books have had, and continue to have, a vital cultural, educational and iconic role in Western and Western-influenced societies." He also scared about the printed form of the books. He also said that literary society is moving away from the printed books.INB has three parts i.e. classified part, author and subject Index and title index. The entries of classified part are headed by chain indexing and subjects entries in INB are classified as per DDC (22nd Edition) and also by Colon Classification Scheme (6th edition). If same subject books are repeated, it is arranged alphabetical order. If same author is repeated, name of the author is not repeated. The INB started publishing from 1958. The first two volumes of INB were published quarterly and then it was cumulated annually. There are no publication of INB in 1968, 1969 and 1970. From 2000, all annual volumes and monthly volumes are available for sale. INB started digitized from 2000. LIBSYS software and GIST technology was used. The software was running in UNIX platform and GIST terminals were used for making entry. After upgradation LIBSYS (LS Premia) is used. INB listed only those materials which are received by National Library. The excluded items are-a) Maps b) Musical scores c) Periodicals and Newspapers (except the first issue of a new periodical and the first issue of a periodical under a new title) d) Keys and Guides to Textbooks e) Ephemeral and other such materials.

The study is concentrated on the revision of class of 020 i.e. Library and Information Science of the last three editions of schedules of DDC with societal change and with the new term arrival which reflected in INB.

2. LITERATURE REVIEW

Ghosh, M., (2009) Diversity of culture in India reflects divergence in language. A country with several languages faces difficulties to create authoritative bibliographical records. Scripting of multi—language, this strenuous work, is being performed by Indian National Bibliography by preparing bibliography on 14 major languages in India i.e. Bengali, Assamese, Oriya, Tamil, Telegu, Kannada, Malayalam, Marathi, Gujrati, Hindi, Sanskrit, Panjabi, Urdu and English documents

received from National Library Kolkata as per DB Act (1954). Objectives of INB are to list publication of documents for present and future generation and researcher. Two areas have been analysed for study i.e. existing situation of INB and present condition of INB comparing with the status of other bibliographies. The structure of bibliography and year wise distribution of entries on the issue of published INB has been displayed in the paper. This paper highlighted availability, issuing agencies and format of National Bibliography of different countries and the drawback of INB i.e. low coverage, delay in entry, lack of online accessibility, less subscriber of INB, lower popularity. Co-operation within professional community and technological advancement are the solution to solve the inadequacy of INB. The thought of Holmberg, K., Bowman, S., Bowman, T., Didegah, F., & Kortelainen, T. (2019) societal impact referred to all types of impact beyond scientific impact. It is assessment of science, technological, environmental benefit of research. Projects like SIAMI/ERIC in 2012 have identified quantitative and qualitative indicators for measuring research impact. This paper also discusses about so many projects/ framework which could assess the social impact. Altmeric study can assess the study of impact on social media. The authors concluded with the point the social impact of research can be considered as outcome of research. Alberecht, M. C. (2005) said about society reflection, influence and control on literature. He articulated literature reflected ethos of culture, class struggle and social facts.Bochner, S. (Ed.). (2013) mentioned human beings as 'social creatures' in his book. Cultural homogeneity shows in a particular group. Creation of individual from different culture is also different from persons belong to another culture.Person's outcome score varies on socio-economic culture of the community. Learning society is synonymous term of knowledge economy. Formal and informal channel of output depends on socio-economic status of person. (Willms, J.D., 2001)

3. OBJECTIVES

Library and Information Science concepts are being changed with the changing of time, social and technological development and the invention of new concepts. Changing concepts were highlighted in different where from the textbook to the classification scheme. The revision of the classification scheme identifies the changes in concepts and a new introduction in this field. Only 020 classes have been taken for the study. The objectives of the study are to

- Identify the changes from the 21st edition, 22nd, and 23rd edition
- Identify the newly added class and discontinued class or isolate ideas
- Identify newly added concepts of publication listed in INB

4. RESEARCH METHODOLOGY

The concepts inthe 020 class of DDC in the 21st, 22nd, and 23rd editions are observed thoroughly and the revised, newly entered concepts and discontinued concepts are collected from the DDC schemes from the 21st edition to the 23rd edition and then analyzed and tried to understand the reason behind the change of classification schedule. The books enlisted in Indian National Bibliography from 2011 to 2020 also showed the reason of changing in the classification scheme.

5. DATA COLLECTION AND DATA INTERPRETATION

Table 1: Revision of class 020 of DDC from 21st edition to 23rd edition

DDC 21st edition	Revision	DDC 22nd edition	Revision	DDC 23rd edition	Revision
020.62	Permanent non-governmental organization	020.62	Permanent organization (the term non-governmental deleted)	020.62	Permanent organization
020.621	International non-governmental organization	020.621	International organization (the term non-governmental deleted)	020.621	International organization

020.622	National non-governmental organization	020.622	National organization (the term non-governmental deleted)	020.622	National organization
020.623	Regional, state, provincial non-governmental organization	020.623	Regional, state, provincial organization (the term non-governmental deleted)	020.623	Regional, state, provincial organization
020.624	Localnon-governmental organization	020.624	Local organization (the term non-governmental deleted)	020.624	Local organization
		020 [.682]	Plant management	020 [.682]	Plant management
		020 [.683]	Personnel management	020 [.683]	Personnel management
		020.7	Education, research and related topics	020.7	Removed
		020.7155	On-the-job training	020.7155	Removed because of relocation of same class in 023.8
021.65	Networks, systems, consortia	021.65	Networks (Deleted the term from heading but class can be used because mentioned below)	021.65	Networks
023.8	In-service training	023.8	Management In-service training	023.8	Management In-service training
				025.042	World Wide Web
				025.0422	Websites
				025.0425	Search and Retrieval
				025.04252	Search Engine
				025.0427	Semantic web
				025.0691	Geography and travel (Geographic Information System)
				025.2814	Acquisition and collection development for archival materials
025.30285	Data processing Computer application	025.30285	Data processing Computer application	025.30285	Data processing
025.30285 572	Application of computer data preparation and representation record formats	025.302855 72	Application of data preparation and representation record formats	025.30285 572	Data Preparation and representation
025.30285 5741	Application of computer file organization and access methods	025.302855 741	Application of file organization and access methods	025.30285 5741	File organization and access methods
025.344	Machine readable materials	025.344	Electronic resources	025.344	Electronic resources
025.3475	Motion pictures, filmstrips, slides,	025.3475	Motion pictures, slides, video	025.3475	Motion pictures, slides, video

	videotapes		recordings		recordings
				025.41	Abstracting
				025.41028 5	Computer Application
				025.41028 5635	Natural Language Processing
				025[.4600 01-460009]	Provision of add standard sub-division
				025[.472-.479]	General subject cataloguing and indexing scheme in specific languages
025.435	Ranganathan's Colon Classification	025.435	Colon Classification	025.435	Colon Classification
		025.486	Title manipulation	025.486	Full-text indexing
				025.487	Tagging
		025.49	Controlled subject vocabularies	025.49	Subject cataloging and indexing of specific subjects (relocated)
		027 [.00682]	Plant management	027 [.00682]	Plant management
		027 [.00683]	Personnel management	027 [.00683]	Personnel management
027[.007-.008]	Standard Subdivisions	027[.007-.008]	Standard Subdivisions	027[.0007-.0009]	Standard Subdivisions
				027.007	Education, research, related topics
				027.008	Group of peoples
		027.42	Library Outreach Program	027.42	Library Outreach Program
				027.508	Government libraries for groups of people
				027.509	History, geographic treatment, biography
		027.65	Government libraries for special groups	027.65	Legislative reference bureaus
		027.652	Legislative reference bureaus	027[.652]	Number discontinued
		027.8222	Elementary level	027.8222	Primary level
		028.108	Reviews with respect to kind of persons	028.108	Reviews with respect to kind of persons
				028.1083	Reviews by young people
				028.1087	Reviews by people with disabilities and illnesses; reviews for and by gifted people

The 025.042 mainly related to the internet i.e. World Wide Web, websites, search and retrieval, search engine, and the semantic web was introduced in the current edition. The term most popular in the current scenario i.e. "tagging" was added under class 025 as 025.487.The computer application was added under the parent class of 025.410285. Legislative reference bureaus which

were previously added as 027.652 in the 22nd edition, now entered as 027.65 in the 23rd edition and 027.652 was discontinued. 025.7 class implies Physical Preparation for storage and use. We may classify books on conservation, restoration, repairing, and preservation here. It also relocated to 025.84. Relocation of the class was noticed in the last three editions of the scheme. Interoperability between classes has been increased with the expansion of class numbers and intention or hospitality of new subject[4] has been increased. Intention noticed in the class of 028.108 i.e. Reviews concerning kind of persons in 22nd edition and 028.1083, 028.1087 classes has been added here in 23rd edition.The degree of changes has been done based on advancement and current thoughts. The reflection is also noticed in Indian National Bibliography. The reason for the changes is also highlighted by the publication of books in the Indian National Bibliography from 2011 to 2020 listed below

Table 2: Listed books containing new concepts of Library and Information Science in INB

Advanced computer application in library and information science. - New Delhi: Deep & Deep, 2011
Application of information technology in libraries. - New Delhi: SSDN, 2011
Digital libraries and digitization. - New Delhi: EssEss, 2011
Digital library use: librarian's guide to internet. - New Delhi: Arise, 2011
Digitization of libraries: challenges of ICT skills to LTS professionals. - Hyderabad: University Library Teacher Association, 2011.
e-library / by C. K. Śarmā, Suṣmā Gupta and Anīlakumār. - New Delhi: Shree, 2010
IT applications in academic libraries of Assam. - Guwahati(Assam): Eastern Book House, 2011
ICT applications in academic library management. - Kolkata: University of Culcatta, March 2010.
Information access, tools, services and systems. - New Delhi: EssEss, 2011.
Information behaviour in university libraries. - Kolkata: Arpita Prakashan, 2010
Information resources for library and information technology. - Delhi: Navyug, 2011
Information technology and library services. - Delhi: A P H, 2011.
IT application in academic libraries of Assam. - Gawahati: EBH, 2011
Knowledge management for library and information science. - Kolkata: New Central Book Agency, 2011
Library automation and networking. - New Delhi: Deep & Deep, 2011
Library automation and total quality management. - New Delhi: Shree, 2011.
Library computerisation. - New Delhi: A.P.H., 2011
Library networking. - New Delhi: A.P.H., 2011
Medical Libraries: information resources and the information needs of the medical practitioners. - New Delhi: K K Publications, 2010.
National Seminar on management of digital e-resources (2011 : Hyderabad)
National Seminar on Management of Open Access Resources(2010:Secunderabad)
National Convention on Knowledge, Library and Information Networking(14th : 2011:Shantiniketan)
Reading habits in digital era: collection of papers in honour of Dr. P. Ragharulu and Dr. G. Sai Prasad / edited by K. Vīrāñjanēyulu...[et al.]. - Hyderabad: B S Publications, 2010.
Reading in information science and information technology. - New Delhi: EssEss, 2011
A semantic web primes: by Grigoris Antoniou and Frank Van Harmelen. - 2nd ed.. - New Delhi: P H I Learning, 2010.
Textbook of information science. - New Delhi: A.P.H., 2011
Use of e-resource in libraries of management institution. - New Delhi: SSDN, 2011.
Academic Library automation. - Jaipur: ABD Publishers, 2012
Advanced computer application in library and information science. - New Delhi: Deep & Deep, 2011
Application of information technology in libraries. - New Delhi: SSDN, 2011
Automation and digitization of university libraries: status, prospects and problems. - New Delhi: Northern Book Centre, 2012.
Computer in library management. - New Delhi: A.P.H., 2012
Digital libraries and digitization. - New Delhi: EssEss, 2011
Digital Library: Pragmatic approach. - Kolkata: ProvaPrakashani, 2012.
Digitization of libraries: challenges of ICT skills to LTS professionals. - Hyderabad: University Library Teacher Association, 2011.
IT applications in academic libraries of Assam. - Guwahati(Assam): Eastern Book House, 2011
ICT based information management in Indian Libraries / by R. G. Praśar and R. K. Śarmā. - Delhi:

Bookwell, 2012.
Information access in digital libraries. - New Delhi: SSDN, 2012
Information access, tools, services and systems. - New Delhi: EssEss, 2011.
Information and communication technology for library and information science professionals. - Kolkata: World Press, 2012.
Information management issues and trends. - New Delhi: SSDN, 2012.
Information resources for library and information technology. - Delhi: Navyug, 2011
Information seeking behaviour and reading habit of students: changing academic environment in India. New Delhi: Radha Publications, 2012.
Information technology and library evolution. - New Delhi: A.P.H., 2012
Information technology and library services. - Delhi: A P H, 2011.
Information technology for Librarians, Information Managers and Information Scientists. - Agra: Y. K. Publishers, 2012.
IT application in academic libraries of Assam. - Gawahati: EBH, 2011
Knowledge management in digital era. - New Delhi: Westville, 2011.
Knowledge management in digital libraries. - Delhi: Kalpaz, 2012.
Library and information science: a guide to school service examination. Kolkata: ProvaPrakashani, 2012.
Library automation. - New Delhi: A.P.H., 2012
Library automation and networking. - New Delhi: Deep & Deep, 2011
Library automation and total quality management. - New Delhi: Shree, 2011.
Library automation: issues and systems. - New Delhi: A.P.H., 2012
Library catalogue: computerization and OPAC services. - Nagpur: Dattsons, 2012
Library computerisation. - New Delhi: A.P.H., 2011
Library information and communication technology. - New Delhi: Deep and Deep, 2011
Library management and technology. - Delhi: Yogi Publication, 2012
Library networking. - New Delhi: A.P.H., 2011
Library services: Challenges and solutions in digital era. - New Delhi: EssEss, 2012.
Marketing information systems. - Delhi: Kalpag, 2012
National Seminar on Preservation of Information Resources in 21st Century (2012 : Aizawl)
National Seminar on management of digital e- resources (2011 : Hyderabad)
Annual Conference of the Society for Information Science, (2010:Kolkata)
Re-engineering of library services. - Jaipur: Satyam, 2012.
Reading in information science and information technology. - New Delhi: EssEss, 2011
Services and facilities in engineering college libraries in ICT environment / edited by S. Raghuram and S. Śrīnivāsā Rāghavan. - Tiruchirappalli: Cauvery Book Agency, 2012.
Textbook of information science. - New Delhi: A.P.H., 2011
Use of e-resource in libraries of management institution. - New Delhi: SSDN, 2011.
Academic Library automation. - Jaipur: ABD Publishers, 2012
Advancing boundaries of knowledge of library science and information technology. - Coimbatore: Parvathy Nilayam, 2013
Automation and digitization of university libraries: status, prospects and problems. - New Delhi: Northern Book Centre, 2012.
Challenges of library and information science in the digital era festschrift in honour of Dr. B. Sathaiah. - Hyderabad: P. S. Telugu University, 2013.
Cloud Computing in digital library. - New Delhi: S K Book Agency, 2013.
Computer and library services. - Kanpur: Garima Prakashan, 2013
Computer in library management. - New Delhi: A.P.H., 2012
Course of action: courseware on library information technology. - Kolkata: ProvaPrakashan, Dec. 2013
Digital library. - New Delhi: Regal, 2013
Digital library: management & technologies. - Jaipur: Vital Publications, 2013
Digital Library: Pragmatic approach. - Kolkata: ProvaPrakashani, 2012.
Digital library: pragmatic approach : GSDI 2.71 version / by IndrajitPān and Subarṇa kumār Dās. Kolkata: ProvaPrakashani, 2012.
Digitization and digital library. - Hailakandi: Sahitya Prakashani, Nov. 2013
E-learning for library professionals. - New Delhi: Regal Publications, 2013
Economics of information system / by M. Suriyā ... [et al.]. - New Delhi: A.P.H., 2012.
Electronic resources management in libraries. - New Delhi: Allied Publishers, 2013.

Elements of Information analysis , consolidation of repackaging (IACR). - Kolkata: ProvaPrakashani, 2013.
Emerging and current trends in library and information science. - New Delhi: Avon Publications, 2013.
Fundamentals of Information and communication technology. - Delhi: B. R. Publishing Corporation, 2013.
ICT based information management in Indian Libraries. - Delhi: Bookwell, 2012.
Information access in digital libraries. - New Delhi: SSDN, 2012
Information and communication technology for library and information science professionals. - Kolkata: World Press, 2012.
Information management issues and trends. - New Delhi: SSDN, 2012.
Information seeking behaviour and reading habit of students: changing academic environment in India. New Delhi: Radha Publications, 2012.
Information seeking behaviour of archaeology & heritage management professionals of Delhi. - Delhi: Yash, 2013.
Information sources, services and systems. - Delhi: P H I Learning, 2013
Information technology and library evolution. - New Delhi: A.P.H., 2012
Information technology for Librarians, Information Managers and Information Scientists. - Agra: Y. K. Publishers, 2012
Knowledge management in digital libraries. - Delhi: Kalpaz, 2012.
Library and information science model question answer: for SSC examination. - Kolkata: ProvaPrakashani, Sept. 2012.
Libraries in the information age / edited by M. Rathan Jyoï. - Hyderabad: University Library Teachers Association, 2013.
Libraries in the information age : festschrift in honours of ŚriAdluri Ravindra Charī / edited by M. Rathan Jyoti. - Hyderabad: University Library, 2013.
Libraries in the information age festschrift in honour of Sri Adluri Ravindra Chary.. - Hyderabad: P S Telugu University, 2013.
Library automation. - New Delhi: A.P.H., 2012
Library automation: issues and systems / by R. S. Kocār and K. N. Sudarśan. - New Delhi: A.P.H., 2012
Library catalogue: computerization and OPAC services. - Nagpur: Dattsons, 2012
LIS infomine: Library and information science. - Kolkata: Arpita Prakashani, 2013.
Marketing information systems. - Delhi: Kalpag, 2012
Oriental Libraries of India in internet age. - Delhi: Kalpaz, 2013
National Seminar on Preservation of Information Resources in 21st Century (2012 : Aizawl)
International Conference on Creating Wisdom and Knowledge through shared Learning (2012 : Indore)
Re-engineering of libarary services. - Jaipur: Satyam, 2012.
Services and facilities in engineering college libraries in ICT environment. - Tiruchirappalli: Cauvery Book Agency, 2012.
Advancing boundaries of knowledge of library science and information technology. - Coimbatore: Parvathy Nilayam, 2013.
Challenges of library and information science in the digital era festschrift in honour of Dr. B. Sathaiah. - Hyderabad: P. S. Telugu University, 2013.
Changing dimensions of library and information. - New Delhi: EssEss Publications, 2014
Computer and library services. - Kanpur: Garima Prakashan, 2013
National Conference on Democratization of Information Using ICT : Role of Libraries for Social Enlightenment(2014:Mangalore)
Course of action: courseware on library information technology. - Kolkata: ProvaPrakashan, Dec. 2013
Current tools and techniques in library science. - Kanpur: Chandralok, 2014
Digital library. - New Delhi: Regal, 2013
Digital library management. - New Delhi: SSDN Publishers & Distributors, 2014
Digital library: management & technologies. - Jaipur: Vital Publications, 2013
Digitization and digital library. - Hailakandi: Sahitya Prakashani, Nov. 2013
Doctoral research trends in library and information science in India. - New Delhi: Synergy Books India, 2014.
Dynamics of e-resources and digital libraries. - New Delhi: Avon Publications, 2014.
E-learning for library professionals. - New Delhi: Regal Publications, 2013
Electronic resources management in libraries. - New Delhi: Allied Publishers, 2013.
Elements of Information analysis , consolidation of repackaging (IACR). - Kolkata: ProvaPrakashani,

2013.
From brick to click: transforming libraries into social spaces. - New Delhi: Synergy Books India, 2014.
Fundamentals of Information and communication technology. - Delhi: B. R. Publishing Corporation, 2013.
In search of an identity. - Kolkata: ProvaPrakashani, 2014
Information and communications technology. - New Delhi: EssEss Publications, 2014
Information sources, services and systems. - Delhi: P H I Learning, 2013
Knowledge organization information processing &retrival - 2. - Tenali: Krishna Publication, 2014
Libraries in the information age. - Hyderabad: University Library Teachers Association, 2013.
Libraries in the information age : festschrift in honours of ŚriAdluri Ravindra Charī. - Hyderabad: University Library, 2013.
LIS infomine: Library and information science. - Kolkata: Arpita Prakashani, 2013.
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National information system: planning and management. - 2nd ed.. New Delhi: Global Vision Publishing House, 2014.
Networking and database management in libraries. - New Delhi: Regal, 2014
Oriental Libraries of India in internet age. - Delhi: Kalpaz, 2013
National Convention on Knowledge, Library and Inforamtion Networking (2014 : Pondicherry)
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Principles of multimedia database systems. - New Delhi: Elsevier, 2014
Radio frequency identification technology in library and information profession. - New Delhi: Regal, 2014
Re-engineering of library services / edited by S. H. Urkudkar. - Jaipur: Satyam, 2013.
World in digital age: digitization and preservation. - Delhi: Shree Kala Prakashan, 2014.
Changing dimension of library and information centers in internet era. - New Delhi: S. K. Book Agency, 2015.
Changing dimensions in librarianship. - Guwahati: Nivedita, 2015.
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Current tools and techniques in library science. - Kanpur: Chandralok, 2014.
Current trends in library & information science digital era / edited by ĀśīṣakumārŚarmā, SanjayakumārKaṃ and BasantakumārDās. - New Delhi: Satyam Publishing House, 2015.
Current trends in library services. - Kanpur: Chandralok, 2014.
Cyber Safety. - Chennai: Poornima Publications, 2015
Digital library management. - New Delhi: SSDN Publishers & Distributors, 2014
Dynamics of e-resources and digital libraries. - New Delhi: Avon Publications, 2014.
Dynamics of planing& marketing of modern libraries and information centres in an information technology-based environment. - Kolkata: Indian Association of Special Libraries and Information Centres, 2015.
From brick to click: transforming libraries into social spaces / edited by Tariq Ashraf...[et.al]. - New Delhi: Synergy Books India, 2014.
In search of an identity. - Kolkata: ProvaPrakashani, 2014.
Information and communications technology. - New Delhi: EssEss Publications, 2014
Information storage and retrieval system. - New Delhi: Aayu Publications, 2015.
Information technology applications in libraries / edited by ŚaradkumārSonkar. - New Delhi: Shree Publishers, 2015.
Information technology in library science. - Delhi: SBW Publishers, 2015.
Introduction to new dimensions in libraries. - Delhi: Jyoti Enterprises, 2015.
Knowledge organization information processing &retrival - 2. - Tenali: Krishna Publication, 2014
Libraries in digital world. - New Delhi: Shree Publishers, 2015.
Library administration and information technology. - Delhi: Saad Publications, 2015.
Library and information science today: trends, challenges and future. - New Delhi: D.P.S. Publishing House, 2015.

Management of libraries in digital era: perspectives and challenges. - Delhi: SBW, 2015.
Marketing in libraries and information centres. - New Delhi: EssEss Publications, 2015.
National Conference of Cloud Computing in Academic Libraries(2014:Kolhapur) / edited by DhanavantīSunīlBāmane. - Kanpur: Shubham Publications, 2014.
National information system: planning and management.. - New Delhi: Global Vision Publishing House, 2014.
Networking and database management in libraries. - New Delhi: Regal, 2014.
National Convention on Knowledge, Library and Inforamtion Networking (2014 : Pondicherry)
Principles of multimedia database systems. - New Delhi: Elsevier, 2014
Public libraries: information marketing and promotion : a special reference to Darjeeling district of West Bengal. - Kolkata: Levent Books, Nov. 2014.
Webometric studies and libraries. - New Delhi: EssEss Publications, 2015.
World in digital age: digitization and preservation. - Delhi: Shree Kala Prakashan, 2014.
Basics of library automation Koha library management software and data migration challenges with case studies. - New Delhi: EssEss Publications, 2016.
Changing dimension of library and information centers in internet era. - New Delhi: S. K. Book Agency, 2015.
Changing dimensions in librarianship. - Guwahati: Nivedita, 2015.
Course of action: courseware on automated library system. - Kolkata: ProvaPrakashani, Oct. 2015.
Current trends in library & information science digital era. - New Delhi: Satyam Publishing House, 2015.
Cyber Safety. - Chennai: Poornima Publications, 2015.
Dynamics of planing& marketing of modern libraries and information centres in an information technology-based environment. - Kolkata: Indian Association of Special Libraries and Information Centres, 2015.
E-journals: aquisition, management, access and use. - New Delhi: Avon Publications, 2016.
Electronic resource management in libraries trends, issues & challenges. - New Delhi: EssEss Publications, 2016.
Human resources management in libraries and information centres. - New Delhi: Satija Research Foundation for Library & Information Science, 2016.
Information resource management in digital librarianship: festschrift volume in honour of Dr. J. L. Saini. - New Delhi: Shree Publishers and Distributors, 2016
Information storage and retrieval system. - New Delhi: Aayu Publications, 2015.
Information technology applications in libraries. - New Delhi: Shree Publishers, 2015.
Information technology in library science. - Delhi: SBW Publishers, 2015
Introduction to new dimensions in libraries. - Delhi: Jyoti Enterprises, 2015.
An introduction to the humanities resource centres of India. - Kolkata: Mitram, Apr. 2016.
Librarianship: a journey from clay tablet to fablet - New Delhi: Shree Publishers &DIstributors, 2016.
Libraries in digital world. - New Delhi: Shree Publishers, 2015.
Library administration and information technology. - Delhi: Saad Publications, 2015.
Library and information science today: trends, challenges and future. - New Delhi: D.P.S. Publishing House, 2015.
Library and information technology system. - Kanpur: Garima Prakashan, 2016.
Library science in digital era. - Kanpur: Garima Prakashan, 2016.
Management of libraries in digital era: perspectives and challenges. - Delhi: SBW, 2015.
Managing library and information services in digital age. - Guwahati: DVS Publishers, 2016.
Marketing in libraries and information centres. - New Delhi: EssEss Publications, 2015.
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Almost 233 books published and enlisted in INB in between 020 classification numbers, consist of the contents like information technology, networks, computer application, automation of library and information science, semantic web, search and retrieval, search engine etc which are currently added to the Dewey Decimal Classification Scheme.

6. FINDINGS

Table 1 represented the changes in the Dewey Decimal Classification Scheme from the 20th edition to the 23rd edition. INB is a national bibliography. The book received in National Library as per DB Act (1954) are being listed. The monthly volume, as well as the annual volume of INB, is published regularly. The list of titles of books mentioned in Table 2 shows the changing dimension of library and information science and more use of terms like semantic web, World Wide Web, information service, information retrieval etc and the changing dimension of content of documents are the main reason of changing the DDC.

7. CONCLUSIONS

Classification is an arrangement process of documents. DDC is the most popular classification scheme devised by Melvil Dewey. It was changed with the new knowledge. The degree of change varies depending on priorities, social changes and current thoughts. DDC 21st edition began in 1988. It is produced in printed form as well as electronic form and the 22nd edition is the first edition of the DDC in the web version.The 22nd edition reflects continuous updating policy since 1996 and the 23rd edition reflects updating policy since 2004 and published in 2011. DDC is now widely used as a tool for organizing materials in the web and it is now used as natural language subject scheme in digital environment. It was being changed with time. New terms were added with advancement of computer technology and used of computer technology in books, documents in library science. INB reflects that changing of contents in printed books also and changing of content of printed book is the main reason behind the change of DDC.

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Embracing the Digital Shift: A Revolution in Library Technology

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ABSTRACT

In the ever-evolving landscape of information management, knowledge repositories play a pivotal role in development of knowledge dissemination and scholarly communication. The advent of Artificial Intelligence (AI) and Information and Communication Technology (ICT) has catalyzed a significant transformation in library services and operations. New emerging technologies brought drastic change in library administration and revolutionizing the information and knowledge repositories. This research paper explores the cyber revolution in libraries and impact of the digital shift on libraries, emphasizing the integration of AI and ICT, the adoption of best practices and its profound implications on information access and scholarly communication. Librarians now assume a pivotal role in the acquisition, dissemination, and organization of digital data. Their role has shifted from being mere custodians of information to active collaborators with researchers and educators, providing support for educational and research pursuits. Librarians are adopting a user-centric approach by offering tailor-made services and resources to cater to the distinctive requirements of their patrons. This approach has fulfilled the ever-changing information needs of researchers and made the library an integral part of the research and education ecosystem. This paper also delves into the multifaceted dimensions of this transformation, shedding light on how libraries are adapting to the digital era and effective implementation of ICT in library operations assist library managers to perform their routine tasks to serve quality services to users and faculty in most effective and an efficient way.

Keywords*: ICT, Best practices, Innovative Technologies, KIOSK ,Academic Library Management Systems, Quality Services and Artificial Intelligence (AI)*

1. PREFACE

The advent of the digital era has brought about significant transformations in the management of modern libraries. Libraries are now harnessing the power of Artificial Intelligence (AI) to enhance cataloging systems, automate repetitive tasks, and provide personalized recommendations to users. AI, with its machine learning algorithms and natural language processing capabilities, has revolutionized information organization and retrieval. Emerging trends and technologies have revolutionized the very concept of academic libraries, leading to redesigned services, exemplary practices, and innovative technology. ICT has provided librarians with the tools to provide research support services, such as digital reference services and online access to databases and e-books (Bhoi, 2017). These changes empower students and research scholars to navigate and excel in an increasingly elaborate technological landscape. Library 2.0 represents a more interactive and collaborative model, leveraging social media, user-generated content, and collaborative tools to enhance engagement between libraries and their users (Thi & Chi, 2020). Libraries have evolved from conventional physical spaces to electronic environments. The shift towards digital libraries means that resources, including books, journals, and multimedia content, are accessible electronically (Panda, 2021). The focus has shifted from a service-oriented model to a user-oriented one. Hybrid libraries combine traditional physical collections with digital resources. Now RFID technology, Robots and Kiosks have entered libraries to serve their users in a supreme way Librarians have adapted to new roles and designations such as Information Officer, Information Scientist, and Documentation Officer (Mittal 2017).

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2. ICT BASED BEST PRACTICES

Best practices are considered by looking at experimentally successful data. Best practices are characterized as "high level," "excellent," "greatly improved," "outstanding "and" par excellent service" in the *Oxford Advanced Learners Dictionary.* It is a standard or expected way of doing something in a specific organization or situation; good practice guidelines. Technological advancement has become a natural facet of our daily survival. In fact, ICTs are essential tools needed for the provision of value-added information that supports the growth and development of special e-resources. "Best practices are developed through implementation, not just excellent ideas, and our expertise is enhanced." (Vyas, S. D.2009)

The phrase "ICT" advocates the usage of computer-based technology and the internet to create information communication services accessible to a broad range of library users. A different set of scientific tools and resources used to communicate and to generate, distribute, stock up, and handle information. ICTs are essential tools needed for the provision of value-added information that supports the growth and development of special e-resources. Digital revolution brought drastic change and affected all aspects of professional life. "Best practice" is defined and determined across a specific discipline or profession. The development of ICT has transformed customer demands as well as traditional views of libraries, collections, and collections. Internet, wireless technology, Radio Frequency Identification (RFID), and the use of a variety of library information resources in ICT, such as digital documents, e-diaries, library management, and web OPACs, are all included in the framework of ICT. Depending on their educational requirements , clients can access a variety of data assets, such as manuscript, voice, pictures, videos, and more. (Mishra, B.,et al,2016)

3. EVOLUTION OF THE LIBRARIAN'S ROLE IN DIGITAL ERA

Libraries serve as a hub for knowledge dissemination, research support, and learning. Librarians, as guardians of information, have traditionally been responsible for organizing and managing the resources in academic libraries. However, with the rapid advancements in digital technologies and the changing landscape of educational information, the traditional role of libraries and librarians has undergone significant transformations

From Custodian to Collaborator: The librarian plays a key role in supporting the institutions' educational and scholarly activities through the creation, maintenance and promotion of library and information services. Now the work of a librarian is not limited to issuing and returning books; today's librarian provides enough support to library users for the effective use of library resources. He provides information on new arrivals to the group effectively. Support teaching, learning, and research activities, as well as synchronize with relevant staff and hold meetings to select new books for respective subjects. Librarians have assumed a pivotal role in the acquisition, dissemination, and meticulous organization of digitalized information. They have transitioned from custodians of information to collaborators with researchers and educators, supporting learning and research goals with experience of fullest utilization of academic e-resources . A wealthy collection of libraries is the foundation of library service, and the librarian makes available the information resources to the user community. With the changing information-seeking behavior of the user community, information managers play an essential role in academic libraries and their innovative quality services. Now a day's librarian introduces accreditation criteria to academic libraries and is highly involved in research activities to provide scholarly content to the knowledge society.

The librarian initiates initiatives in knowledge discovery, subject information dissemination, scholarly research using social media content, information literacy programs, effective practices in library and collection development, new arrivals, book exhibitions, inter-library loan services, digital data management, touch screen information portals, and discusses plans to provide the community with the highest quality print and electronic information resources and services. librarians actively participate in, support, and promote research. Scholarly communication is the mechanism being used to prepare research and other scholarly publications, analyze their quality, disseminate information to the scholarly community, and store them for future reference. Encouraging user contribution in various library activities, such as organizing book talks, book reviews, book displays, film reviews,

etc., to generate attentiveness amongst users for effective use of electronic information assets, vocational guidance, career interest, and capacity-building programs.

4. ROLE OF AI IN ACADEMIC LIBRARY MANAGEMENT SYSTEMS

Telepresence robots in libraries present an innovative opportunity to extend library services beyond physical confines, effectively engaging with users who are not physically present. As technology continues to advance, the potential uses of these robots within libraries are expected to expand, providing more ways for users to interact with library offerings and materials. These robots enable remote involvement in group meetings and conversations, promoting collaboration and including users who are geographically distant in library activities. In terms of accessibility, telepresence robots play a vital role. They can enhance accessibility for individuals with disabilities by providing virtual sign language interpretation services and allowing remote users to access materials that may not be available in their local library (Tella and Ogbonna, 2023).

AI is being used in various ways in academic libraries, revolutionizing their operations and services. Some specific examples include:

i) **Automation of Routine Tasks**: AI is used to automate tasks such as classifying, indexing, and cataloging, leading to quicker and more accurate results while minimizing errors and inconsistencies in the library's collections
ii) **Information Retrieval**: AI improves the precision of search and recall efforts, enhancing the organization and accessibility of information within the library
iii) **Virtual Assistants and Chat bots**: AI-powered virtual assistants and chat bots are being used to assist patrons with a wide range of tasks, providing personalized recommendations and enhancing user services
iv) **Collection Management**: AI assists in collection management, freeing up librarians to focus on more high-level responsibilities such as information literacy and reference services
v) **Enhancing User Satisfaction**: AI technologies help in enhancing user satisfaction with library services by providing innovative experiences and improving access to resources

Many libraries have embraced the integration of robotic technologies. For example, the Joe and Rika Mansueto Library in Chicago and the Westport Library in Connecticut, as well as the Chicago Public Library, have implemented this trend, with the latter lending out small, mobile Finch robots (Tella, A. and Ajani, Y.A., 2022). More and more companies are deploying service robots, including physical robots and virtual chat bots, to cater to their customers' needs. Some opt for robots designed to mimic humans in appearance and behavior, aiming to boost customer acceptance of the technology. Conversely, other firms choose more machine-like robot designs to prevent the uncanny valley phenomenon, where highly human-like robots can evoke feelings of unease. This strategic approach assumes that overly human-like robots may elicit discomfort among users (Blut, M. et al., 2021). These examples demonstrate how AI is being integrated into academic libraries to improve efficiency, enhance user services, and optimize resource management**.**

5. NEW TRENDS AND TECHNOLOGIES IN LIBRARIES TO ENRICHING SERVICE EXCELLENCE

Best practices that can improve the environment for educational resources in academic libraries. Libraries have been developing and implementing new trends and technologies to serve its clients quality services

Some Cybernetics Based General Innovative Excellent Practices and Value Added Services

- **Library Administration and Computerization: "Library Computerization"** refers to the application of ICT to routine library tasks including resource management, acquisition, cataloguing, circulation, serial control and so on. Library administration and computerization are fundamental components of digital libraries, involving the implementation of integrated system software to manage library operations efficiently. Commonly used software includes Library

Automation Software, Database Management Software, Anti-Virus Software, and Application Software such as LIBSYS, Granthalya, New Gen Lib, Auto Lib, KOHA, LIBSYS, and SOUL. Self checkouts **KIOSKS** and **RFID** technology are common components seen in modern library system (Prabhakar, S., et al ,2017).

- **Digital Documentation**: A digital library is a crucial aspect of academic libraries, serving to meet the educational needs of the user community effectively. It comprises a well-organized collection of documents and reading materials in digital or electronic format, accessible via the internet or CD-ROM disks. Users can access various resources including e-books, magazines, audio, and video content.
- **Electronic Document Delivery Services (EDDS):** facilitate the instant transmission of stored information to users via email, fax, or document delivery software like Ariel. This enables quick access to required documents without delay.
- **Scholarly Communication in the Digital Realm** The digital shift has redefined scholarly communication, transcending traditional publication methods. Libraries are becoming hubs for collaborative research, open access initiatives, and data sharing. This section discusses the evolving landscape of scholarly communication and the role libraries play in facilitating global collaboration
- **Institutional Repository:** An institutional repository serves as a repository designed to gather, safeguard, and distribute digital editions of publications affiliated with an institution, particularly those originating from academic organizations. The academic library expand its institutional repository of previous year's question papers, syllabuses, research papers, notes, and information on career interests so that it can be made available to library users to meet their information needs.
- **Institutional Ranking and the Digital Library Landscape:** In an era of technological innovation, institutional ranking is increasingly influenced by a library's ability to embrace digital advancements. This section examines the correlation between technological integration and institutional ranking, emphasizing the role of libraries as key contributors to academic excellence.
- **Online full-text Services**: Online full-text services provide access to complete documents or specific information referenced in a database, allowing users to view, search, and download manuscripts or publications easily. Full-text databases offer the entire content of an article, rather than just a summary, enhancing accessibility and usability for users.
- **Mobile Apps :** Mobile apps in libraries offer users on-the-go access to resources, enabling them to engage with e-books, databases, and catalog searches from their mobile devices. The apps use push notifications to keep users informed about updates, due dates, and new arrivals, enhancing user engagement.
- **Data Visualization Tools :** Data visualization tools in libraries use visual elements like graphs, charts, and interactive maps to represent information. These tools simplify complex data, making it easier for users to understand trends and patterns.
- Additionally, they provide usage analytics, helping librarians track resource popularity and make informed decisions about collection management based on user preferences.
- **RFID (Radio-Frequency Identification) and NFC (Near Field Communication)** technologies are employed within library settings to streamline the management of resources effectively. These technologies enable the quick and accurate tracking of library materials, allowing for faster check-in and check-out processes. RFID tags on books and other items can be easily scanned, automating tasks such as inventory management. NFC technology facilitates contactless interactions, enhancing the overall user experience in libraries.
- **Online Databases Exploration:** Libraries often provide access to various online databases to facilitate research and information retrieval for students. like PUBMED, ,EBSCO, EMBASE PROQUEST, SCOPUS, SCIENCE DIRECT,WEB OF SCIENCE.
- **Library Data Analytics :** Library data analytics involves the systematic analysis of library-related data to gain insights into user behavior, resource usage, and overall library performance. This aids librarians in making informed decisions regarding collection development, services, and resource allocation. Through the utilization of data analytics, libraries can improve user experiences and adjust their services to align with changing educational needs.

6. ROLE AND IMPACT OF KIOSKS IN LIBRARY REVOLUTION

In the ever-evolving landscape of academic libraries, kiosks have emerged as indispensable tools, revolutionizing the way patrons interact with library resources and services. These self-service stations play a multifaceted role, significantly impacting various aspects of library operations and user experience. Firstly, kiosks serve as convenient access points for library resources, enabling patrons to browse catalogs, check out materials, and access digital collections with ease. By providing round-the-clock availability, kiosks cater to the diverse schedules of students and faculty, ensuring uninterrupted access to essential resources. Self -checkout station, returns and Renewals, catalogue search, account management, Printing and Scanning , Language section facility, security measures and so on (Udochukwu and Agunwamba, 2021).

Figure 1, 2 & 3

(Source: https://www.imageholders.com/custom-kiosk-solutions/education/libraries/)

i) **Enhanced Accessibility**: Kiosks provide patrons with convenient access to various library resources and services, such as catalog searches, account management (e.g., renewing borrowed items), and self-checkout for borrowing materials. This accessibility empowers users to interact with library resources independently and at their convenience, without relying solely on library staff assistance.

ii) **Extended Service Hours**: With kiosks, libraries can extend their service hours beyond regular operating times. Patrons can perform basic tasks such as checking out books or accessing digital resources even when the library is closed, thereby accommodating diverse schedules and increasing overall patron satisfaction.

iii) **Reduced Queues and Wait Times**: By allowing patrons to perform routine transactions independently, kiosks help alleviate congestion at service desks, reducing wait times for assistance. This efficiency benefits both library staff, who can focus on more complex inquiries, and patrons, who experience quicker service.

iv) **Improved User Experience:** Implementing user-friendly interfaces and intuitive design in kiosks enhances the overall user experience. Patrons can navigate through various options easily, leading to higher satisfaction and increased usage of library services.

v) **Promotion of Digital Resources**: Promotion of Digital Resources: Kiosks act as platforms for advertising the digital resources and online services provided by the library. They have the capability to display e-books, databases, and other digital collections, encouraging patrons to explore and utilize these resources beyond traditional print materials.

vi) **Data Collection and Analysis**: Kiosks can collect valuable data on patron interactions and usage patterns, providing insights into user behavior and preferences. Libraries can use this information to tailor services and resources to better meet the needs of their patrons.

vii) **Cost Savings**: While there is an initial investment in deploying kiosks, they can lead to long-term cost savings by optimizing staff resources, streamlining workflows, and reducing overhead associated with manual transactions.

viii) **Adaptation to Technological Trends**: Integrating kiosks aligns libraries with technological trends and demonstrates a commitment to innovation in service delivery. This modernization can attract tech-savvy patrons and enhance the library's reputation as a progressive institution.

Overall, kiosks play a multifaceted role in academic libraries, offering benefits such as improved accessibility, efficiency, and user experience, while also contributing to cost savings and aligning with technological advancements in library services.

7. CHALLENGES OF DIGITAL TECHNOLOGY IN LIBRARY ADMINISTRATION SYSTEM

i) **Protecting User Data and Information** : Digital libraries collect and store sensitive user information it becomes difficult to protect from cyber threats

ii) **Managing and Updating Digital Content**: With constantly evolving technology digital libraries require continuous updates and maintenance to ensure compatibility with new devices and update software.

iii) **Budgetary Factors :** Balancing the cost of maintaining and expanding digital resources with limited budget and resources, digital libraries require significant funding for hardware, software etc making it challenging to expand and improve services with limited resources

iv) **Managing Overwhelming Amount of Digital Content:** The abundance of digital resources make it difficult to determine the quality and relevance of information.

8. OPPORTUNITIES IN DIGITAL SHIFT OF ACADEMIC LIBRARY MANAGEMENT SYSTEM

i) Access to Vast Information Resources: Digital libraries offer librarians access to a broad array of information sources, such as scientific journals, databases, e-books, and multimedia content. With this wealth of resources, librarians can assist researchers, and students in finding the latest and most relevant information for their work.

ii) **Integration of Emerging Technologies : L**ibrarians can explore the use of artificial intelligence, machine learning , data analytics , Using technology to improve quality services and streamline library operations

iii) Collaboration and Networking: Digital libraries enable librarians to collaborate and network with colleague, researchers and experts worldwide. Medical librarians can participate online communities, discussions forums, and social media groups dedicated to health sciences librarianship.

iv) **Data Management and Organization: L**ibrarians have the opportunity to play a crucial role in managing the transformation of knowledge management, adapting to the changing needs and demands of digital age: Librarian can support researchers in organizing, preserving and sharing research data through digital repositories and data management platforms.

9. CONCLUSION

The integration of robotics and kiosks has sparked interdisciplinary collaborations and fostered innovation within the library community. The digital revolution in libraries has preceded in a new era of accessibility, efficiency, and innovation. Emerging technologies such as robots and kiosks have reshaped the landscape of library services, offering unprecedented opportunities for enhancing user experience and streamlining operations. As libraries continue to adapt to the demands of the digital age, the integration of these technologies has become instrumental in redefining the role of libraries as dynamic hubs of knowledge dissemination and community engagement. One of the most significant trends in modern libraries is the adoption of robotics to automate repetitive tasks and enhance service delivery. Robots, equipped with advanced functionalities, are revolutionizing processes such as inventory management, retrieval of materials, and even providing assistance to patrons. By leveraging robotics, libraries can optimize resource utilization, improve operational efficiency, and offer personalized assistance to users, thereby augmenting the overall library experience (Agarwal, G. 2023).

The rise of technology has compelled academic libraries to adapt, shifting from conventional services to embrace emerging technologies that cater to the evolving information preferences of their users. Today's users are increasingly tech-savvy and seek convenient, remote access to scholarly resources. As a result, smart technologies have become a prominent trend in academic libraries.

These innovations hold promise in improving service delivery and are particularly valuable in facilitating distance learning, a mode of education that has gained prominence in higher education.

With online and distance learning becoming more prevalent, smart technologies are balanced to play a pivotal role in supporting the evolving needs of both students and faculty in the academic community (Hamad, F., et al, 2023). Research scholars today are very specific in their educational needs and academic pursuits. The proliferation of kiosks in libraries has transformed the way patrons interact with library resources and services. With kiosks facilitating round-the-clock access and automating routine transactions, librarians can devote more time to addressing complex inquiries and providing specialized assistance, thereby enriching the quality of service delivery. Libraries persistently evolve to meet the evolving needs of their communities by embracing emerging technologies and utilizing them to offer innovative services and resources.

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Embracing Library 2.0: A Journey into Transformative Innovation and Community Engagement

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ABSTRACT

In the digital age, libraries are no longer mere repositories of knowledge but dynamic hubs of innovation and community engagement. This article explores the evolution and impact of Library 2.0, a paradigm shift redefining the essence of libraries and their interaction with communities. Drawing from diverse case studies and scholarly literature, it delves into the guiding principles, technological underpinnings, challenges, and far-reaching impacts of Library 2.0 on information access and services. Through the lens of technological innovation, including social media platforms, collaborative tools, mobile applications, and data analytics software, libraries are empowered to transcend physical constraints and foster meaningful connections with users. However, alongside these opportunities, challenges such as digital literacy disparities, privacy concerns, and equitable access must be addressed. By exploring the transformative potential of Library 2.0, this research aims to inspire libraries to embrace innovation and enhance their role as vital pillars of knowledge dissemination and community empowerment.

Keywords*: Library 2.0, digital age, innovation, community engagement, paradigm shift, technological evolution, information access, social media platforms, collaborative tools*

1. INTRODUCTION

In an age where technology is reshaping the landscape of information access and dissemination, libraries are embracing innovative approaches to fulfil their mission of providing equitable access to knowledge and resources. Central to this evolution is the integration of Web 2.0 technology, which represents a paradigm shift in the way libraries interact with their patrons and deliver services.

Web 2.0 encompasses a range of interactive and collaborative online platforms, including social media, blogs, wikis, and multimedia content sharing sites. These tools offer libraries unprecedented opportunities to engage with patrons in real-time, foster community-driven knowledge sharing, and create dynamic digital experiences.

However, as libraries navigate the integration of Web 2.0 technology into their services, they must also grapple with a myriad of challenges and considerations. From addressing digital literacy disparities to managing privacy concerns and ensuring the sustainability of digital initiatives, librarians are tasked with balancing the promise of technological advancement with the realities of resource constraints and evolving user expectations.

To shed light on these complex dynamics, this article undertakes a comprehensive SWOT analysis of implementing Web 2.0 technology in library services. By examining the strengths, weaknesses, opportunities, and threats inherent in this digital transformation, we aim to provide librarians, stakeholders, and decision-makers with a nuanced understanding of the strategic implications and potential outcomes of embracing Web 2.0 in the library ecosystem. Through this exploration, we seek to empower libraries to harness the full potential of Web 2.0 while navigating the inherent challenges with confidence and foresight.

2. LITERATURE REVIEW

The integration of Web 2.0 technology into library services represents a significant shift in how libraries interact with their patrons and fulfil their missions in the digital age. This section provides an overview of key themes and findings from existing literature on the topic, encompassing research, case studies, and professional perspectives.

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Chapter 24; S. Hasan, S. Kumar, S. Panda, K. N. Khan & G. Samdani (Eds); PP. 191-196; Synergy Books India, N.D.

- *Empowering User Engagement and Collaboration:* Numerous studies highlight the transformative impact of Web 2.0 technologies on user engagement and collaboration within library settings. Liu and Lu (2012) discuss how social media platforms such as Facebook and Twitter enable libraries to connect with patrons, promote events, and facilitate dialogue in real-time. Similarly, Case and Given (2016) emphasize the role of Web 2.0 tools like wikis and collaborative document editing platforms in fostering co-creation and knowledge sharing among library users.
- *Addressing Digital Literacy and Inclusivity:* Digital literacy disparities and concerns about inclusivity are recurring themes in the literature on Web 2.0 technology adoption in libraries. Research by Lim and Lee (2015) highlights the importance of providing digital literacy training to both staff and patrons to ensure equitable access to online resources and services. Furthermore, Case and O'Brien (2017) underscore the need for libraries to consider accessibility issues when designing and implementing Web 2.0 platforms to accommodate users with disabilities effectively.
- *Managing Privacy and Security Concerns:* Privacy and security considerations are central to discussions surrounding the implementation of Web 2.0 technology in library services. Studies by Taylor and van der Walt (2019) and Koehler and Mishra (2016) examine the challenges libraries face in safeguarding patron data and ensuring compliance with privacy regulations amidst the proliferation of online platforms and digital content. Strategies for addressing these concerns range from developing robust data protection policies to implementing encryption protocols and user authentication mechanisms.
- *Enhancing Service Delivery and Innovation:* Web 2.0 technology offers libraries new avenues for enhancing service delivery and fostering innovation. Case studies by Mathews (2018) and McInerney (2019) showcase how libraries leverage social media, blogs, and multimedia content to promote library resources, engage with diverse audiences, and showcase their unique offerings effectively. Furthermore, research by Borgman (2015) highlights the role of Web 2.0 technologies in facilitating interdisciplinary collaboration and research dissemination within academic library settings.
- *Balancing Resource Constraints and Sustainability:* Despite the potential benefits of Web 2.0 technology integration, libraries must grapple with resource constraints and sustainability concerns. Studies by Chowdhury and Paul (2018) and Johnson (2020) explore the financial implications of maintaining and supporting Web 2.0 platforms and initiatives, particularly for libraries with limited budgets and staffing resources. Strategies for addressing these challenges include partnering with external stakeholders, adopting open-source solutions, and leveraging community-based approaches to content creation and curation.

3. WEB 2.0

The concept of Web 2.0 emerged in the early 21st century as a response to the static, one-way nature of the early World Wide Web, often referred to as Web 1.0. Early Web (Web 1.0). The early days of the internet, characterized by static websites where users primarily consumed information. Websites were typically created and managed by webmasters, with limited opportunities for user interaction or contribution. As internet technology advanced, there was a gradual shift towards dynamic, interactive content (Panda, 2021). Technologies such as JavaScript, CSS, and server-side scripting languages enabled websites to become more responsive and user-friendly. In the early 2000s, platforms like Friendster, Myspace, and Blogger paved the way for the democratization of content creation. Users could now easily create and share content, connect with others, and participate in online communities. The term "Web 2.0" gained prominence in 2004 when Tim O'Reilly and Dale Dougherty organized the first Web 2.0 Conference. O'Reilly's influential article "What Is Web 2.0" outlined the key principles and characteristics of this new phase of the internet, emphasizing user participation, collective intelligence, and the power of network effect. Web 2.0 is marked by several defining features, including user-generated content (e.g., blogs, wikis), social networking (e.g., Facebook, LinkedIn), collaboration tools (e.g., Google Docs, Wikipedia), and rich, interactive user experiences (e.g., AJAX-powered web applications).The development of technologies like AJAX (Asynchronous JavaScript and XML), RSS (Really Simple Syndication), APIs (Application Programming Interfaces), and web services played a crucial role in enabling the functionalities

associated with Web 2.0, such as real-time updates, syndication of content, and seamless integration of third-party services. Web 2.0 revolutionized the way people interacted with the internet, empowering users to create, share, and collaborate on a scale never before imagined. The proliferation of social media, blogging platforms, and collaborative tools transformed the internet into a participatory platform where individuals could engage in dialogue, share knowledge, and collaborate on a global scale. The evolution of Web 2.0 continues to this day, with ongoing advancements in technology, user behavior, and internet infrastructure shaping the digital landscape. Concepts such as Web 3.0 (Semantic Web) (Panda & Kaur, 2023a) and the decentralized web (Web 3.0) represent potential future directions (Panda & Kaur, 2023b), building upon the principles and foundations established by Web 2.0.

4. RESEARCH METHODOLOGY

The research methodology for the survey-based article titled "Embracing Library 2.0: A Journey into Transformative Innovation and Community Engagement" is designed to explore the adoption of Library 2.0 principles, its impact on transformative innovation within libraries, and its effectiveness in enhancing community engagement. The methodology involves a systematic approach to gathering data from library professionals and patrons to understand their perspectives, experiences, and perceptions regarding Library 2.0 initiatives.

The research adopts a mixed-methods approach, incorporating both quantitative and qualitative techniques to provide a comprehensive understanding of Library 2.0 implementation. The survey serves as the primary instrument for data collection, supplemented by interviews and focus groups to gain deeper insights into participants' experiences and viewpoints.

The sampling frame includes libraries of various types (academic, public, special) and sizes, ensuring diversity in the sample. A combination of purposive and random sampling techniques will be employed to select participants, including library administrators, staff members, and patrons who have interacted with Library 2.0 services. Data collection will be carried out through surveys administered via face to face interview and focus group discussions.

5. DATA ANALYSIS

The data analysis for the survey-based research article titled "Embracing Library 2.0: A Journey into Transformative Innovation and Community Engagement" involves both quantitative and qualitative approaches to comprehensively explore the adoption and impact of Library 2.0 initiatives within libraries.

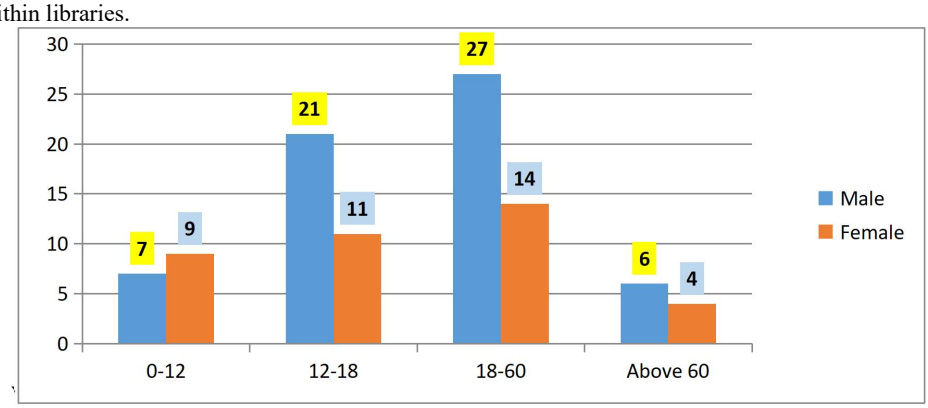

Figure 1: Descriptive Statistics of Participants' Demographics

Quantitative Analysis: The data provides insights into the age distribution of respondents within the user community. The majority of respondents belong to the 12-18 age range, indicating a significant presence of adolescents among the users. This age group comprises 32 respondents (21 males and 11 females). Following the 12-18 age range, the 18-60 age range has the next highest count of respondents, totalling 41 (27 males and 14 females). The 0-12 age range and above 60 age

range have comparatively smaller representation, suggesting a lesser presence of young children and older adults in the survey.

Gender Distribution: Across all age ranges, there is a predominance of male respondents within the user community, except for the 0-12 age range where females outnumber males.

Age and Gender Trends: The data reveals age and gender trends within the User community, indicating a higher representation of males in older age groups (12-18, 18-60, and above 60), while females are more represented in the 0-12 age range.

Table 2: Utilization of Web 2.0 Technology Within the User Community

Age Range	Gender	Regular Web 2.0 User (%)
0-12	Male	20
0-12	Female	15
12-18	Male	70
12-18	Female	60
18-60	Male	50
18-60	Female	40
Above 60	Male	25
Above 60	Female	20

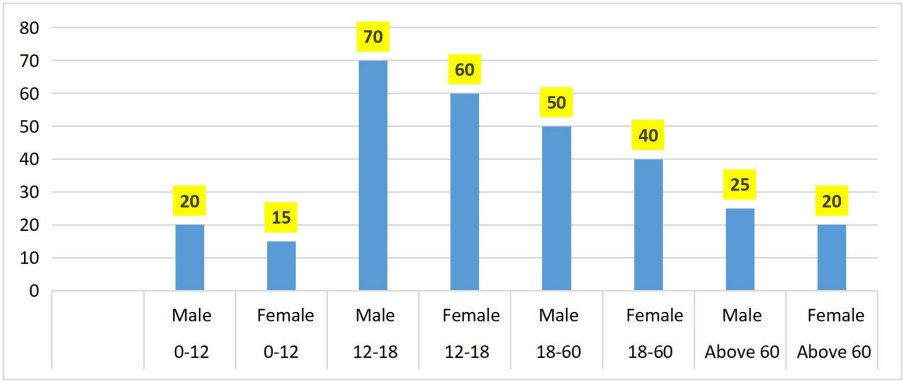

Figure 2: Regular Web 2.0 Users

Table 2 categorizes respondents into four age groups: 0-12, 12-18, 18-60, and above 60. This segmentation allows for an analysis of how Web 2.0 usage varies across different stages of life. Respondents are further divided into two gender categories: Male and Female. This breakdown enables us to understand if there are any gender-based differences in Web 2.0 usage patterns.

Regular Web 2.0 Usage (%): This column represents the percentage of respondents within each age range and gender category who reported regular usage of Web 2.0 technologies. For example, in the 0-12 age range, 20% of males and 15% of females reported regular usage of Web 2.0 technologies. In the 12-18 age range, 70% of males and 60% of females reported regular usage. Similarly, for the 18-60 age range, 50% of males and 40% of females reported regular usage. Finally, among respondents above 60 years old, 25% of males and 20% of females reported regular usage.

Interpreting this data allows us to observe several trends like there's a general trend of higher Web 2.0 usage among younger age groups compared to older ones. Within each age range, males tend to report slightly higher rates of regular Web 2.0 usage compared to females, though the difference varies across age groups. Adolescents (12-18 age range) exhibit the highest rates of regular Web 2.0 usage, with a notable gender disparity favouring male. As age increases, there's a gradual decline in the percentage of respondents reporting regular Web 2.0 usage, indicating a potential generational divide in technology adoption and usage habits.

Table 3: Usage Percentages of Various Social Media Platforms

Age Range	Gender	Facebook (%)	Twitter (%)	Instagram (%)	YouTube (%)	LinkedIn (%)	Flickr (%)

0-12	Male	10	5	5	3	1	1
0-12	Female	8	4	4	2	1	1
12-18	Male	40	30	50	60	20	10
12-18	Female	35	25	45	55	15	8
18-60	Male	60	50	70	80	40	20
18-60	Female	55	45	65	75	35	18
Above 60	Male	30	20	40	50	15	5
Above 60	Female	25	15	35	45	10	3

In this table Age Range and Gender are similar to the previous table, providing segmentation for different demographics. Facebook (%), Twitter (%), Instagram (%), YouTube (%), LinkedIn (%), Flickr (%): These columns represent the percentage of respondents within each age range and gender category who reported using each respective social media platform.This table provides insights into the popularity of various social media platforms across different demographics.This table provides insights into the popularity of various social media platforms across different demographics. For instance: Facebook is widely used across all age ranges and genders, with higher usage among older demographics. Twitter usage is more prominent among younger age groups, particularly adolescents and young adults. Instagram shows high usage among adolescents and young adults, reflecting its popularity for visual content sharing. YouTube has widespread usage across all age ranges, with particularly high engagement among younger demographics.

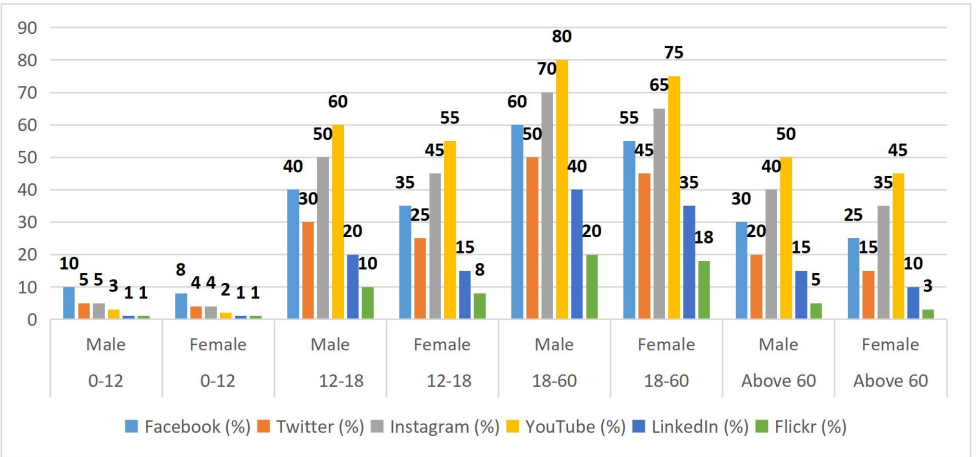

Figure 3: Usage Percentages of Various Social Media Platforms

LinkedIn is more commonly used by older age groups, reflecting its professional networking focus.Flickr has relatively lower usage across all age ranges compared to other platforms, with older demographics showing slightly higher engagement. Based on the data provided in the table regarding social media platform usage across different age groups, we can discern the age group that is most prone to technology usage. Adolescents and young adults (12-18 age range) consistently show high usage percentages across most social media platforms, including Facebook, Twitter, Instagram, YouTube, LinkedIn, and Flickr.

Usage percentages tend to decline with age, with older age groups (18-60 and above 60) showing progressively lower engagement levels across most platforms.

6. CONCLUSION

In the pursuit of transformative innovation and community engagement, the modern library must embark on a journey of embracing Library 2.0 principles. Through an analysis of data on both age distribution among library users and the usage of Web 2.0 technologies, it becomes evident that the landscape of library services is evolving alongside the digital revolution.

The data underscores the importance of understanding user demographics and technological preferences to effectively cater to the needs of diverse communities. While the majority of respondents fall within the 12-18 and 18-60 age ranges, with adolescents and young adults exhibiting the highest engagement with Web 2.0 platforms, it is essential not to overlook the representation of other age groups, including young children and older adults.

Understanding platform-specific usage patterns is crucial for designing targeted marketing campaigns, content strategies, and community engagement initiatives. Adapting content formats and messaging to align with the preferences of each platform's user base can enhance engagement and reach within the target audience. Platforms with lower usage percentages, such as Flickr, may require tailored strategies to increase awareness and engagement, or organizations may choose to allocate resources more strategically based on the popularity of each platform within their target demographics. For libraries to remain relevant and impactful in the digital age, they must strategically integrate Web 2.0 technologies into their services while also addressing barriers to engagement, such as digital literacy gaps and privacy concerns. This involves not only providing access to digital resources but also offering comprehensive digital literacy programs and promoting the safe and responsible use of technology.

In embracing Library 2.0 principles, libraries must adopt a user-centric approach, prioritizing user needs and preferences in the design and delivery of services. This entails embracing flexibility, adaptability, and continuous improvement, as libraries evolve to meet the changing needs and expectations of their communities in an increasingly digital and interconnected world.Ultimately, by embracing Library 2.0 principles and harnessing the power of Web 2.0 technologies, libraries can position themselves as dynamic hubs of innovation, learning, and community engagement, enriching the lives of users and contributing to the advancement of society as a whole.

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Impact of Digital Library Resources on Student Lifestyle Learning

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ABSTRACT

The way students access and interact with educational resources has been revolutionised by digital libraries, which have had a significant impact on their lives. In this essay, the many ways that digital libraries have impacted student lives are examined, including the abundance of resources at their disposal, the ease and adaptability they offer, the increased opportunities for collaboration and interaction, the improvement of research and information literacy skills, the cost-effectiveness, sustainability in the environment, and the ability to adapt to new technology. Students are now able to study at their own pace and on their own schedule thanks to the ease and flexibility of digital libraries, which provide materials anytime, anywhere. Research horizons have been broadened and collaborative learning experiences have been enhanced by the abundance of information available in digital format. Additionally, as students learn to use search engines and critically assess sources, digital libraries have helped students build their research and information literacy abilities. Financial strains have been lessened by the accessibility of digital resources, which have also lessened their environmental effect by conserving resources and paper. Ultimately, in order to improve the educational experience, digital libraries have reacted to technology changes by including technologies like augmented reality and virtual reality. All things considered, digital libraries have had a profoundly positive influence on students' lives, giving them more access, convenience, and chances for cooperation and learning.

Keywords: *Digital Library, digital library recourse, Skill, learning, Seeking behaviour*

1. INTRODUCTION

The term "digital library resources" describes online electronic databases of knowledge and instructional materials. These sites provide a broad spectrum of digital content, such as databases, e-books, scholarly articles, research papers, and multimedia. The advent and ubiquity of digital library resources have revolutionised the way that information is traditionally accessed and used for educational purposes.

Digital library resources are important because they give students access to an unparalleled amount of knowledge and information. Digital library resources are not constrained by physical location or restrictions, in contrast to traditional libraries. Their extensive collection of academic resources spans multiple fields, providing students with the opportunity to investigate unique viewpoints, focus on specific subjects, and participate in independent learning.

Digital library materials also improve the convenience and effectiveness of the learning process. Students can use laptops, tablets, or cell phones to access these resources at any time and from any location. This adaptability allows for learning possibilities outside of the classroom and conventional library settings, meeting the demands of contemporary student lifestyles.

2. STUDENT LIFESTYLE LEARNING DEFINITION

The term "student lifestyle learning" describes how educational resources and activities are incorporated into students' everyday routines. It acknowledges that education is not limited to

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traditional classroom environments but rather encompasses a range of facets of students' lives, such as their hobbies, personal interests, and interpersonal relationships. The concept of "student lifestyle learning" recognises the significance of establishing a smooth link between students' academic endeavours and their general experiences and choices in life.

Student lifestyle learning in the context of digital library resources entails making the most of these resources' ease of use and accessibility to support lifelong learning and knowledge acquisition. It includes incorporating digital library resources into the study routines, routines of students, and routines of students seeking information. Student lifestyle learning acknowledges that learners can interact with course content and pursue intellectual development in ways that suit their own interests, schedules, and preferences.

Researchers and educators can investigate novel ways to improve students' learning experiences, encourage self-directed learning, and meet the varied needs and preferences of contemporary learners by comprehending the idea of student lifestyle learning and analysing the effects of digital library resources within this framework.

3. EVALUATION OF DIGITAL LIBRARY RESOURCES

Technology breakthroughs and the growing need for easily available digital information have furled the development of digital library resources. At first, digital libraries mainly served as archives for scanned texts and materials. But as the internet has grown, digital library materials' reach and power have also increased dramatically.

These days, resources from digital libraries come in a variety of formats, such as e-books, e-journals, multimedia, research databases, and institutional repositories. They facilitate effective information access and knowledge sharing among users by providing advanced search functionality, metadata organisation, and collaborative features.

4. BENEFIT OF DIGITAL LIBRARY RESOURCES FOR STUDENT LEARNING

i) **Access to a vast array of materials:** Students can access a vast array of scholarly materials, such as e-books, research papers, and academic journals, thanks to digital library resources. Due to the abundance of resources available, students can participate in multidisciplinary learning, investigate other points of view, and gain a deeper grasp of many disciplines.

ii) **Convenience and adaptability:** The constraints of physical proximity and regular library hours are removed with digital library materials. With the availability of digital resources at all times and locations, students may tailor their education to suit their tastes and schedules. This convenience meets the needs of students' busy schedules and encourages self-directed learning.

iii) **Improved research skills:** A lot of digital library resources include sophisticated search features that let students find pertinent material fast. Students can traverse vast amounts of material more quickly and effectively by using features like citation tracking, filters, and keyword searches.

iv) **Multimedia and interactive content:** A lot of digital library materials include interactive tools, movies, and simulations. By presenting knowledge in dynamic and interactive ways, these resources improve student engagement and promote active learning. Multimedia information and visualisations can help make difficult subjects easier to understand and remember.

5. LIMITATIONS AND CHALLENGES WITH DIGITAL LIBRARY RESOURCES

i) **Information overload:** Students may become overwhelmed by the abundance of information available through digital library resources. It can be difficult to sort through the many search results and assess the reliability and applicability of the sources.To properly manage information overload, students must acquire critical thinking and information evaluation abilities.

ii) **Digital divide and access disparities:** Students from underprivileged origins or those living in areas with poor internet connectivity have difficulties due to unequal access to digital library resources. The digital divide makes already-existing educational disparities worse by impeding fair access to the knowledge and tools needed for learning.

iii) **Credibility and authenticity issues:** A variety of sources, including trustworthy and untrustworthy material, are included in digital library resources. It may be necessary for students to critically assess and confirm the legitimacy of digital resources because they may come across

sources that are of dubious quality or reliability. This calls for the improvement of information literacy abilities.

iv) **Restrictions on copyright and licencing:** Digital library resources frequently have these issues. In order to guarantee compliance when utilising and sharing digital assets, students must negotiate copyright laws and comprehend fair use guidelines. The degree to which students can use specific resources may be restricted by these legal reasons.

To guarantee the successful integration of digital resources into student learning experiences, educators and institutions must address these issues, take advantage of the advantages of digital library resources, and encourage information literacy and equitable access.

6. METHODOLOGY

6.1. Research Design

Depending on the particular research goals and setting, different research designs may be used to examine how children might be encouraged to develop information literacy skills. Here are two potential study designs that are frequently employed in this field:

i) **Experimental Design:** Researchers can assign participants to various groups, such as an intervention group and a control group, when using an experimental design. While the control group did not get any information literacy interventions, the intervention group does. The information literacy abilities of the two groups can then be compared using pre- and post-assessments or other evaluation techniques to determine the impact of the interventions.

ii) **Qualitative Design:** When it comes to information literacy abilities, educators and students' experiences and points of view can be thoroughly explored and understood using a qualitative study design. To collect rich qualitative data for this approach, focus groups, interviews, and observations may be used. It can provide light on the methods and difficulties teachers encounter in fostering information literacy abilities as well as the results of their work on students' learning.

6.2. Strategies of Data Collection

Researchers can use a variety of strategies, either separately or in combination, to collect data on the promotion of information literacy abilities. Several typical techniques include of:

i) **Surveys:** Teachers and students can be asked questions in order to get quantitative information about their knowledge, attitudes, and behaviours related to information literacy. In order to gather a variety of data, the survey may include Likert-scale, multiple-choice, and open-ended questions.

ii) **Interviews:** To learn more about educators' strategies, difficulties, and accomplishments in advancing information literacy abilities, one can do individual or group interviews with them. Interviews with students can also reveal details on their information-seeking habits, encounters, and opinions regarding the usefulness of information literacy training.

iii) **Focus Groups:** Educators or students can participate in small groups called focus groups where they are led in a conversation about information literacy abilities. This approach enables a thorough investigation of common experiences, viewpoints, and concepts pertaining to information literacy.

iv) **Observation:** In classrooms or other learning environments, researchers can watch how teachers teach information literacy skills. Observations can offer important insights into how information literacy training is really carried out and how it affects students' learning.

6.3. Selection of Participants

The population of interest and the objectives of the study will determine who gets to participate. Possible participants might be:

i) **Teachers:** Choose teachers that instruct courses or subjects that call for information literacy abilities. They may come from various academic fields or grade levels. Take into account elements like participation willingness, experience, and skill.

ii) **Students:** To guarantee diversity, select pupils from various educational programmes or grade levels. Take into account variables including age, educational background, and previous experience receiving information literacy training.

Obtaining appropriate consent and making ensuring that ethical concerns about confidentiality and privacy are taken into account are crucial when choosing participants.

7. FINDING AND ANALYSIS

i) **Students' Views on Digital Library Resources:** A Number of studies have looked into how students view digital library resources, and the results typically point to favourable opinions. Students value the digital library resources' accessibility, ease of use, and versatility. Since digital resources offer a wide range of content in multiple formats, they view them as invaluable tools for their academic endeavours. Students are frequently satisfied with the resources' accessibility and their ability to find, find, and download them quickly. The flexibility of remote access to digital library resources, which does away with locational restrictions and working hours, is another feature that students value.

ii) **Effect on Study Habits and Time Management:** One area of research is how digital library resources affect study habits and time management. Studies reveal that students' time management and study habits might be impacted by digital library resources. Students are able to participate in flexible and self-directed learning due to the ease of use and accessibility to digital materials. Students have the freedom to set their own study plans, use resources as needed, and do independent research. Though digital library resources are flexible, it's vital to remember that they can also present problems like diversions and information overload. For students to stay focused and handle the deluge of information, they must learn efficient time management techniques.

iii) **Impact on Information Seeking Behaviour:** Students' information seeking behaviour is greatly influenced by digital library resources. Research indicates that students are depending more and more on digital resources to meet their information demands. With the use of digital library resources, students can investigate a variety of sources, do rapid and effective searches, and obtain current information. Students frequently favour internet resources over traditional print materials because of their accessibility and availability. But with so much information available online, students also need to learn how to critically evaluate sources in order to determine their legitimacy and credibility.

iv) **Academic Performance and Learning Outcomes**: Research has looked into how digital library resources affect both academic performance and learning outcomes. A number of research indicate that academic achievement and the utilisation of digital library resources are positively correlated. Scholarly publications, e-books, and research databases are just a few of the many resources that students can access to expand their knowledge base and help them with their assignments, research projects, and test preparation. The capacity to obtain up-to-date and pertinent information is essential for the growth of critical thinking abilities and the creation of excellent work. It is crucial to remember, though, that a number of variables, such as students' motivation, information literacy levels, and how well the materials are incorporated into the curriculum, affect how well they use digital library resources in the classroom.

Overall, the results point to students' favourable perceptions of digital library resources, which they acknowledge as having an impact on their study habits, accessibility, and ease of use. These resources have an impact on how students behave when seeking information, which can enhance learning objectives and academic achievement. To optimise the advantages of digital library resources for students, it is imperative to tackle obstacles including information overload, diversions, and the enhancement of information literacy abilities.

8. IMPLICATIONS OF THE FINDINGS

i) **Consequences of the Results:** The results concerning how students view digital library resources, how they affect time management and study habits, how they affect information seeking behaviour, and how well students achieve academically have a number of consequences.

ii) **Improved Access and Convenience:** Students can access a wide range of materials more easily and conveniently with the use of digital library resources, which gives them flexibility and ease in their academic endeavours. Increased engagement, independence, and self-directed learning may result from this.

iii) **Changing Information Seeking Behaviour:** The impact of digital library resources on students' information seeking behaviour emphasises the necessity for them to acquire critical assessment abilities in order to successfully traverse the plethora of material available online. Teachers and librarians should place a strong emphasis on teaching information literacy so that students can assess the validity and dependability of internet sources with confidence.

iv) **Learning Outcomes and Academic Performance:** Since there is a favourable correlation between using digital library resources and academic performance, incorporating these resources into the curriculum may help students achieve better learning outcomes. Teachers can use internet tools to help students conduct research, think critically, and produce high-caliber work.

v) **Comparing Digital Library Resources with Traditional Library Resources:** Although digital library resources have many benefits, it's vital to think about how they stack up against traditional library resources. Several points of comparison consist of:

- **Accessibility:** By removing physical obstacles, digital library resources enable quick and distant access to a variety of materials. Conventional library resources might only be available in limited quantities and need to be physically present.
- **Depth and Scope:** Conventional library resources, especially those in print periodicals and books, can provide thorough and in-depth information. On the other hand, digital resources might offer a wider variety of sources and the speedier access to current information.
- **Tangibility and annotation:** Conventional library materials facilitate tactile reading, annotation, and hands-on engagement. Because digital resources might not be as tangible, note-taking and annotating techniques might need to be done differently.

9. FUTURE DIRECTIONS AND POSSIBLE IMPROVEMENTS

In light of the results, the following are some possible avenues for additional study and advancements:

i) **Longitudinal Studies:** Researching the effects of digital library resources over an extended period of time on students' academic performance, information literacy abilities, and learning outcomes can be done through conducting longitudinal studies.

ii) **Effective pedagogical:** practices for incorporating digital library resources into the curriculum can be investigated further through study. This entails determining the most effective teaching strategies, supporting the development of information literacy skills, and encouraging critical assessment abilities.

iii) **Customisation and Personalisation:** Upcoming innovations may concentrate on creating digital library materials that are tailored to the requirements, interests, and learning styles of specific students. User-friendly interfaces, recommendation engines, and adaptive technologies may all be involved in this.

iv) **Evaluation methods and Metrics:** Creating standardised methods and metrics for evaluation can help determine how digital library resources affect different outcomes like academic achievement, critical thinking skills, and information literacy.

Design and User Experience: Students' usefulness, accessibility, and engagement with digital library materials can all be improved with ongoing enhancements made to their design and user experience. Iterative design approaches can be informed by usability testing and user feedback.

10. CONCLUSION

The emphasises how much better digital libraries have made students' lives. These libraries have completely changed the way that education is delivered by providing a wealth of readily available resources that can be tailored to meet the requirements of individual students. Digital libraries offer students the opportunity to study at their own pace and on their own schedule, resulting in a more customised educational experience. Students' research and information literacy abilities have improved, collaborative learning opportunities have been expanded, and research vistas have been expanded thanks to digital libraries. Their attractiveness is further enhanced by their affordability and environmental sustainability, which ease financial burdens and save resources. In addition, as technology advances, digital libraries keep up with the times by introducing techniques like virtual and augmented reality that improve learning even more. All things considered, digital libraries have greatly enhanced students' ease of access to education, as well as their chances for

learning and teamwork. This has resulted in a fundamental change in how people interact with and obtain education.

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Semantic Web Integration in Academic Libraries: Revolutionizing Knowledge Management and User Experience

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ABSTRACT

This paper explores the transformative potential of Semantic Web integration in academic libraries, focusing on revolutionizing knowledge management and enhancing user experience. By imbuing data with explicit meaning and relationships, Semantic Web technologies offer innovative solutions to address the challenges posed by the abundance and complexity of digital content in academic settings. Through a comprehensive analysis, it examines how Semantic Web solutions such as RDF, ontologies, linked data, and semantic annotations can reshape knowledge organization, facilitate interoperability, and deliver personalized services to library patrons. The paper also discusses the objectives, requirements, and implementation strategies for developing Semantic Libraries, emphasizing user centric design, collaboration, and interoperability. Despite the challenges and threats posed by data quality, interoperability, and resource constraints, the paper underscores the transformative potential of Semantic Web integration in academic libraries and advocates for continued investment, collaboration, and innovation in this area. Ultimately, Semantic Web integration represents a paradigm shift in how information is accessed, organized, and utilized in academic libraries, offering a promising vision for the future of scholarly communication and knowledge dissemination.

Keywords: *Semantic Web, Semantic web stack, Semantic web technology, Semantic web components*

1. INTRODUCTION

In the age of information abundance, academic libraries serve as the information provider for the invaluable resources for the support of the students, faculty and researchers. The traditional methods of managing and accessing these resources are increasingly challenged due to increase in volume and complexity of digital content. The integration of Semantic web technologies within academic library will have a transformative approach to revolutionize knowledge management and enhance user experience.

The Semantic Web represents a paradigm shift on how we conceive and interact information on the internet. By integrating explicit meaning and relationships, the semantic web enables machines to interpret content in a manner that human perceive. In the context of academic libraries, this means moving beyond simple keyword searches towards more intelligent and contextually relevant resource discovery mechanisms. The paper views the multifaceted role of Semantic Web integration in academic libraries, examining how it can reshape knowledge organization, facilitate interoperability, and deliver personalized services to library patrons. Semantic web technologies has the potential that academic libraries stand to unlock the new levels of effectiveness, and user engagement in fulfilling the mission as hubs of learning and research.

Through a comprehensive analysis of the advancements, challenges, and future prospects of Semantic Web integration in academic libraries, this paper aims to provide insights into the transformative potential of this approach. By understanding the principles and applications of Semantic Web technologies within the library context, librarians and researchers, can chart a course towards a more intelligent, interconnected, and user-centric academic library ecosystem.

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2. ORIGIN OF SEMANTIC WEB

Sir Tim Berners-Lee, the inventor of the World Wide Web, along with his colleagues James Hendler and Ora Lassila, first proposed the concept of the Semantic Web in the early 2000s. The idea stemmed from the recognition that while the web had evolved into a vast repository of information, much of this information was intended for human consumption, making it difficult for machines to understand and process.

The term "Semantic Web" was introduced in Berners-Lee's seminal scientific article titled "The Semantic Web," published in the Scientific American journal in May 2001. In this article, Berners-Lee outlined his vision for a web of data that could be interpreted and processed by machines, enabling more intelligent information retrieval and automated decision-making. He envisioned a web where information would not only be presented in human-readable formats but also enriched with metadata and semantic annotations, allowing computers to understand the meaning and context of data.

The Semantic Web builds upon existing web technologies such as HTTP, HTML, and XML but extends them with additional standards and protocols for representing and interlinking data in a machinereadable format. Key technologies associated with the Semantic Web include Resource Description Framework (RDF) for representing data, Web Ontology Language (OWL) for defining vocabularies and relationships, and SPARQL for querying linked data.

Since its inception, the Semantic Web has evolved into a vibrant research area, attracting contributions from academia, industry, and standardization bodies. While the vision of a fully realized Semantic Web has yet to be fully achieved, significant progress has been made in developing foundational technologies, establishing best practices, and demonstrating the potential applications of semantic technologies across various domains, including healthcare, e-commerce, and digital libraries.

3. WHAT IS THE SEMANTIC WEB?

The Semantic Web represents an evolution of the World Wide Web into a machine-understandable platform where information is not just presented in human-readable formats but also encoded with meaning and relationships that computers can interpret. At its core, the Semantic Web is built upon standardized technologies and principles aimed at structuring and linking data in a way that enables automated processing and reasoning. Key components of the Semantic Web include the Resource Description Framework (RDF), which provides a standardized model for representing data and relationships, and ontologies, which define vocabularies and relationships between concepts within specific domains. Linked Data principles further facilitate the publication and interlinking of structured data, fostering a web of interconnected knowledge. Additionally, the Semantic Web incorporates query languages like SPARQL to enable flexible and powerful data retrieval. Overall, the Semantic Web aims to transform the web into a global knowledge graph, where information is not only accessible but also interpretable and usable by both humans and machines, leading to enhanced knowledge discovery, collaboration, and innovation.

4. SEMANTIC WEB SOLUTIONS

Semantic Web solutions comprise a range of technologies and methodologies aimed at improving data organization, interoperability, and accessibility online. These solutions are crafted to assign explicit meaning to data, empowering machines to comprehend and manage information more intelligently and autonomously. Among the key Semantic Web solutions is the Resource Description Framework (RDF), which establishes a standardized structure for representing data and metadata in a triple format, allowing for the depiction of relationships between resources. Web Ontology Language (OWL) facilitates the development of intricate, machine-readable knowledge models by defining and illustrating ontologies, which support automated reasoning and inference. SPARQL Protocol and RDF Query Language (SPARQL) enable robust and adaptable data access by querying linked data sources. Linked Data principles foster the dissemination and connection of structured data, facilitating data integration and discovery across various sources.

Ontology development tools offer graphical interfaces and utilities for creating, modifying, and overseeing ontologies, simplifying the ontology development process. Semantic annotation tools empower users to annotate web content with semantic metadata and mark-up, enhancing the

significance of web pages. Semantic search engines leverage ontologies and semantic annotations to refine search accuracy and relevance. Knowledge graphs serve as organized knowledge repositories, amalgamating information from diverse sources and domains to support advanced analytics and recommendation systems. Semantic Web services establish a standardized framework for describing and identifying web services through semantic annotations, facilitating automated service discovery, composition, and invocation. Various standards and best practices foster the adoption and compatibility of Semantic Web technologies, outlining vocabularies, schemas, and guidelines for publishing and consuming linked data online. In essence, Semantic Web solutions provide a comprehensive toolkit for actualizing the vision of a more intelligent, interconnected, and machinecomprehensible web, thereby unlocking fresh opportunities for data integration, knowledge discovery, and collaboration across an array of domains and applications.

5. COMPONENTS OF SEMANTIC WEB

The Semantic Web comprises several key components and technologies that work together to enable the representation, integration, and interpretation of data in a machine-understandable format. Some of the fundamental components of the Semantic Web include:

i) *Resource Description Framework (RDF):* RDF is a standardized data model for representing information on the web. It uses triples, consisting of subject-predicate-object statements, to express relationships between resources. RDF provides a flexible and extensible framework for encoding diverse types of data.

ii) *Ontologies:* Ontologies define formal vocabularies that describe concepts, relationships, and constraints within a specific domain. They provide a structured framework for organizing knowledge and facilitating interoperability between different systems and datasets. Ontologies are typically expressed using languages such as Web Ontology Language (OWL).

iii) *Web Ontology Language (OWL):* OWL is a language for defining ontologies on the Semantic Web. It allows users to specify classes, properties, and relationships between entities in a formal and machinereadable manner. OWL provides a rich set of constructs for expressing complex domain models and reasoning about data.

iv) *Linked Data:* Linked Data principles promote the publication and interlinking of structured data on the web. By assigning Uniform Resource Identifiers (URIs) to resources and establishing semantic links between them, Linked Data enables the creation of a global data commons that facilitates data integration and discovery.

v) *SPARQL Protocol and RDF Query Language (SPARQL):* SPARQL is a query language for retrieving and manipulating RDF data on the Semantic Web. It allows users to express complex queries over linked data sources, enabling powerful data access and integration capabilities.

vi) *Semantic Annotations*: Semantic annotations enrich web content with machine-readable metadata that describes the meaning and context of the information. Annotations enable search engines and other applications to understand and interpret content more accurately, leading to improved search results and data interoperability.

vii) *Inference Engines:* Inference engines utilize ontologies and logical reasoning to derive new knowledge from existing data. By applying deductive and inferential rules, inference engines can infer implicit relationships and make inferences about the data, supporting tasks such as data integration, classification, and validation.

viii) *Knowledge Graphs:* Knowledge graphs represent structured knowledge bases that capture relationships between entities and concepts. They integrate information from multiple sources and domains, providing a unified view of knowledge that supports advanced analytics, recommendation systems, and natural language processing.

ix) *Semantic Web Services:* Semantic Web services provide a standardized framework for describing and discovering web services using semantic annotations. They enable automated service discovery, composition, and invocation based on the semantic descriptions of service capabilities and requirements.

The Semantic Web Stack and Semantic Web Technologies are foundational frameworks and technologies that enable the realization of the Semantic Web vision. They encompass a range of standards, languages, and protocols designed to facilitate the representation, integration, and

interpretation of data in a machine-understandable format. Below, researcher outline both the Semantic Web Stack and some key Semantic Web Technologies:

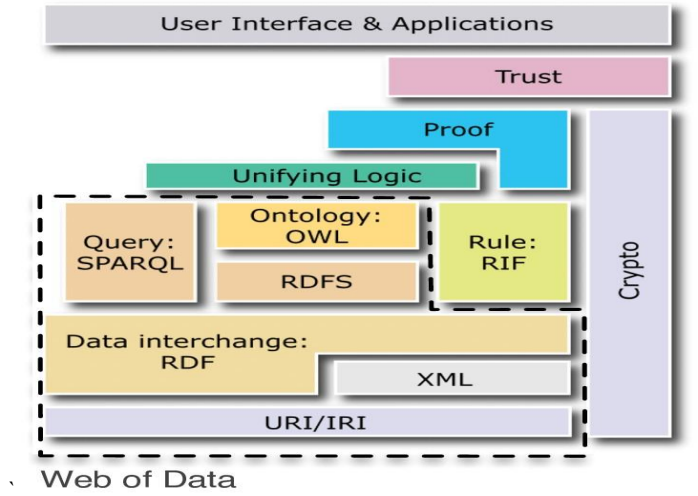

Figure 1: Components of Semantic Web

5.1. Semantic Web Stack:

- *URI (Uniform Resource Identifier):* URIs serve as unique identifiers for resources on the web, enabling precise referencing and linking of data. Examples means "https://www.example.com/index.html"
- *HTTP (Hypertext Transfer Protocol):* HTTP provides the protocol for transferring data on the web, facilitating the exchange of information between clients and servers.
- *RDF (Resource Description Framework):* RDF is a standardized data model for representing information on the web. It uses triples (subjectpredicate-object statements) to express relationships between resources.
- *RDFS (RDF Schema):* RDFS is an extension of RDF that allows for the definition of vocabularies and basic ontologies. It provides constructs for specifying classes, properties, and relationships between resources.
- *OWL (Web Ontology Language):* OWL is a language for defining ontologies on the Semantic Web. It enables the formal representation of concepts, properties, and relationships within a domain, supporting advanced reasoning and inference.
- *SPARQL (SPARQL Protocol and RDF Query Language):* SPARQL is a query language for retrieving and manipulating RDF data on the Semantic Web. It allows users to express complex queries over linked data sources, enabling powerful data access and integration capabilities.

5.2. Semantic Web Technologies:

- *RDFa (RDF in Attributes):* RDFa is a syntax for embedding RDF metadata within HTML documents. It allows web developers to annotate web content with semantic metadata, enhancing searchability and interoperability. Tools can extract that structured data and generate RDF triples for further reuse. Rdfa can be considered as another serialization format for RDF.
- *Microformats:* Microformats are a set of simple, open data formats built upon existing web standards. They enable the embedding of semantic metadata within HTML documents, facilitating data interoperability and integration. Microformats are small patterns of HTML to represent commonly published things like people, events, blog posts, reviews and tags in web pages. Microformats are the quickest & simplest way to provide an API to the information on your website.

- *JSON-LD (JSON for Linked Data):* JSON-LD (JavaScript Object Notation for Linking Data) is a lightweight Linked Data format that gives our data context. It is easy for humans to read and write. It is easy for machines to parse and generate. It is based on the already successful JSON format and provides a way to help JSON data interoperate at Web-scale. JSON-LD is a lightweight syntax for expressing linked data in JSON format. It provides a simple and compact way to represent RDF data, making it easier to integrate with web applications and APIs.
- *SHACL (Shapes Constraint Language):* The SHACL vocabulary describes how a given shape is linked to *targets* in the data and also provides a way for a Data Graph to specify the Shapes Graph that should be used for validation. The result of a SHACL validation describes whether the Data Graph conforms to the Shapes Graph and, if it does not, describes each of the failures. SHACL is a language for defining constraints and validation rules for RDF graphs. It allows users to specify the structure and integrity constraints of RDF data, ensuring data quality and consistency.
- *Linked Data Platform (LDP):* Linked Data Platform Resources (*LDPRs*) are HTTP resources that conform to the simple patterns and conventions in this section. HTTP requests to access, modify, create or delete LDPRs are accepted and processed by LDP servers. Most LDPRs are domain-specific resources that contain data for an entity in some domain, which could be commercial, governmental, scientific, religious, or other. LDP is a set of specifications for building Linked Data applications on the web. It defines standard RESTful interfaces and patterns for managing and accessing linked data resources, promoting interoperability and scalability.
- *Vocabularies and Ontologies:* Various vocabularies and ontologies, such as schema.org, FOAF (Friend of a Friend), and DBpedia Ontology, provide standardized vocabularies for describing common concepts and entities on the web, enabling data interoperability and integration.
- *Define Objectives and Requirements:* Identify the goals and objectives of the Semantic Library project. Determine the specific functionalities and features you want to incorporate, such as improved search capabilities, personalized recommendations, and enriched metadata.
- *Data Modeling and Ontology Development:* Develop an ontology that defines the concepts, relationships, and properties relevant to your library domain. This ontology will serve as the foundation for organizing and representing library resources in a structured and machine-understandable format. Use standards such as RDF and OWL for ontology development.
- *Semantic Annotation of Library Resources:* Annotate library resources (e.g., books, articles, multimedia) with semantic metadata using RDFa, JSON-LD, or other annotation techniques. Embed metadata within the HTML markup of web pages or provide metadata alongside resource descriptions in linked data formats.
- *Linked Data Publication:* Publish library data as linked data according to Linked Data principles. Assign unique URIs to library resources and make them accessible via HTTP. Provide RDF representations of resources and establish semantic links between related resources.
- *Semantic Search and Retrieval*: Implement a semantic search engine that leverages SPARQL queries to retrieve library resources based on semantic metadata and user queries. Use inferencing techniques to enhance search results and provide context-aware recommendations.
- *User Interface Design:* Design an intuitive user interface that enables users to interact with library resources and services effectively. Incorporate features such as faceted search, semantic browsing, and personalized recommendations to enhance the user experience.
- *Integration with External Data Sources:* Integrate library data with external data sources and vocabularies to enrich the semantic context of resources. Utilize existing ontologies and vocabularies relevant to the library domain, such as library standards (e.g., Dublin Core) or domain-specific vocabularies.
- *Collaboration and Interoperability:* Foster collaboration and interoperability by aligning with other Semantic Libraries and institutions. Participate in linked data initiatives and communities to share resources, vocabularies, and best practices.
- *Evaluation and Feedback:* Continuously evaluate the effectiveness and usability of the Semantic Library through user feedback, usage analytics, and performance metrics. Iterate on the design and implementation based on insights gathered from stakeholders and end-users.

- *Documentation and Training:* Provide comprehensive documentation and training materials to support librarians, developers, and users in understanding and utilizing the Semantic Library effectively. Offer workshops, tutorials, and online resources to promote adoption and usage.
- *Applications of RDF (Resource Description Framework) in Digital Libraries:*

i) *Metadata Management:* RDF is widely used in digital libraries to manage metadata describing digital resources such as books, articles, and multimedia files. RDF provides a flexible and extensible framework for representing metadata in a machine-understandable format, enabling efficient search, retrieval, and organization of digital resources.

ii) *Semantic Interoperability:* RDF enables semantic interoperability between heterogeneous digital library systems and repositories. By representing metadata using RDF triples, digital libraries can exchange and integrate metadata from different sources, facilitating seamless access to distributed digital collections.

iii) *Linked Data Integration:* RDF facilitates the integration of digital library resources with the broader web of Linked Data. Digital libraries can publish metadata about their resources as Linked Data, enabling them to be interconnected with other datasets and resources on the web. This interconnectedness enhances the discoverability and accessibility of digital library resources.

iv) *Semantic Search and Discovery*: RDF-based metadata allows for more sophisticated search and discovery capabilities in digital libraries. Semantic search engines can leverage RDF metadata to understand the semantics of queries and documents, enabling more accurate and context-aware search results. Users can discover relevant resources based on their relationships, classifications, and other semantic properties encoded in RDF.

v) *Personalized Recommendation:* RDF metadata can be used to generate personalized recommendations for users in digital libraries. By analyzing user preferences, browsing history, and the semantic relationships between resources, recommendation systems can suggest relevant items that match users' interests and preferences, thereby enhancing the user experience and engagement.

vi) *Ontology-based Information Organization:* RDF enables digital libraries to employ ontologies for organizing and categorizing digital resources. Ontologies define formal vocabularies that capture domain-specific concepts and relationships, providing a structured framework for organizing and navigating digital collections. This ontology-based approach enhances the consistency and coherence of information organization in digital libraries.

vii) *Metadata Enrichment and Annotation*: RDF metadata can be enriched with additional annotations and semantic relationships to enhance the understanding and interpretation of digital resources. Annotations such as subject classifications, annotations, and semantic relationships can be expressed using RDF triples, providing richer descriptions of digital resources and supporting advanced analysis and visualization techniques.

6. CHALLENGES AND THREATS

Developing semantic libraries is accompanied by several challenges and potential threats that necessitate careful consideration and strategic planning. Firstly, ensuring the quality and integration of data poses a significant hurdle. Semantic libraries often aggregate data from diverse and heterogeneous sources, varying in formats, structures, and quality levels, which complicates the harmonization and integration process. Additionally, the development and maintenance of ontologies, which underpin semantic libraries, demand considerable resources and domain expertise. These ontologies must accurately capture domain-specific concepts and relationships while remaining adaptable to evolving domain needs. Achieving interoperability between semantic libraries and systems is another challenge, as differences in vocabularies, ontologies, and data models hinder seamless data exchange and integration. Scalability and performance issues arise due to the large volumes of data handled by semantic libraries, necessitating efficient data management and processing strategies. Privacy and security concerns also loom large, especially with the presence of sensitive or personal information in these libraries, requiring robust security measures to safeguard user data. Furthermore, ensuring user adoption and usability is crucial for the success of semantic libraries, necessitating intuitive interfaces and user-friendly applications. Bridging the semantic gap and addressing ambiguity in data interpretation present additional challenges, requiring advanced techniques such as natural language processing and semantic reasoning. Lastly, resource constraints,

including limited funding, personnel, and technical capabilities, pose ongoing challenges to the development, deployment, and sustainability of semantic libraries. Addressing these challenges demands interdisciplinary collaboration, innovative technologies, and strategic planning to harness the full potential of semantic libraries in enhancing knowledge organization, discovery, and access.

7. CONCLUSION

In conclusion, the integration of Semantic Web technologies in academic libraries holds immense promise for revolutionizing knowledge management and enhancing the user experience. By leveraging Semantic Web principles such as RDF, ontologies, and linked data, academic libraries can overcome traditional limitations and unlock new opportunities for data organization, interoperability, and discovery. Semantic annotations and metadata enrichments enable more accurate and contextually relevant resource discovery, while personalized recommendation systems cater to the diverse needs and preferences of users. The Semantic Web facilitates collaboration and innovation by providing a shared framework for knowledge representation and exchange, fostering interdisciplinary research and discovery. Despite the numerous challenges and threats associated with developing semantic libraries, including data quality, interoperability, and resource constraints, the transformative potential of Semantic Web integration cannot be overstated.

Moving forward, it is essential for academic libraries to continue investing in Semantic Web technologies and methodologies, prioritizing user-centric design, interoperability, and data quality. Collaborative efforts within the academic community, along with support from funding agencies and industry partners, are critical for advancing the Semantic Web agenda in libraries. Additionally, ongoing research and development efforts should focus on addressing key challenges such as scalability, privacy, and usability, ensuring that semantic libraries remain effective and sustainable in the long term.

In essence, Semantic Web integration in academic libraries represents a paradigm shift in how we access, organize, and utilize information, offering a transformative vision for the future of scholarly communication and knowledge dissemination. By embracing Semantic Web principles and leveraging emerging technologies, academic libraries can continue to evolve as dynamic hubs of learning, research, and innovation in the digital age.

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The Evolution of Artificial Intelligence and Machine Learning in Library Systems and Services

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ABSTRACT

Artificial Intelligence (AI) and machine learning (ML) have changed many things, including libraries and services. This article explores the integration of artificial intelligence and machine learning in libraries and services and examines their impact on user experience, administrative collection, record keeping, and decision-making. Examines the challenges, opportunities, and ethical considerations associated with the use of artificial intelligence and machine learning in libraries. It also discusses future trends and possible advances in the use of artificial intelligence and machine learning and highlights their role in the creation of future library services.

Keywords: *Emerging Technologies, Artificial Intelligence, Machine Learning, Library Systems, Services*

1. INTRODUCTION

Libraries have long been at the forefront of disseminating and storing information. They face new challenges and opportunities arising from rapid technological developments in the digital age. One of the biggest changes in recent years has been the integration of artificial intelligence (AI) and machine learning (ML) into libraries and services.

Artificial intelligence and machine learning technologies provide libraries with unprecedented capabilities to improve their operations, improve user experience, and update information needs. This introduction sets the stage for exploring the far-reaching impact of artificial intelligence and machine learning on library services and clarifies the main purpose of this article.

2. EVOLUTION OF LIBRARY SERVICES

Traditionally, libraries receive physical services consisting of books, magazines and other printed materials. However, the emergence of the internet and digital technology has changed the way information is accessed, shared and used. The library has been developed into a recognized center providing various digital services, multimedia information and online services.

3. THE RISE OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

The rise of artificial intelligence and machine learning technology has transformed many industries, from healthcare and finance to transportation and entertainment. Artificial intelligence and machine learning in libraries have the potential to simplify operations, improve resource allocation, and improve user engagement. This technology allows libraries to leverage rich data and provide insights to better serve patrons.

4. OBJECTIVES

This article is designed to provide an overview of the integration of artificial intelligence and machine learning in libraries and services. It explores the various roles of artificial intelligence and machine learning in collection management, data storage, additional information use, and decision support. It also explores the challenges, opportunities, and ethical considerations surrounding the adoption of artificial intelligence and machine learning in libraries.

5. SIGNIFICANCE OF THE STUDY

Understanding the integration of artificial intelligence and machine learning in libraries and services is important for librarians, professionals, researchers, and policymakers. By illuminating the

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issues, challenges, and ethics surrounding the adoption of artificial intelligence and machine learning in libraries, this research contributes to ongoing debates about the future of libraries in the digital age. In fact, the integration of artificial intelligence and machine learning technologies represents a revolution in library services and promises to usher in a new era of design innovation, performance and customer centricity. This article aims to shed light on this transition and provide insight into the opportunities and challenges ahead.

6. LITERATURE REVIEW

The role of artificial intelligence (AI) and machine learning (ML) in libraries and services, especially in collection management, was deemed crucial. Research by Das (2021) and Al-Aamri (2021) demonstrated many uses, including information creation, resource searching, book finding, and user services. However, Cordell (2023) emphasized the need for collaboration between librarians and technology researchers to close the gap between engagement and user experience. Jayawardena (2021) continued this by providing smart library management and intelligence-based recommendations using IoT technology regarding the user's design and behavior.

In information retrieval, Luca (2022) and Gollapalli (2014) showed the development of skills, including the efficiency and performance of tasks such as data classification document. Li (2021) discussed the practical use of library group development and management, solving problems and proposing countermeasures. Amzat (2023) discussed the integration of artificial intelligence and the virtual world into academic libraries to improve user experience. Panda and Kaur (2023) explored how emerging technologies like AI, ML, NLP, AR, and VR redefined digital library experiences, emphasizing intuitive content curation, seamless information retrieval, and engaging learning possibilities while ensuring a user-centric approach.

In libraries, Pence (2022) highlighted the role of AI in data analysis, remote access, and private study of library outputs. Bisht (2023) highlighted the potential of artificial intelligence to improve efficiency, accuracy, and user experience. Barsha (2023) discussed the challenges and benefits of using artificial intelligence in developing countries, while Oyelude (2021) envisioned the development of services through technologies such as natural language processing and human-computer interaction.

Artificial intelligence and machine learning brought challenges and opportunities. Panda and Chakravarty (2022) proposed an AI-driven "InfoBot" or "Chatbot" solution to enhance virtual library services amidst the COVID-19 pandemic, demonstrating its practical implementation and highlighting its potential to augment reference services, thus embracing the concept of a "library without walls." Bakshi (2018) argued that machine learning revealed patterns in big data, while Chouard (2015) discussed the renewal of artificial intelligence with advances in neural networks and chips. Al-Ameri (2023) acknowledged the problem in the field of intellectual property, while Akinola (2023) pointed out the problems faced by academic librarians in Nigeria. Panda et al. (2024) examined how cloud and fog computing synergized within Library 5.0, enhancing services and user experiences while addressing challenges and ensuring robust security and privacy measures.

Thinking about justice was difficult. Rashmi (2023) drew attention to the issues of injustice, justice, and responsibility, especially in preventing discriminatory behavior. Motta (2020) referred to transparency and disclosure of machine learning algorithms to solve ethical issues, while Piano (2020) called for guidelines and controls in AI-driven decision-making to be fair, accurate, and accountable.

7. ROLE OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN LIBRARY SYSTEMS AND SERVICES

7.1. In Collection Management

Collection management is an important part of library operation and includes the acquisition, arrangement and maintenance of materials, books in the library to meet the information needs of the users. The combination of artificial intelligence (AI) and machine learning (ML) technologies has revolutionized the collection management process by providing libraries with powerful tools for efficiency, improving resource allocation, and increasing user satisfaction. Automatic cataloging and metadata tools: Artificial intelligence and machine learning algorithms automate the cataloging process by analyzing metadata, text, and multimedia content. Natural language processing (NLP)

algorithms extract valuable information from records, summaries, and full text to help create accessible and accurate lists. Machine learning techniques such as clustering and classification help organize library materials into themes and categories, improving discovery and ease of access.

7.2. Demand Forecasting and Collection Development

AI-powered statistical models analyze usage patterns, data trends, and user preferences to predict demand for library materials. Using historical loan data and external factors such as demographic trends and changes in academic programs, librarians can make harvest and acquisition-informed decisions. Machine learning algorithms identify new topics, popular brands, and trends, allowing librarians to choose different and relevant products to suit their needs and interests.

7.3. Acquisition and Selection Recommendations

Recommendations based on demand intelligence analyze user behavior, reading history, and content preferences to make acquisition and ranking recommendations Check the product for removal or removal options. Integrated filtering algorithms compare user data and similar plans to create personalized recommendations, encourage patience, and make interacting with library collections easier. The proposed process can improve conservation and ensure continuity and innovation of buildings by providing feedback on resources and identifying obsolete or obsolete materials.

7.4. Protection and Management of Digital Assets

Artificial intelligence and machine learning technologies facilitate the protection and management of digital assets through functions such as format conversion, data integrity analysis, and digital rights management. Image recognition algorithms detect physical defects and digitally prioritize items based on storage priority and usage needs. Machine learning-based content analysis tools make it easy to enrich metadata, tag content, and annotate semantics to improve the discovery and accessibility of digital texts while also ensuring their preservation there for the long term.

7.5. Quality Control and Performance Analysis

Artificial intelligence and machine learning algorithms improve quality control by detecting errors, inconsistencies, and defects in records and digital assets. Text mining technology allows libraries to maintain the accuracy and consistency of information in their collections by detecting typos, grammatical errors, and formatting inconsistencies in catalog information. Machine learning-based anomaly detection models can protect the integrity and integrity of stored information by detecting inaccuracies and suspicious patterns in reference materials, alerting libraries to problems such as inaccessibility, information leakage, or malfunction.

7.6. The Impact of Artificial Intelligence and Machine Learning on Information Access

Access to information is the foundation of library services, allowing users to effectively access, search and store relevant information. The combination of artificial intelligence (AI) and machine learning (ML) technology has revolutionized the data ingestion process by providing advanced search capabilities, identity suggestions, and contextual knowledge of the technology. This chapter explores the various impacts of artificial intelligence and machine learning on information storage in libraries.

7.7. Improved Search Algorithms

Artificial intelligence and machine learning algorithms are powerful, advanced search engines that understand natural questions, relationships, and user goals. Natural Language Processing (NLP) technology allows search engines to interpret complex queries, extract relevant content and generate search results. Machine learning algorithms learn from user interactions and feedback to improve search accuracy, rankings, and returns, thus improving the overall search experience of consumers in the library.

7.8. Personalized Recommendations

The recommendation system uses artificial intelligence to analyze users' behavior, preferences and past interactions to provide recommendations based on personal preferences and needed

information. Collaborative filtering uses user data interaction plans to identify patterns and similarities between users and plans to create personalized recommendations for impacted resources. Content-based filtering algorithms analyze the content and metadata of information in the library to recommend items based on their similarity to the user's interests and profile. Hybrid offering encourages patience and collaboration across library collections by combining collaborative and content-based technology to deliver better and more diverse offerings.

7.9. Context-Aware Research Technologies

Artificial intelligence and machine learning power context-aware research technologies that determine factors such as the user's location, device type, time of day, and search history to customize search results and recommendations. Location-based services use geographic information to recommend nearby libraries, events, and services, thereby increasing the accessibility and convenience of information for people in specific areas. Time-based algorithms adjust search results and recommendations based on time factors such as trending topics, seasonal preferences, and historical usage patterns to ensure freshness and timeliness of data recovery.

7.10. Visual and multimedia retrieval

Artificial intelligence and machine learning algorithms help retrieve visual and multimedia content by analyzing image, audio and video data. Image recognition algorithms classify and tag visual data, allowing users to search and search archived text based on visual characteristics such as color, texture, and shape. Speech recognition algorithms incorporate audio content into text, making it easier to search for keywords from recorded speeches, sermons, and oral histories. Video analytics technology extracts metadata and keyframes from video content, allowing users to search and find video collections based on content, scenes, and descriptions.

7.11. Cross-language retrieval and translation

Artificial intelligence and machine learning technologies support cross-language retrieval and translation, allowing users to access information in multiple languages and overcome language barriers. Machine translation algorithms translate search queries and information between different languages, allowing users to receive relevant information in their preferred language. Differentiator technology tools use multilingual embeddings and semantic similarity metrics to identify queries and data across languages; thus allowing users to explore relevant resources even if they are not taught the same language as the questions.

7.12. Improved user experience through artificial intelligence and machine learning:

User experience (UX) plays an important role in consumer decision-making regarding library interest and engagement. Integration of artificial intelligence (AI) and machine learning (ML) technologies allows libraries to improve user experience by providing personalized services, facilitating access to information, and improving communication and communication. This chapter explores how artificial intelligence and machine learning can help improve the user experience of libraries and services.

7.13. Personalized recommendations and discovery

Recommendations based on AI-powered systems analyze user preferences, behavior and past interactions to create personalized recommendations for needs and information requirements. Using integration, content filtering, and recommendation techniques, libraries can provide users with relevant recommendations for books, products, events, and services, promoting effective discovery and collaboration with library collections.

7.14. Intelligent virtual assistants and chatbots

Artificial intelligence-powered virtual assistants and chatbots provide instant help and support to users and improve the accessibility and functionality of library services. Natural language processing (NLP) algorithms enable virtual assistants to understand and answer user questions, provide information about library services and programs, and provide assistance and problem solving.

Chatbots can handle routine questions such as library opening hours, financial information and simple questions, freeing up staff time for complex questions and personal interactions with users.

7.15. Adaptive interface and personal responsibility

Artificial intelligence and machine learning technologies can enhance adaptation and personalization to customize the user experience based on personal preferences, behaviors and situation. Adaptive interfaces optimize usability and accessibility for different groups of users by dynamically adjusting layout, content, and functionality based on user interaction and feedback. Personalization features allow users to customize their profiles, preferences and settings, allowing them to tailor their library experience to their specific needs and preferences.

7.16. Context-aware services and recommendations

Artificial intelligence and machine learning algorithms power context-aware services and recommendations that include context people use, such as location, device type, time of day, and search history, to customize interactions and deliver content. . Location-based services use geographic information to recommend nearby libraries, events, and services, thereby increasing the convenience and accessibility of information for users in specific areas. Time-based algorithms adjust recommendations and notifications based on time factors such as trending topics, seasonal trends, and historical usage patterns to ensure messages are timely and relevant.

7.17. Analysis of user feedback and continuous improvement

Artificial intelligence and machine learning technologies facilitate analysis of user feedback and interaction data to identify patterns, trends, and areas for improvement in library services and systems. Sentiment analysis algorithms process user reviews, reviews, and surveys to measure satisfaction, identify pain points, and prioritize improvements. Customer behavior metrics track navigation patterns, research questions, and resource usage to understand customer preferences, inform service design decisions, and improve user experience over time.

7.18. Artificial intelligence and machine learning in decision making

In addition to improving user experience and enhancing collection management, artificial intelligence (AI) and machine learning (ML) technology play a role in supporting library decision-making. plays an important role in the process. By analyzing data, predicting trends, and optimizing resource allocation, artificial intelligence and machine learning enable libraries and managers to make the right decisions, leading to efficiency, effectiveness, and user satisfaction. This chapter explores various ways in which AI and machine learning can support decision-making in libraries and services.

7.19. Predictive analysis of resource allocation

Model intelligence driven by predictive modeling analysis of historical data, traffic patterns, and public trends to predict future needs for library materials. Through the use of machine learning algorithms, libraries can predict which materials will be in high demand and realize efficient use, classification and additional strategies. Forecasting also informs decisions about resource allocation, staffing levels and budget allocation, allowing libraries to optimize resources and improve service.

7.20. Design and Management

Artificial intelligence and machine learning technologies help libraries build collections and manage decisions by analyzing reference materials, checking for inconsistencies in the collection, and agreeing to retrieve and delete them. Text mining and natural language processing (NLP) algorithms analyze user input, analytics, and data submissions to assess the quality and suitability of existing resources and identify areas for improvement. Using machine learning-based recommendations, libraries can customize different and relevant products to meet the changing needs and preferences of their user communities.

7.21. Performance evaluation and impact assessment

Artificial intelligence and machine learning algorithms facilitate performance evaluation and impact assessment of library services by analyzing the use of statistics, indicators and user feedback

to create plans. Text mining technology allows Libraries to evaluate the effectiveness and impact of their programs, events, and publications by extracting key information and topics from texts such as customer reviews, social media posts, and articles. By measuring user sentiment and satisfaction, machine learning-based sentiment measurement tools can provide valuable recommendations for service improvement and strategic planning.

7.22. Efficiency and optimization

Artificial intelligence and machine learning technology increases efficiency and effectiveness in daily operations, making the process more efficient and reducing effort. Machine learning algorithms analyze operational data, detect inconsistencies and inefficiencies, and recommend process improvements to increase performance and reduce costs. Robotic process automation (RPA) technology automates repetitive tasks such as data entry, inventory management, and interlibrary loan processing, freeing staff time for higher costs and strategic planning.

7.23. Strategic Planning Decision Support

AI-powered decision support provides libraries and administrators with data-driven insights and recommendations for strategic planning and decision-making. This system analyzes multiple data sources, including usage statistics, population patterns, and financial allocations, to identify opportunities for innovation, application resources, and service development. Decision support leverages advanced analytics and visualization tools to support libraries in making evidence-based decisions consistent with their mission, vision, and idea goals.

8. CHALLENGES AND OPPORTUNITIES

The integration of artificial intelligence (AI) and machine learning (ML) technologies into libraries and services presents two challenges and opportunities. While these technologies have the potential to increase efficiency, improve user experience and support decision-making processes, their use also raises concerns about data privacy, algorithmic bias and technical infrastructure. This chapter examines the key challenges and opportunities associated with the adoption of artificial intelligence and machine learning in libraries.

8.1. Challenges:

i) **Data Privacy and Security**: The use of artificial intelligence and machine learning algorithms requires access to large amounts of data, paper, including reference materials, circular materials and bibliographic materials. Ensuring the confidentiality and security of this information is important to protect customer privacy and comply with data protection laws such as GDPR and CCPA.

ii) **Algorithm Bias and Fairness**: Artificial intelligence and machine learning algorithms can introduce bias in training data, which can lead to prejudice or discrimination. Libraries must be vigilant in identifying and minimizing bias in algorithmic decision-making to ensure all users have equal access to information and resources.

iii) **Infrastructure and skills**: The use of artificial intelligence and machine learning technology requires efficient infrastructure, including computing resources, quality, data storage and network connectivity. Libraries may face challenges in finding and maintaining the infrastructure and expertise necessary to develop, implement, and manage AI solutions.

iv) **Ethical decision making**: The use of artificial intelligence and machine learning in libraries leads to ethical decision making regarding transparency, accountability and informed consent. Libraries should be transparent about their use of AI technology, provide users with a clear explanation of how their information will be used, and ensure that decisions made by AI systems are based on ethical and professional values.

8.2. Opportunities:

i) **Improve user experience**: Artificial intelligence and machine learning technologies provide libraries with the opportunity to improve user experience by providing personalized recommendations, virtual services, and contextual information services. By using this technology, libraries can increase user satisfaction, engagement and loyalty, and ultimately provide moderate

and inclusive access to information and knowledge, fulfilling their mission of providing customer service.

ii) **Decisions made from data:** Artificial intelligence and machine learning algorithms enable librarians to make decisions from data at all stages of library operations paper, including collection management, resource allocation and strategic planning. By analyzing data usage, predicting trends, and streamlining operations, libraries can improve their services and be more responsive and responsive to the needs of consumers and communities.

iii) **Innovation and Collaboration**: Libraries use artificial intelligence and machine learning technology to provide opportunities for innovation, collaboration and knowledge sharing within institutions. Libraries can collaborate with researchers, technologists, and other stakeholders to develop and implement innovative solutions that solve the complex and advancing problems of library research.

iv) **Lifelong learning and development**: The integration of artificial intelligence and machine learning in libraries provides librarians and information professionals with the opportunity to develop new skills and abilities in data analysis, machine learning and computational thinking. By supporting lifelong learning and professional development, librarians can adapt to technological changes, improve their skills, and stay at the forefront of innovation in the field.

9. ETHICAL CONSIDERATIONS

As libraries integrate artificial intelligence (AI) and machine learning (ML) technologies into their systems and services, it is important to address ethical issues to ensure accountability, transparency, and equity in this important technology. This chapter examines the ethical implications of artificial intelligence and machine learning in libraries and suggests concepts and best practices to guide ethical decision-making.

i) **Transparency and Accountability**: Transparency is important for artificial intelligence and machine learning to ensure users understand how their data is collected, used and processed. Libraries must clearly explain the purpose and functionality of AI-powered services, including recommendations, virtual assistants, and predictive analytics. Additionally, libraries should establish an accountability system that allows users to voice concerns or errors and ensures that the decision-making process is transparent and accountable to stakeholders.

ii) **Fairness and Fairness**: Artificial intelligence and machine learning algorithms may introduce bias in the information presented, resulting in unfairness or prejudice. Libraries must identify and reduce bias in algorithmic decision-making processes to ensure all users have equal access to information and resources. This may include diverse training data, ongoing evaluation of algorithms for bias, and using fairness-aware machine learning techniques to reduce bias.

iii) **Privacy and data protection**: The library collects and processes sensitive user data documenting circulars, research questions and private letters. It is important to maintain user privacy and data protection principles and ensure that AI and machine learning comply with laws and regulations. Libraries must implement effective data management practices, including data anonymity, access, and access control to protect user privacy and security against unauthorized disclosure or misuse of personal information.

iv) **Information consent and user control**: Libraries should respect user autonomy and provide opportunities for consent and user control for the use of data in artificial intelligence and machine learning. This may include obtaining explicit consent for the collection and processing of data, providing users with clear information about how their data is used, and offering users the option to opt-out or edit their particular interests. Libraries must enable users to make informed decisions about interacting with AI-powered services and respect their privacy and independence.

v) **Intellectual freedom and intellectual rights**: Artificial intelligence and machine learning technologies raise questions about intellectual freedom and intellectual rights. Property rights, especially regarding contractual terms and legal regulation. Libraries must adhere to the principle of intellectual freedom and ensure that intellectual offerings do not deny users access to greater thought and feeling. Additionally, libraries must respect laws and intellectual property rights when developing and using artificial intelligence and machine learning, and obtain appropriate licenses and permissions for terms of use and distribution.

vi) **Code of Ethics and Responsibility**: Lawyers and media professionals are responsible for upholding ethical standards and values when using professional technology and machine learning. This includes the following codes of ethics, such as the American Library Association Code of Ethics and the IFLA Code of Ethics for Librarians and Other Information Workers, which emphasize the principles of independence, intellectual property risk, privacy, and access to information. Libraries should engage in ongoing reflection, discussion, and professional development to ensure their use of AI and machine learning is ethical and best practices.

10. FUTURE TRENDS AND DIRECTIONS

As libraries continue to evolve in response to technological changes and changing user needs, the collaboration of artificial intelligence (AI) and machine learning (ML) technologies will play an increasing role in creating more libraries. important role. The future of library systems and services. This chapter explores new trends and potential directions for artificial intelligence and machine learning in libraries, highlighting the opportunities for innovation, collaboration and change in the digital age.

i) **Advances in Natural Language Processing (NLP):** Future advances in Natural Language Processing (NLP) promise to improve data retrieval, virtual assistance, and user interaction in libraries. Advanced NLP techniques such as sentiment analysis, location recognition and context will allow libraries to better understand user queries, deliver search results, learn more and offer personalized recommendations based on a person's interests and needs.

ii) **Integrating AI and Machine Learning into Library Learning Environments:** AI and machine learning technologies will be integrated into library learning environments to support personalized learning, adaptive instruction, and competency-based assessment. Intelligent lessons, realistic practices and personalized learning will provide students with the learning experience necessary to meet their specific learning needs, abilities and interests, encouraging engagement and fostering lifelong learning.

iii) **Enhance intelligence-driven data analysis and decision support:** Libraries will use intelligence-driven data analysis and decision support to inform strategic planning, resource allocation, and service quality. Analytical models will predict future patterns in user behavior, library use, and information needs, allowing libraries to adjust their services and resources accordingly as needs change. The best information visualization tools will facilitate information decision-making and institutional collaboration, enable libraries to communicate their insights, and drive change in the organization.

iv) **AI-enhanced accessibility and accessibility solutions include:** AI and machine learning technologies will increasingly be used to improve accessibility and incorporation of services into libraries and resources. The use of subtitles and subtitles will increase the accessibility of multimedia content for hearing-impaired users, while visual aids and annotation tools will also help people use invisible access to visible devices. Artificial intelligence-supported translation and localization services will facilitate multilingual access to libraries and promote multilingualism and cultural diversity.

v) **Collaboration and knowledge sharing in intellectual research and development:** The Library will work with universities, research organizations, and partners in field work to advance artificial intelligence and machine learning research and development. The joint venture will focus on knowledge sharing, technology transfer and capacity building, driving innovation and accelerating the implementation of artificial intelligence solutions in the housing sector. Interdisciplinary collaboration will bring expertise from a variety of disciplines, including computer science, information science and psychology, to solve complex problems and drive change in home services.

vi) **Ethical and Social Implications of Artificial Intelligence and Machine Learning in Libraries:** As artificial intelligence and machine learning become more prevalent in libraries, there will be greater concern about the ethics and consequences of their use. Libraries will consider the importance of ethics such as transparency, fairness, privacy and intellectual freedom in the design, development and use of AI-supported systems and services. The partnership aims to develop best practices, guidelines and standards for the responsible use of AI in libraries to ensure that these technologies support the important benefits and principles of libraries.

11. CONCLUSION

The integration of artificial intelligence (AI) and machine learning (ML) technology into libraries and services represents the way forward in documenting, engaging users, and fulfilling their roles in the changing digital age. . In this article, we explore the different roles and impacts of AI and machine learning in libraries, from improving collection management and data retrieval to improving user experience and decision support.

Artificial intelligence and machine learning technologies provide libraries with unprecedented opportunities to simplify operations, improve resource allocation, and provide personalized services based on users' changes and needs. By leveraging advanced algorithms, data analytics, and automation tools, libraries can improve efficiency, effectiveness, and accessibility in every aspect of library services, from analysis and discovery to teaching and explanation.

However, the use of artificial intelligence and machine learning in libraries also raises ethical concerns such as privacy, justice, transparency and intellectual freedom. Libraries must address ethical issues and ensure that AI-powered systems and services support library values and principles such as fairness, greater race, and inclusion.

Looking ahead, the future of artificial intelligence and machine learning in libraries promises continuous innovation, collaboration, and adaptation to new models and technologies. As libraries advance in natural language processing, personalized learning environments, and supporting cognitively focused decision-making, they will play an important role in supporting those same individuals, encouraging lifelong learning, and strengthening communities through access to information and knowledge. .

In summary, the role of integration of artificial intelligence and machine learning technologies in libraries has great opportunities to improve services, engage users, and advance the library's mission as an important learning, discovery, and support structure. By thinking ethically, encouraging collaboration, and fostering innovation, libraries can use the full potential of AI and machine learning to shape the future of libraries and the communities they serve.

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A Comprehensive Overview of Digital Preservation in the Digital Library Landscape

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Abstract

The Advent of e-resources, interlibrary networking, and library automation have brought a substantial change in the traditional library systems. In the current digital era, this change has made it immanent to make the use of new techniques for the efficient preservation of digital records. This study examines some of the fundamental elements of digital preservation systems, such as protocols, practices, and resources meant to protect digital data across time. It explores the fundamentals, difficulties, and solutions related to digital preservation, stressing the significance digitally born documents. It looks into the planning and management techniques, procedures, and standards for digital preservation. Further, this study offers some insights on managing the challenges of digital preservation in the context of digital library system.

Keywords: *Traditional, Digital, Preservation, E- Resources, Protocols, Procedures*

1. INTRODUCTION

The engagement of libraries and the librarians with the digital preservation have commenced since the introduction of computers. With the library automation the migration and refreshment of OPAC records had also started. By the mid-1980s, Indian libraries had also started the building of databases and subscriptions of electronic resources. Among such resources were Current Contents on Disc (CCOD) and other computer based services. By the late 1960s, the institutions like National Archives, data archives and other institutions related with culture had set up programs of digital preservation. Such programs were concerned with the issues of technology preservation and digital contents of that period.

Libraries acquired their digital materials through various channels and undertook projects to convert their analogue collections into digital forms for increasing their access. The digital resources possess many advantages over the printed materials. However, the risk of data loss in digital form is much higher compared to the physical form. Digital preservation looks into the issues of adaption of preservation concepts and manage the myriad risks in the middle of rapidly growing technological innovations. Digital documents or resources are vulnerable to loss owing to decay and obsolescence of the storage media and becomes inaccessible and unreadable when the software or hardware becomes obsolete and is lost. The preservation of digital documents demands substantial investments and involves a large number of issues and challenges.

The way information is accessed, stored, and kept has undergone a significant transition as a result of the rapid growth of technology. Traditional library systems are undergoing a paradigm transition in the modern digital landscape due to advances like automation, proliferation of electronic materials, and the networking of libraries. As a result, the maintenance of digital records has become indispensable to ensure the longevity and accessibility of important data.

2. DEFINITION

According to the Handbook of Digital Preservation Coalition (2006) “digital preservation refers to all of the actions required to maintain access to digital materials beyond the limits of media failure or technological change. Those materials may be digital records created during the day-to-day business of an organization; “born-digital” materials created for a specific purpose (e.g. teaching resources); or the products of digitization projects.”

According to The American Library Association, “digital preservation combines, policies, strategies and actions to ensure the accurate rendering of authenticated content over time, regardless

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of the challenges of media failure and technological change, digital preservation applies to both born digital and reformatted content."

3. OBJECTIVES

i) To provide a thorough understanding of digital preservation and its importance within the framework of the developing Environment for digital libraries.
ii) To investigate the key elements of digital preservation systems, such as protocols, exercises, and equipment meant to protect memories throughout time.
iii) To investigate the difficulties in maintaining digital records and identify methods for successfully resolving these difficulties.
iv) To talk about best practices, frameworks, and standards for digital preservation that can be used to organise and oversee preservation projects.
v) To educate librarians, archivists, and information workers on the value of digital preservation and provide them with the skills and resources they need to carry out successful preservation plans.
vi) To further the conversation about digital preservation and its vital role in protecting our cultural legacy and enabling information access for upcoming generations.

4. PROTOCOLS OF DIGITAL PRESERVATION

The preservation of our heritage has become a vital task in the present age which is characterized by the exponential growth of digital information. On the one hand the digital age has transformed the ways through which we create, disseminate, and store information, but on the other it has also posed extraordinary challenges in ensuring the longevity and accessibility of digital resources. It is here that the protocols of digital preservation become important and serve as the guiding principles and strategies for conserving the digital heritage for future generations. There is, at the core of digital preservation, a set of protocols that direct the standards, best practices, and methodologies for the effective management of digital content over the course of time.

One of the essential protocols of digital preservation is to ensure the integrity and authenticity of the digital content. it encompasses the implementation instruments such as checksums, digital signatures, and encryption to notice and check data corruption or unsanctioned changes. Through upholding data integrity, the reliability and trustworthiness of digital collections can be guaranteed by the various organizations. Metadata, plays an important role in digital preservation by providing crucial information about the background, structure, and origin of digital objects. Protocols related to metadata set up regular formats and vocabularies to describe digital assets and thus makes it easier to organize, discover, and interpret information over time. Common metadata standards include Dublin Core, PREMIS (Preservation Metadata: Implementation Strategies), and METS (Metadata Encoding and Transmission Standard).

The choice of file formats considerably influences the long-term feasibility of digital content. Protocols of digital preservation stress upon the use of open, non-proprietary file formats that are well-documented, widely supported, and resistant to technological obsolescence. Additionally, migration and emulation strategies are employed to periodically transfer digital assets to newer formats or simulate legacy environments to ensure continued accessibility. Strong storage infrastructure is essential for conserving digital assets securely and reliably. Protocols dictate the use of redundant storage systems, data replication, and off-site backups to protect against hardware failures, natural disasters, or malicious attacks. Furthermore, adherence to standards such as OAIS (Open Archival Information System) ensures the systematic management of digital repositories, including ingest, storage, access, and preservation planning.

Balancing the need for long-term preservation with the requirements for access and usability is a key consideration in digital preservation protocols. Institutions must define access policies that govern who can access digital collections, under what conditions, and for what purposes. This involves implementing access controls, copyright clearance procedures, and user authentication mechanisms while upholding principles of openness, inclusivity, and equitable access. Protection of intellectual property rights and management of copyright restrictions are fundamental aspects of digital preservation protocols. Organizations must form clear policies for acquiring, licensing, and managing rights of associated with digital content to ensure agreement with legal and ethical values.

This may involve negotiating agreements with content creators, implementing digital rights management (DRM) technologies, or applying copyright exemptions for preservation purposes.

Planning ahead for the long term and distributing resources sustainably are essential to the ongoing, iterative process of digital preservation. Protocols support risk assessment, resource prioritization, scalability planning, and the creation of comprehensive preservation programs. Furthermore, cooperation with funding organizations, multinational consortia, and key stakeholders and decision-makers is essential for developing the area of digital preservation and addressing new difficulties.

5. PRACTICES

Digital preservation encompasses a range of strategies and practices aimed at ensuring the longevity, accessibility, and usability of digital assets over time. the wealth of digital content demands meticulous stewardship to prevent loss, obsolescence, or degradation. Here, we delve into a comprehensive exploration of the best practices for digital preservation.

The foundation of any successful digital preservation initiative lies in clearly defined objectives and policies. Organizations need to articulate the preservation goals, prioritize the digital collections, and prepare broad preservation policies that will take care of issues like file formats, metadata standards, access restrictions, and long-term sustainability. All this needs collaboration between stakeholders like the archivists, librarians, curators, IT specialists, and legal experts.

Digital preservation involves a myriad of risks that compromise the integrity and accessibility of digital resources. To overcome this problem exhaustive risk assessments empowers the organizations to detect potential threats like hardware fiasco, software outmodedness, data corruption, natural adversities, cyberattacks, and legal encounters. By executing vigorous backup strategies, disaster recovery strategies, and security measures, institutions can manage risks to a large extent and minimize the chances of data loss.

In order to guarantee interoperability, regularity, and sustainability in the digital preservation process, it is essential to accept established standards and best practices. Ignition, storage, access, and preservation planning can all be effectively managed with the help of standards like as ISO 14721, PREMIS (Preservation Metadata: Implementation Strategies), and OAIS (Open Archival Information System). Organizations can facilitate the exchange of digital content across many platforms and ensure long-term usage by adhering to standard file formats, metadata schemas, and preservation protocols.

Lifecycle Management and Version Control are also quite useful practices in the process of digital preservation. Implementation of lifecycle management practices includes the systematic tracking of the creation, modification, and obsolescence of digital resources. The mechanisms of version control empower the organizations to manage changes to digital content effectively, track provenance, and guarantee the tracing activity over time.

The discovery, comprehension, and management of digital materials are made easier by metadata. Standardized metadata methods and vocabularies must be adopted by organizations in order to systematically characterize the properties, context, and provenance of digital things. This comprises technical metadata (such as checksums and file attributes), administrative metadata (such as rights management and preservation actions), structural metadata (such as file format and relationships), and descriptive metadata (such as title, creator, and date).

Format Migration and Emulation are the practices used in digital asset transfer and regeneration of software respectively. Handling the risk of format outmodedness is a central concern in digital preservation. Format migration involves periodic transfer of digital assets from the obsolete or imperilled formats to a more sustainable formats while conserving the content, structure, and functionality. Emulation, on the other hand, involves the regeneration of outdated software environments to enable the rendering and execution of heritage digital objects within contemporary systems. By employing the two strategies, digital collections can be future-proofed and continuous access across shifting technological landscapes can be ensured.

Community Engagement, Collaboration and knowledge sharing acts as crucial transporters of innovation and sustainability in digital preservation activities. Actions like engagement with peer institutions, professional networks, associations, and research communities can foster the exchange of suitable practices, tools, and resources. Participation in collaborative initiatives allows the

organizations to leverage collective expertise and infrastructure while maximizing efficiencies and reducing duplication of effort. Besides, this engagement with diverse user communities and stakeholders may nurtures inclusivity, responsiveness, and relevance in digital preservation efforts.

The practice of incessant monitoring and evaluation can make digitisation process more fruitful. Digital preservation is not a stagnant effort but a dynamic process which demands unceasing monitoring, evaluation, and adaptation to fluctuating environments. In order to assess the effectiveness, efficiency, and impact of the preservation activities organizations need to set up metrics and benchmarks. Steps like regular audits, quality assurance checks, and feedback mechanisms can help in the identification of areas for improvement, addressing emergent encounters, and demonstrate accountability to stakeholders. Through the promotion of the culture of unceasing improvement and learning, institutions can make certain the resilience and relevance of their digital preservation programs.

6. RESOURCES

In the rapidly developing realm of digital preservation, staying up-to-date of the most recent resources, tools, and best practices is indispensable for effective safeguarding of our digital heritage. A large number of resources exist that support the various institutions, professionals, and enthusiasts in their digital preservation endeavours and offer insights into their features, benefits, and applications. There are some significant Digital Preservation Repositories which play an important role in the preservation of our digital heritage.

The Digital Public Library of America (DPLA) allows free access to a vast collection of digitized documents and offers many digital collections from libraries, archives, and museums across the country. A Pan-European digital network called Europeana compiles cultural heritage holdings from European libraries, museums, and archives. Comparably, the Internet Archive is a massive digital archive that preserves digital artifacts such as audio recordings, films, books, and web screenshots.

Open-Source software can also be helpful in preserving digital content. The open-source digital preservation system Archivematica organizes digital content workflows for ingest, preservation, and access while adhering to global standards and guidelines. Another source is BitCurator, an open-source collection of tools and software specifically made for digital forensics and workflows related to digital preservation that are tailored to the requirements of museums, libraries, and archives. Similar to this, DuraSpace works with a variety of open-source software programs for digital repositories, such as Fedora for managing digital assets, VIVO for managing research information, and DSpace for institutional repositories.

7. STANDARDS AND GUIDELINES:

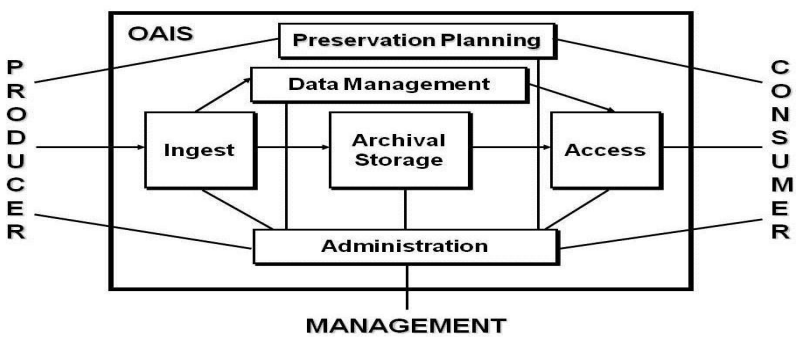

Figure 1: OAIS Functional Model

(Brian Lavoie, *The Open Archival Information System (OAIS) Reference Model: Introductory Guide* (2nd Edition), 2014. P. 12)

An international standard called OAIS (Open Archival Information System) offers a conceptual framework for managing and organizing digital archives. It outlines the main ideas, duties, and obligations of archival systems, such as planning for preservation, ingest, storage, and access.

The PREMIS data dictionary and XML schema provide principles for characterizing preservation activities, events, and agents and is essential for the long-term preservation of digital assets.

A standard called METS is used to encode structural, administrative, and descriptive metadata about digital objects. It supports intricate digital preservation operations by facilitating digital information interchange and interoperability between systems and repositories.

An international standard called ISO 16363 offers a benchmark for assessing the dependability and sustainability of digital preservation initiatives. It also describes the rules and methods for auditing and certifying trustworthy digital repositories.

From basic to advanced levels of practice, the National Digital Stewardship Alliance (NDSA) Levels of Digital Preservation provide a tiered framework for evaluating and enhancing an organization's digital preservation capabilities.

Digital Preservation Coalition (DPC): Serving professionals of all skill levels, DPC provides a comprehensive library of training materials, webinars, and workshops on digital preservation subjects.

Congress Library Digital Preservation Education: Designed for librarians, archivists, and other cultural heritage professionals, the Library of Congress offers online courses, webinars, and resources on digital preservation best practices, technologies, and standards.

Preserving digital objects with restricted resources, or Digital POWRR, is a program that provides free courses and materials on digital preservation techniques and equipment. It is designed to meet the needs of smaller organizations and institutions who have little funding.

The goal of the Digital Preservation Network (DPN) is to promote cooperation and common infrastructure for digital preservation among university libraries and cultural heritage organizations. It also aims to preserve and make scholarly digital content accessible.

The Expert Group on Digital Recordkeeping of the International Council on Archives (ICA) offers a platform for archivists and records professionals to share information, insights, and optimal techniques related to digital preservation and electronic records management.

The Digital Preservation Coalition (DPC) Community Forum provides a venue for practitioners of digital preservation to converse, exchange resources and knowledge, and seek guidance on a variety of preservation-related subjects.

8. STRATEGIES OF DIGITAL PRESERVATION

i) **Bit-stream Copying/ Backup:** it is popularly known as “backing up data” and involves the process of making a duplicate of a digital object. Bit preservation is not digital preservation but provides one building block for the more complete set of digital preservation practices and processes. (Handbook of DPC). It is not a long-term technique for maintenance of data and is often combined with remote storage so that the original and copy may not become the victims of same disastrous event. (Jagdish Arora; 2006)

ii) **Refreshing:** it basically means the copying of digital information from one storage medium to another medium of the same kind and without any alteration in the bit-stream. For example, copying from the old decaying CD-RW to a new one. It is an important element of any fruitful project of digital preservation. However, its effectiveness remains so long as the hardware and software involved remains still accessible or still in use. (Therese Roksvag Nilsen; 2012).

iii) **Technology preservation:** It is meant to preserve the technological environment which operates the system like the operating systems, applications, media drives etc. However, it is not a best long-term strategy as the indefinite function is impossible for outmoded technology. (Arora, p. 12; T.R. Nilsen, p. 36). Strong consensus exists about the impracticality of technology preservation as a digital preservation strategy as the number of hardware components that require preservation would soon grow to unmanageable levels, resulting in expensive maintenance of preserved hardware. (Marilyn Deegan and Simon Tanner (ed.): 2018).

iv) **Digital Archeology:** this strategy consists of methods and procedures that rescue content from damaged media or from obsolete hardware and software environments. It is a kind of emergency

recovery strategy and mostly involves the techniques that recover bit-streams from unreadable media. (Arora: 2006 p.12)

v) **Analogue backups:** This method involves the conversion of digital objects into analogue form by the application of durable analogue media.

vi) **Migration:** The concept of migration is more extensive than refreshing and consists of a set of tasks designed to attain the periodic transfer of digital resources from one hardware or software to another. (Arora: 2006 p.13) The main aim of migration is to preserve the integrity of the digital objects in the face of technological changes.

vii) **Replication**: It is utilized represent varied digital preservation strategies and one form of it is the Bit-stream copying. LOCKSS (Lots of Copies Keeps Stuff Safe) and peer-to-peer data trading are also the forms of replication. the former is a consortia form of replication, while the latter is an open, free-market form and in both cases the goal is to improve the durability of digital documents while upholding their authenticity and integrity by copying and using manifold storage locations.

viii) **Emulation**: This strategy translates instructions from the original software to the new platforms and uses a distinct software called 'emulator' for this process. The attempt here is to simplify the digital preservation by removing the necessity of keeping old hardware working. (Arora: 2006, p. 13). It needs the creation of emulator programs to translate code and instructions across computing environments.

Numerous projects have tested the emulation principle, with typically positive outcomes. However, in order to make emulation a widely used long-term digital preservation strategy, consortiums will need to be formed in order to carry out the administrative tasks of assembling documentation and specifications of the systems to be emulated, obtaining the relevant hardware and software's intellectual property rights, and performing the technical steps required to create functional emulators. Many experts opine that among all digital preservation strategies emulation harbors the maximum potential costs. Hendley's study also predicts that the implementation of this strategy will need the emergence of third-party services specializing in developing emulator programs. (Marilyn Deegan and Simon Tanner (ed.): 2018). It will likely involve the highest costs.

ix) **Encapsulation**: Encapsulation can be understood as a method of combining a digital object with the metadata required to grant access to it. The grouping method ostensibly reduces the possibility of losing any crucial element required to decode and create a digital entity. It is possible to contain reference, representation, provenance, fixity, and context information with a digital object. One important component of emulation is thought to be encapsulation.

x) **Universal Virtual Computer**: Emulation is used in the Universal Virtual Computer program. To replicate the fundamental architecture of all computers, which consists of memory, a series of registers, and rules governing the movement of data between them, a computer program that is independent of any hardware or software already in use must be created. Users may use the application software of their choosing to produce and store digital data, but every file would also be backed up in a format that the universal computer could read. All that would be needed to read the file in the future is a single emulation layer between the computer of that era and the universal virtual computer.

9. DIFFICULTIES OR CHALLENGES TO DIGITAL PRESERVATION

As the present age is dominated by digital information, the task of conserving our shared heritage for our future generations is not without some severe challenges. Digital preservation is full with complications that originate from the technological, organizational, legal, and cultural factors.

Technological Obsolescence is one of the major difficulties facing the process of digital preservation of various forms of content. Fast developments in hardware and software technologies lead to the obsolescence of various digital formats and makes the digital objects either inaccessible or unreadable over time. The lifecycle of digital storage media like the hard drives, magnetic tapes, and optical discs, is limited, and without appropriate maintenance and migration plans, data loss or corruption becomes inescapable.

Format Migration too is a task full of difficulties. Migration of the digital content from obsolete or endangered formats to more workable formats is a formidable task that requires careful planning, resources, and expertise. Brian F. Lavoie points out that the costs of format migration center

on various factors, like the occurrence frequency, tools for the migration and the tolerance of information loss, a result of the migration process. (Marilyn Deegan and Simon Tanner (ed.): 2018). Likewise, Emulation is not an easy and straightforward job. Emulation of heritage software environments to enable the rendering and implementation of obsolete file formats presents many technical challenges and may not every time guarantee the authenticity and accuracy of digital objects.

Metadata Management is another difficulty in the process of digital preservation. Creation, management, and preservation of metadata for digital objects is a labour-intensive process and needs standardized plans, controlled vocabularies, and consistent practices. To ensure the accuracy, completeness, and relevance of metadata over longer periods of time poses persistent challenges, mainly as digital collections grow and evolve over time.

Both moral and legal complex obstacles for digital preservation arise from factors including copyright rules, intellectual property rights, and privacy regulations, especially when it comes to usage permits, access restrictions, and orphan works. Careful navigation and stakeholder participation are required to strike a balance between the necessity for preservation and legal and ethical considerations.

Resource constraints like limited funding, staffing shortages, and competing priorities pose significant barriers to implementing robust digital preservation programs, particularly for smaller institutions and organizations with restricted resources. Investing in infrastructure, training, and collaboration is essential for overcoming resource constraints and building sustainable digital preservation initiatives.

Achieving interoperability and smooth exchange of digital content across varied systems and platforms entails association with standardized formats, protocols, and other practices. Interdisciplinary collaboration across various libraries, archives, museums and academia presents both opportunities and challenges related to communication, coordination and cultural dissimilarities.

The issues of sustainability and continuity are an integral part of digital preservation actions. Being a continuous and ongoing process its requires sustained investment, commitment, and institutional support. Guaranteeing the endurance and continuity of digital preservation efforts amid organizational changes, budget variations, and unstable priorities poses substantial challenges equally for institutions and communities.

10. SOLUTIONS TO THE DIFFICULTIES IN DIGITAL PRESERVATION

The myriad problems faced by digital preservation makes it quite imperative to identify and implement some effective solutions that can alleviate the risks, barriers, and guarantee the long-lasting access and usage of our digital heritage. There is a comprehensive range of solutions and strategies that aim at overcoming the challenges of digital preservation.

The recovery, verification, and preservation of digital materials from outdated or damaged storage media can be aided by technological innovations such as digital forensics tools and procedures. Emulation and virtualization technologies enable the revival of outdated software environments and enable the access and rendering of digital items in more modern systems. Artificial intelligence (AI) and machine learning algorithms can help automate decision-making, content analysis, and information extraction. They can also improve processes and increase productivity.

An affordable way to handle format migration, create metadata, and manage storage is to use open-source digital preservation tools such as Archivematica, BitCurator, and DSpace. Gaining access to comprehensive file format registries, such as PRONOM and GDFR (Global Digital Format Registry), can help with the identification, validation, and planning of migrations in an educated manner.

Following preservation metadata standards, such PREMIS, makes it easier to manage and document important details about digital assets, improving their usability and accessibility over time.

The challenges to digital preservation, such as orphan works, copyright term extensions, and restrictive license agreements, might be addressed by highlighting the advocacy for copyright reforms and legislative improvements. In addition to encouraging the unrestricted dissemination and reuse of digital content, supporting open access efforts and license models like Creative Commons also promotes collaboration and knowledge exchange. In a similar vein, organizations can guarantee responsible stewardship and respect for various cultural viewpoints by creating ethical principles and best practices for digital preservation.

By making an investment in the numerous professional development programs, workshops, and training efforts, practitioners can arm themselves with the information, skills, and tools required for efficient digital preservation. Digital preservation initiatives can benefit from increased community involvement and interdisciplinary cooperation between academic institutions, industry, libraries, archives, and museums. These initiatives can also increase resilience, diversity, and creativity.

Securing financing for digital preservation projects, infrastructure upgrades, and capacity building activities can be achieved by pursuing funding options from government agencies, philanthropic organizations, and private foundations. By putting into practice cost-sharing plans, consortium agreements, and shared infrastructure projects, organizations can combine resources, lower expenses, and increase efficiency in their efforts to preserve digital content. Campaigns and public awareness-raising initiatives can be used to engage policymakers, stakeholders, and the general public. This will raise the profile of digital preservation on national and international agendas and attract funding and support for preservation efforts.

11. CONCLUSION

To sum up, the digital preservation protocols function as the guiding principles and frameworks that guarantee the digital history of humanity's accessibility, integrity, and usability for all time. Organizations may manage the challenges of digital stewardship, reduce the chance of data loss or degradation, and preserve society's collective memory for future generations by following these guidelines. Adopting the standards of digital preservation is not just a technological necessity but also a moral duty to protect our cultural legacy and knowledge for future generations in an era where digital information is both abundant and fragile.

The best practices for digital preservation offer a comprehensive strategy for preserving humanity's digital heritage for upcoming generations. Organizations may confidently and preemptively negotiate the difficulties of digital preservation by adopting the values of proactive stewardship, collaboration, and innovation. The path of digital preservation necessitates commitment, perseverance, and a shared desire to preserve our collective memory and cultural legacy in the digital age. This includes developing explicit laws and standards as well as putting strong technical solutions and community involvement initiatives into practice.

Having access to top-notch tools and resources is crucial for creating and managing successful preservation programs in the ever-changing field of digital preservation. Institutions can find a multitude of tools to assist with their digital preservation efforts, including digital repositories, open-source software solutions, standards and guidelines, chances for training and teaching, and community interaction platforms. Institutions can confidently navigate the complexities of digital stewardship and guarantee the long-term accessibility and usability of our digital heritage for future generations by utilizing these resources and encouraging collaboration and knowledge sharing within the digital preservation community.

The task of digital preservation is intricate and multidimensional, involving aspects related to technology, organizations, law, and culture. The challenges of digital preservation highlight the need for coordinated action and collaboration across sectors and disciplines. These challenges range from technology obsolescence and format migration to legal complications and resource limits. Institutions, professions, and communities may manage the difficulties of digital preservation with resilience, inventiveness, and a shared commitment to safeguarding our digital history for future generations by recognizing and tackling these problems head-on.

It takes a multipronged strategy that includes policy reform, capacity building, technology innovation, and cooperative action to overcome the challenges of digital preservation. Through the adoption of innovative technological solutions, migration tools, legal and policy frameworks, capacity-building programs, and resource mobilization tactics, professionals, communities, and institutions can confidently and resiliently navigate the complex world of digital preservation. We can guarantee the long-term accessibility, integrity, and utility of our digital legacy for future generations by working together and taking coordinated action.

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Emerging Technologies in Libraries Exploring the Future and their Implication in Libraries

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ABSTRACT

The use of Information technology has transformed the system the Libraries have been providing services to the stakeholders. They are considered centres of education, knowledge, research, and its importance continues to rise. The libraries plays an important role in nurturing analytical thinking, techno literacy, and it can play a very important role in providing need based services to the users Through the use of information technology the libraries can continue to be a great source of information for the users. The future of libraries depends on the use o the different types of the emerging technologies vis a vis Big Data Mobile apps Internet of Things etc.. By using these technologies and also upholding their traditon libraries can better serve the users and provide a great services and resources to its users .

Keywords: *Libraries, Technologies, Implications, Internet of Things Block Chain, Mobile App, Library Services*

1. INTRODUCTION

The advent use and advancement of ICT (Information and Communication Technology) has influenced a lot to services provided by the libraries. With this use of Information technology the users are expecting more from the libraries in terms of library services as compared to the traditional ones. Emerging technologies are the need of the hour and can play an important role in changing the libraries, information centres and information processing professionals and help to be informed with recent advancements in the technology and thereby helping in advancement and development of the libraries. ICT has turned the libraries from manual to be digital ones in which each of library activity are to be done with the help of the latest technology. Thus, library working has become user angled from service angled, in which libraries resources are organized preserved and services are provided as per the need of user. The actual use of of the technologies in the libraries have helped these libraries to be the "Digital Libraries, Virtual Libraries, Hybrid Libraries, Library without Walls, Library 2.0" etc. This has also led to the change in working and designation of librarians to Information Scientist, Information Officer, Documentation Officer etc. This advancement has brought the libraries and library services to users' doorsteps and making the availability of the library resources 24x7 according to the need and convenience. The emerging technologies have has brought a revolution and growth of information in the field of library. New technologies have advanced and reformed each and every task of the library from Purchase, Technical Processing, and preservation to Access and Dissemination of information as per the needs of the users. It has also improved the way of thinking and interaction of the library users with the libraries.

2. EMERGING TECHNOLOGIES IN LIBRARIES

The advent of ICT has given many new technologies in the arena of library services and information science. The applications of these various technologies have changed the libraries and their services. Now the days are gone when users come to the library, rather libraries are providing the limitless access to the information resources in wide range of techniques and from several online

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resources. Library and information centres have also engaged the information experts for providing better services and hence saving the time of the users. Emerging technologies are being used in the libraries in the following ways:

i) Housekeeping Tasks

The housekeeping operations are the backbone of the library or providing the services to the users. The emerging technologies have totally changed the way in which the services are provided now a day. Now many new types of library automation softwares with state of the art latest features are available in the market. Even many free softwares are also available online which can be easily downloaded and installed and can be used for the in house automated library operations. The automated systems in the library has made the day to day library tasks very convenient and trouble free, as far as, placing the orders for procuring the documents, giving reminders from time to time to the users, this which was very time consuming process earlier, accessioning of material, serial control, circulation etc also become convenient with the use of automated softwares. Reports of different types can also be generated at any time e.g., Daily check In/Out Reports, User Login/ logout Reports, Fine generation/receiving Reports, Membership Reports etc.

ii) Mobile Apps

An app is "an application software" that is meant to work on the device called "mobile". Mobile technology is one of the fastest-growing technologies and is available through application distribution platform. Mobile application requires the use of specialized integrated development platforms. There are companies like Android Developers, Boopsie, Library Anywhere, Capira etc. which create Mobile Apps for library. Mobile applications provide simpler user interface. And can improve access to information. The most widely used are Cloud, Big data, Analytics across the globe. Modern-day libraries have started to provide library services through library mobile apps, giving information about library rules, timings rules, Ask the librarian etc.. Applications in Library app include Searching library catalogue, Databases etc.

iii) Web Based Library Services

The state-of-the- art libraries are providing the web based library services to its stakeholders. Some of these services comprise online retrieval of electronic resources like e-journals, e-books, e-thesis etc. depending upon the policy of the library for such services. Users are able to access these services by using login id and password or sometimes direct access is provided through library webpage. Web 2.0 has revolutionized the field of library and converted the Long-established Library systems to Library 2.0. Though, "Web 2.0 is a two way web technology" in which library stakeholder can interact on the web with the help of this technology. The stakeholders can ask queries, receive any notifications/alerts from the librarian, and can get answers of their reference queries from the librarians on the network by using the Web2.0. With the help of these services, information users can keep themselves updated of the required information 24X7 from any corner of the world without any types of constraints. The library users are free to access the information as per his/her need or convenience. Some of the most commonly cited examples of this technology include Facebook, X, Instagram, etc.

iv) Web Based OPAC

Web OPAC i.e. Online Public Access Catalogue through Web has also impacted the working of libraries to a great extent of providing the library services to the users as per their convenience. With the help of this service the users can check the availability of any library material from their personal space and doorsteps. Web OPAC is an Online catalogue of library resources, which informs the users that whether the needed resource is actually present on stacks or not. The library stakeholders can access this service with the help of their institute's website and can easily find their resources and save their time.

v) Intelligent Return and Sorter System

The Intelligent Return and Sorter System technology is utilized in libraries to computerize the issue and return sorting process. The library stakeholders can swiftly return their checked-out items at their own with "real-time check-in". The library-users can also verify that the documents have been

checked in and the machine can generate return slips of the respective documents. Though, in the traditional Library System, the entire library tasks such as issue and return of library items is done manually, which is a time consuming as well as hectic task. With the use of information technology/automation, all these problems can be avoided and the time of the user can be saved. These systems are now used by all types of libraries. The sorter uses easily handled technology to direct the items into the boxes and can also perform multiple tasks at a time such as forming and aligning receipts, generating statistics etc. The Intelligent Return and Sorter System helps in enhancing user satisfaction, minimizing the time of check-in and check-out of the documents, helping to increase staff productivity without compromising the quality of library services offered by the respective institutes.

vi) Block chain

Block chain technology is opening new gateways. In addition to its use in financial services, block chain-based systems may be put into operation in other fields of Libraries and information centres. It is one of the technologies which uses cryptographic signature for creating records. It is a "chain of blocks or a growing list of records" associated to each other by cryptography. The main benefits of block chain are that these are cost-effective and secured. A block chain has six main elements i.e. "node, transaction, block, chain, minor and consensus. A transaction is requested and a block of the same transaction is created. Each block consists of certain data, the hash of the block and the hash of the previous block".

The segment is then propelled towards the chain for node validation. After this, validated block is added to the chain with each node getting proof of the work done. Any invalidated/correct attempt is informed to each node in the chain ensuring unambiguousness in the whole operation. The block chain works in a distributed manner i.e. it is not dependent on a single device to keep the data. But the data is circulated via network to all. It helps to build the metadata of libraries, connecting the library networks, digital preservation and networking organizational data management, Inter Library loan, and library cards and share the partnerships across organizations.

vii) Data Everywhere

Data is an important asset for the libraries. Libraries, as organizations that collect data may be interested in improving their services, can use the data for their own purposes or maybe share this data with governments, or other organizations. The libraries can act as the data repositories, as the various types of data is available depending upon the various types of services provided by the libraries. Data is a valuable information resource, to classify and archive data or to make data accessible digitally depends upon the organization.

Data collection and management is important job in libraries and these innovative technologies can be used to accumulate and analyse the exact data of the users. Information can be collected from the usage of library services on the personal gadgets such as mobiles, iPads and other web focused devices. Data collection can be utilized in the libraries to generate products, apps and services, better visibility of library services and foster the library substances.

viii) Internet of Things

IOT "refers to the possibility of connecting everyday devices" and moving data amongst these devices through Wi-Fi/Bluetooth/internet. IOT is most innovative tool for the library services and tasks nowadays and its integration with the library services can help in enhancing the library services to the users It can help in automation of the various library services such as self-issue and self-return, stock verification, observing and recording of user activities, theft control, enabling real time tracking of library resources. It helps in automated inventory management. The various state of the art devices will sense and transmit the data. It helps in promoting the library services and betterment of library tools, from tracing room usage and marking attendance to monitoring moisture levels for specific collections of the library. Therefore, the library can extend better services by using this technology.

ix) Facial Recognition

This "is a type of biometric technology", a self-service face recognition system, and that uses statistical measurements of people's face and its marks to determine digital recognition of the

individual. The face reading technology can be used in library for distinguishing the users coming in the library, "who they are, where they live, what books they checked out, and if any overdue etc." It can replace the traditional library cards which are being used nowadays. Though, facial recognition is easy to use, but it comes with some drawbacks like personal secrecy issues etc. that might cause security concerns for users.

x) Voice Control

Voice Control technology provides "a new option for interacting with computers and technologies through advanced machine learning, speech recognition". Voice based assistant will be very useful for searching the resources in the library. Voice-controlled technology could provide the way users access resources. Voice based assistant will communicate with the user and will give the exact location of the document in the library. The voice assistance can be multilingual so that the library user can give input in any of the languages.

xi) Quick Response Code

QR (Quick Response Code) is a remarkable development in the field Information Technology, by using this, the information can be connected using QR codes. In this way, the libraries can link a Quick Response Code (QR Code) to the library resources etc. QR code technology is usually managed as a channel to "deliver a message to end users". The QR codes are primarily used by libraries for supporting its services, quickly access to their resources. Mobile phones and devices with QR code readers can both read QR codes, which are just strings of text that a mobile device uses to carry out an operation. It is possible to write codes that link straight to a URL. The QR Code should be generated and placed on the website address and also at some practical/strategic location in the library, like the entrance to a bookstore etc.

xii) Open Access, Outreach programs

An outreach service is usually a different service which is totally unique in itself. – it may not be necessity of all library users; it may not be utilized by all library stakeholders i.e. looking outside the wall of the library for providing services to the particular group or community Outreach services are usually "provided to the individuals or groups who have special needs". A service is made available to a certain set of library patrons, and after that group accepts it, it becomes a regular service that is included in the core services.

xiii) Academic Integrity and Plagiarism

Academic integrity and plagiarism are integral part of academic system; any argument about modern tendencies in library services and systems will be lacking without these statements. Plagiarism is "using another's ideas, words, theories, illustrations or graphics, opinions, or facts without giving due credit". For students/researchers, replicating others' work mutilates the scholarly reliability and integrity of their scholarly experience. Therefore, prevention of piracy has become the requisite for the society.

3. CONCLUSION

Our lives have become simpler with the use of information technology. The libraries are no more the same as they were a decade ago. The implementation of new above mentioned tools would help to improve the reach of the library services to the doorsteps of the users to a greater extent. The roles of librarians have been redefined due to the changing information technology scenario, their upskilling due to the technological advancements is mandatory. The library staff should be able to cope up with the changing environment. A fast changing technological landscape is transforming libraries in the future. In order to continue offering their customers essential services, libraries must cope up with these developments. But as libraries become more reliant on these technologies, they also need to be aware of the risks and difficulties i.e. maintaining digital assets, protecting user privacy, and guaranteeing fair retrieval for all users that are associated with them.

Despite these obstacles, libraries are dazzling, because of technologies like artificial intelligence, which open up new avenues for collection development, interacting with users, and providing advanced services. Libraries may continue to play a crucial role in fostering education,

literacy, and lifelong learning, providing access to a wide range of vivid knowledge and information, and creating an informed society by implementing these technologies.

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GNIMS Library Transforming From SLIM21++ to iSLIM

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ABSTRACT

SLIM21 (System for Library Information and Management) helps you catalogue library resources like, books, e-books, films, sound recordings, drawings, clippings, articles, reports, letters, pamphlets, serials publications... all those things that contain information so vital to our Institute. iSLIM is a cloud-based system with the same services as offered by SLIM21. The cataloguing adheres to popular international standards, retrieval of information is simple, fast and efficient.

Keywords: *User Friendly, Fast and Efficient Software, Outcome Based Software*

1. INTRODUCTION

iSLIM is an online library management system to automate all your library processes and provides for an interactive user experience. iSLIM follows a modular approach and offers the essential modules like Acquisition, Cataloguing, Circulation and Serials. It automates routine tasks such as cataloging and circulation, freeing librarians to focus on more value-added activities. SLIM21 Software is a highly comprehensive and user-friendly library management software brought to you by Algorhythms Consultants Pvt. Ltd. The first version of SLIM software was launched in the year 1988. Since then it has been continuously improved by incorporating feedback from clients and adopting to the latest technical innovations. SLIM21 is backed by unflinching after sales support from Algorhythms Consultants Pvt. Ltd, an ISO 9000: 2008 certified company. Algorhythms project execution and quality control procedures make every library automation project a total success.

2. OBJECTIVE OF GNIMS LIBRARY

i) "To improve the utilization of print and e-resources per user"
ii) The cloud-based library management system provides easy access anytime, anywhere.
iii) It eliminates the need to be in one location to have access to the library and data stored in it.
iv) It can be accessed through many devices such as desktop computers, laptops, tablets, or smartphones.
v) This makes it possible for patrons and staff to access their digital collections from anywhere at any time, which has proven to be useful for all.

3. iSLIM

iSLIM is a cloud-based library automation software which allows easy mobile access to all the users and assists librarians to streamline their library operations and provide a seamless experience for their users.

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Chapter 30; S. Hasan, S. Kumar, S. Panda, K. N. Khan & G. Samdani (Eds); PP. 234-239; Synergy Books India, N.D.

Figure 1

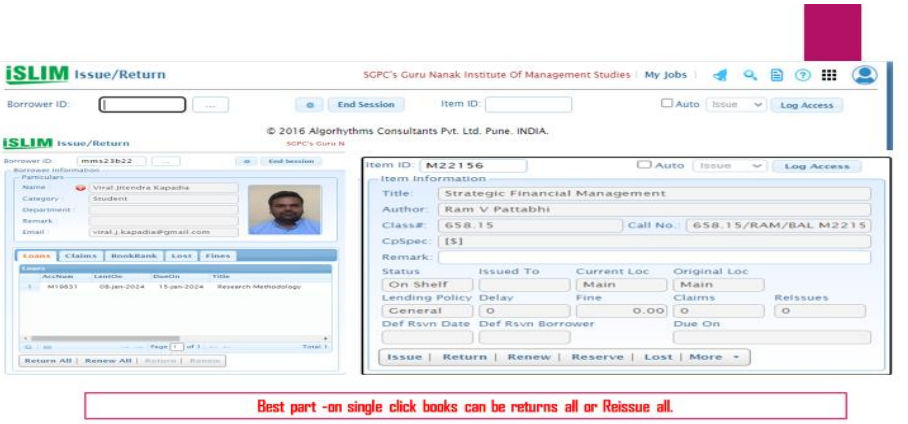


Figure 2

4. MODULES USE BY GNIMS BUSINESS SCHOOL LIBRARY

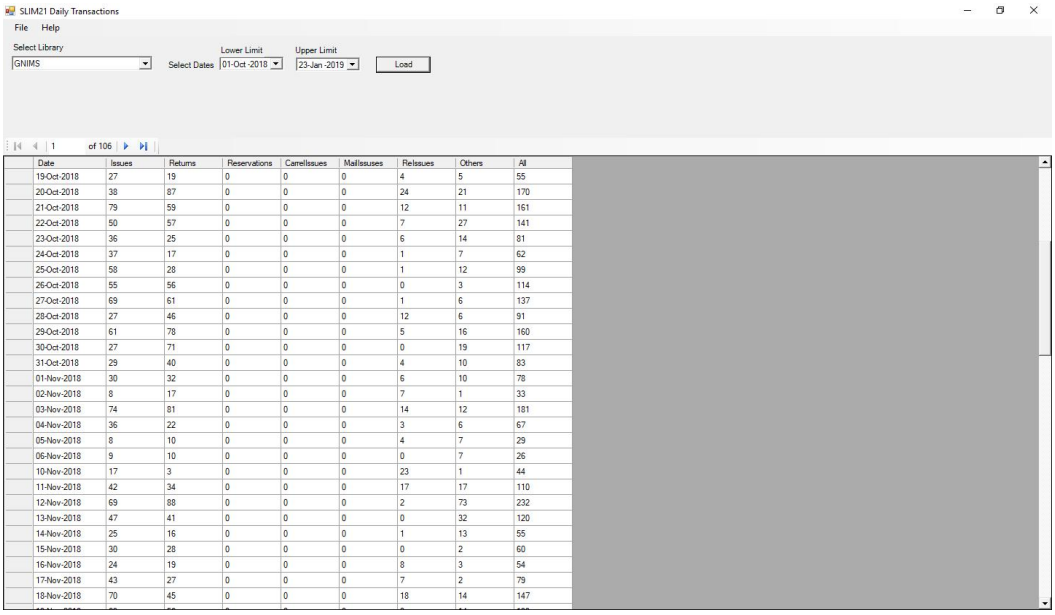
SGPC's GNIMS Library has been using SLIM 21 Software earlier and now shifted to iSLIM Software. It is depending to library to library as per their customer demand. As per our user need, GNIMS Business School Library has been using following modules for our administrative work.

a) Basic Modules: GNIMS Library has following Basic modules for smooth functionality of daily library administrative work.

b) Cataloguing: SLIM has virtually no limit on length of bibliographic details. Example, a Title can be 10 characters or 500 characters; summary can be 50 words or 500 words; article can have one author or 10 authors.

c) Circulation :

- Issues, returns, reissues
- Title or copy specific reservations/cancellations
- Bulk transactions for a borrower
- Easier interface to the barcode system, offering basic transactions like Issue and Return
- Print transaction report for a borrower
- Collect reserved item
- Overdue loans notice
- No dues certificate
- Membership renewal reminder



Date	Issues	Returns	Reservations	CamelIssues	MailIssues	ReIssues	Others	All
19-Oct-2018	27	19	0	0	0	4	5	55
20-Oct-2018	38	87	0	0	0	24	21	170
21-Oct-2018	79	59	0	0	0	12	11	161
22-Oct-2018	50	57	0	0	0	7	27	141
23-Oct-2018	36	25	0	0	0	6	14	81
24-Oct-2018	37	17	0	0	0	1	7	62
25-Oct-2018	58	28	0	0	0	1	12	99
26-Oct-2018	55	56	0	0	0	0	3	114
27-Oct-2018	69	61	0	0	0	1	6	137
28-Oct-2018	27	46	0	0	0	12	6	91
29-Oct-2018	61	78	0	0	0	5	16	160
30-Oct-2018	27	71	0	0	0	0	19	117
31-Oct-2018	29	40	0	0	0	4	10	83
01-Nov-2018	30	32	0	0	0	6	10	78
02-Nov-2018	8	17	0	0	0	7	1	33
03-Nov-2018	74	81	0	0	0	14	12	181
04-Nov-2018	36	22	0	0	0	3	6	67
05-Nov-2018	8	10	0	0	0	4	7	29
06-Nov-2018	9	10	0	0	0	0	7	26
10-Nov-2018	17	3	0	0	0	23	1	44
11-Nov-2018	42	34	0	0	0	17	17	110
12-Nov-2018	69	88	0	0	0	2	73	232
13-Nov-2018	47	41	0	0	0	0	32	120
14-Nov-2018	25	16	0	0	0	1	13	55
15-Nov-2018	30	28	0	0	0	0	2	60
16-Nov-2018	24	19	0	0	0	8	3	54
17-Nov-2018	43	27	0	0	0	7	2	79
18-Nov-2018	70	45	0	0	0	18	14	147

Figure 3

The most use module above mentioned is circulation. At GNIMS **e**very month Top 10 -15 Users of the library are displayed on the Notice Board and this encourages the other students also to read and come in the next Top 15 List.

d) Serials Control : SLIM serials control system helps achieve an effective utilization of periodicals budget. It allows for tracking receipts of issues, filing claims for issues not received, preparing binding orders, etc.

The Journal Title Information includes:

- Title, Abbreviation, ISSN and other identification numbers
- Publisher / Agent
- Periodicity
- Delivery Mode
- Gratis / Exchange / Depository
- Multiple Addresses for Communications
- Holding note for Union catalogue
- Separate list of journals on proposals

Additional Facilities:

- Generation of arrival schedule for issues of journal
- Subscription history for journals
- Popularity statistics
- Accessioning of bound volumes
- Publication history
- Integrated with article indexing

e) Acquisition: IM Acquisition system supports the entire range of activities from the time someone makes a proposal to acquire an item, until it is finally paid for and accessioned.

- **iOPAC :** SLIM OPAC (Online Public Access Catalogue) offers powerful online search facilities to search through library catalogues:

Figure 4

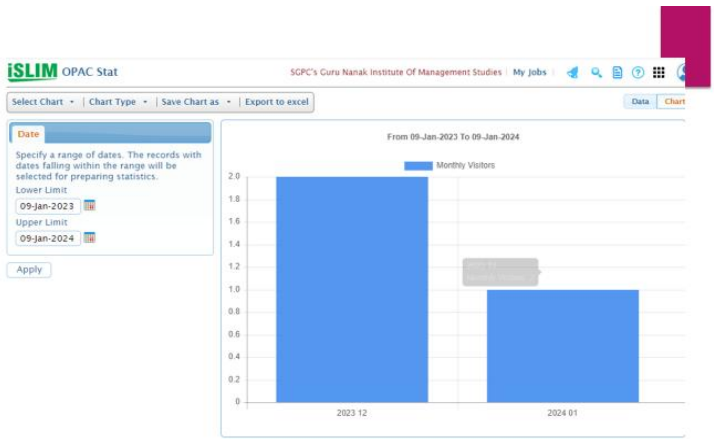


Figure 5

The repository of words, names, titles, keywords, etc. is available for on-line browsing while the search phrase is being entered. This displays alternate spellings; words derived from same root, etc. and thus helps the searcher by providing a view of the data. In addition to these conventional searching methods, OPAC indexes every word in the description of the item. Thus, to conduct a search one need not be aware of the cataloguing style of the library. Above mentioned five modules very well using in GNIMS Library for the fast and efficient works.

f) Enterprise Modules:

GNIMS Library has following enterprise modules

- Web Based OPAC
- Current Awareness Service (CAS)
- Statistical Analysis

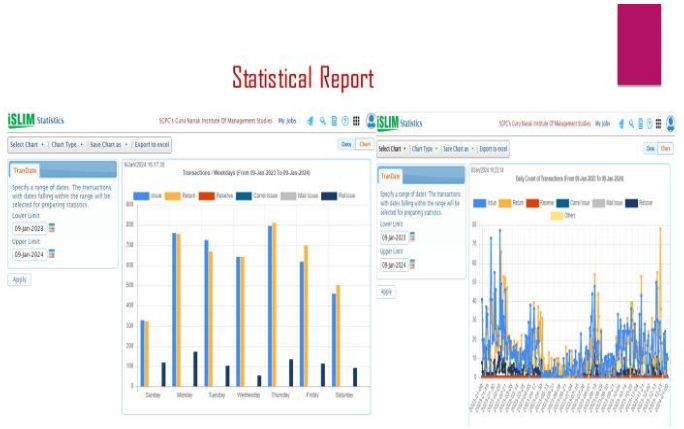


Figure 6

From the above-mentioned category, the most useful module is Statistical Analysis. This Module produces different statistical information required for library management such as:

- Distribution of transactions over working-hours, week-days, or months
- Popularity of Subjects
- Popularity of Item Types
- Most active or Inactive Items and Members

This result is also uploaded on the Library Website and forwarded on the Class Representative WhatsApp Group.

g) Additional Utilities:

GNIMS Library has following Additional Utilities Add-Ons module which help libraries with their specific requirements.

- News Clipping Publishing
- DCOLL (Digital Collection)

News Clipping Publishing:

At GNIMS we use News clipping publishing module, when any articles or advertisement related to GNIMS is published in media.

DCOLL (Digital Collection):

Digital collection is used for our Students projects. Still work is going on, not yet totally implemented.

5. MAJOR FINDINGS

- iSLIM Software is very useful for daily retinue work

- Different type of statistical report helps us for the Audit purpose.

6. CONCLUSION

Current scenario is about learn, unlearn and relearn, similarly one needs to be updated about the new innovations and be tech savvy to be able to perform duties to the best. At GNIMS Business School Library the user has high expectation from service provider. As we have different kind of users such as full time, working professionals, Life time user, researchers, teaching faculty, so to fulfill their need and requirement relative to their academic, iSLIM software is very valuable.

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Citation Analysis: A Literature Review

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ABSTRACT

This paper analyses various studies focused on citation analysis across diverse academic disciplines and institutions. Examples include investigations into citation patterns within specific regions, disciplines, or institutions, utilizing methodologies ranging from manual data collection to comprehensive analyses of publication databases and specialized software. It provides a comprehensive examination of citation analysis, a fundamental methodological approach within bibliometrics and scientometrics. Citation analysis involves the evaluation of citations within academic literature to understand scholarly communication, impact, and influence. The review outlines the objectives of citation analysis, including contextualization, gap identification, synthesis of findings, critical evaluation, and theoretical framework establishment, emphasizing its significance in academic research.

Keywords: *Citation Analysis, Literature Review. Bibliometrics, Scientometric, Research Productivity.*

1. INTRODUCTION

A literature review is a critical synthesis of existing research and on a particular topic or research question. It serves as a foundational component of academic writing, providing context, establishing the significance of the study, and identifying gaps or areas for further investigation. A well-conducted literature review not only demonstrates the author's familiarity with the relevant literature but also offers insights, connections, and interpretations that contribute to the advancement of knowledge within a field. So that a literature review serves as a comprehensive survey and analysis of existing research on a particular topic, providing a foundation for new investigations and contributing to the advancement of knowledge within a discipline.

2. CITATION ANALYSIS

Citation analysis is a fundamental methodological approach within the broader field of Bibliometrics and Scientometrics. It involves the examination and evaluation of citations within academic literature to gain insights into various aspects of scholarly communication, impact, and influence. By analysing citations, researchers can uncover patterns, relationships, and trends that provide valuable information about the dissemination of knowledge, the evolution of research areas, and the impact of individual works and researchers.

Citation analysis serves as a powerful tool for understanding the dynamics of scholarly communication, assessing research impact, and determine decision-making in academia and beyond. However, it is essential to approach citation analysis with critical awareness of its limitations and ethical considerations to ensure its responsible use in research evaluation and assessment.

3. OBJECTIVES

The primary objectives of a literature review are as follows:

i) **Contextualization:** A literature review contextualizes the research within the wider framework of existing scholarly work. It helps readers understand the historical development, key debates, and theoretical frameworks relevant to the topic under investigation.

ii) **Identification of Gaps:** By synthesizing existing research, a literature review identifies gaps, inconsistencies, or areas where further exploration is needed. This sets the stage for the researcher to articulate the research question or hypothesis that will guide their study.

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Chapter 31; S. Hasan, S. Kumar, S. Panda, K. N. Khan & G. Samdani (Eds); PP. 240-244; Synergy Books India, N.D.

iii) **Synthesis of Findings:** A literature review synthesizes findings from diverse sources to provide a coherent narrative of the current state of knowledge on the topic. It may highlight patterns, contradictions, or emerging trends within the literature.
iv) **Critical Evaluation:** A literature review critically evaluates the strengths and weaknesses of existing studies, including their methodologies, theoretical frameworks, and empirical findings. This evaluation helps researchers assess the reliability and validity of the evidence presented in the literature.
v) **Identification of Methodological Approaches:** Depending on the research question, a literature review may discuss various methodological approaches employed in previous studies. This can inform the researcher's choice of methodology for their own investigation.
vi) **Theoretical Framework:** A literature review often includes discussions of relevant theoretical frameworks or conceptual models that inform the research. This theoretical grounding provides a framework for interpreting findings and generating new hypotheses.
vii) **Contribution to Knowledge:** Finally, a literature review concludes by summarizing the contributions of existing research and articulating how the current study builds upon, extends, or challenges previous findings. It may also suggest directions for future research based on gaps identified in the literature.

4. LITERATURE REVIEW

Some important literature reviews related to citation analysis are appended below.

Dwivedi et al., (2023) study the evolution of AI and big data research in Information Systems (IS) from 1997 to 2022. It finds that IS is the most cited discipline, with two main topical clusters: problem domain-specific AI and organizational-specific AI. The study also identifies influential authors, articles, and institutions. It also highlights gaps in existing research and suggests potential avenues for future research in AI and big data in IS. This study contributes to understanding the field's evolution and current state. **Haldar, (2023)** analyzes research published in Library Herald from 2017 to 2021, revealing key themes, influential authors, and emerging research areas. Using bibliometric methods, the study identifies highly cited articles and prominent authors, revealing evolving research trends in library and information science. The analysis highlights the breadth and depth of scholarship, from digital libraries to information retrieval, providing valuable insights for future research directions and collaborations. **Iyengar et al., (2023)** This research analyzes citation trends in the Journal of Orthopaedics articles, identifying patterns and trends in scholarly communication and impact. It uses bibliometric and scientometric methods to identify influential articles, authors, and research topics. **Wiseman et al., (2023)** This literature review analyzes citation patterns in the American Journal of Surgery, identifying seminal works that have significantly influenced the field. It uses bibliometric methods to identify key milestones, breakthroughs, and trends in surgical research. The study highlights citation as a marker of scholarly impact and influence. **Kaur & Verma, (2022)** analyzes citations in doctoral theses in the Maharashtra region using Shodhganga, an Indian digital thesis repository. It aims to understand citation patterns, frequency, sources cited, and scholarly influence. The findings could help develop optimal citation management strategies, promote collaboration, and inform research endeavors. Future research could expand to other regions or explore different aspects of citation behavior. **Shukla & Bhatt, (2022)** analyzes citations in doctoral theses in commerce and financial studies at the University of Delhi, aiming to understand citation patterns, sources, and scholarly influence. The findings may benefit researchers, educators, and policymakers, providing insights on citation management and facilitating collaboration. Potential research directions include expanding analysis to other institutions. **Bachalapur et al., (2021)** analyzes research productivity and citations from BLDEA's professional institutions in Vijayapura, India, from 2011 to 2020. It focuses on 910 publications in health sciences, pharmaceutical science, and engineering and technology. The analysis highlights the importance of research within BLDEA's institutes and recommends interdisciplinary collaborations to enhance productivity and academic standing. **Biswas et al., (2021)** examines the utilization of information sources by 23 doctoral theses at ICFAI University, Dehradun, focusing on 8979 citations. The analysis examines various parameters, including bibliographic form, authorship pattern, geographic distribution, scattering of Indian and foreign authors' citations, and chronological distribution. The findings can inform library collection development and design user services in libraries, enhancing research and learning experiences. The

study contributes to a deeper understanding of information-seeking behavior among doctoral researchers and provides practical implications for library management. **Gayan, A. & Singh, (2021)** analyzes authorship patterns in Chemistry by examining citations from doctoral theses from 2007 to 2016. It found that journals are the most frequently cited type of document, followed by books. Multi-authorship is prevalent, with 87.27% of citations attributed to papers with multiple authors. Research groups with 2 to 5 authors and 6 to 10 authors are more productive. Recent studies are preferred over older ones, suggesting a trend towards incorporating the latest advancements in the field. **Gayan, M. & Singh, (2021)** examines citation analysis of Tripura University's mathematics PhD theses, analyzing patterns, trends, and scholarly impact. It discusses citation behavior, citation frequency, and sources. The review offers recommendations for optimizing citation practices and fostering collaboration, and suggests future research directions. It provides valuable insights into Tripura University's mathematics research. **Khandare & Sonwane, (2021)** analyzes citations in economics Ph.D. theses from BAMU Aurangabad, assessing scholarly impact and citation patterns. It uses scientometric methods and specialized tools to evaluate bibliographic data, providing insights into citation patterns, sources, and influence. The findings may inform researchers, educators, and policymakers, guiding best practices for citation management and collaboration. **Mandrekar et al., (2021)** examines citations in economics theses submitted to Goa University, assessing scholarly impact and citation patterns. It uses citation analysis methods to understand frequency, sources, and influence. The analysis aims to identify trends in citation behavior, potentially uncovering influential works. Findings may inform research, management, and collaboration. **Medhi & Sarmah, (2021)** analyses the International Journal of Digital Library Services (IJODLS) published 144 articles between 2015 and 2017, with 1915 citations. The highest number of articles was published in 2015, indicating increased visibility. Single-author citations were predominant, with journal citations accounting for the majority. The most cited journal was "Annals of Library and Information Studies," with India contributing the most citations. **Mondalab & Roy, (2021)** The study examines citations in doctoral theses on history and law at the University of Burdwan, focusing on scholarly impact and patterns. It uses citation analysis methods to understand citation patterns, frequency, sources, and influence. The findings can guide citation management and collaboration among scholars. Future research should expand to other institutions or disciplines to further understand this area. **Singh & Kumar, (2021)** analyzes citations in Indian Library and Information Science doctoral theses using JABREF reference management software. It aims to understand citation patterns, trends, influential works, and impact of research within the Indian academic context. The findings can guide research initiatives and facilitate collaboration within the LIS community. However, potential limitations include sample size and data collection methods. Future research directions may include expanding analysis scope or using alternative methodologies. **Rohila et al., (2020)** The study analyzes doctoral dissertations from the Animal Physiology Division of ICAR – NDRI, Karnal, to understand citation patterns in scientific literature. The analysis provides insights into research sources, authorship, and resource allocation, and suggests future research to explore citation impact indicators and interdisciplinary collaborations.

5. SUMMARY OF LITERATURE REVIEW

The literature review delves into various studies centered on citation analysis and scholarly impact across diverse academic disciplines and institutions. Dwivedi et al. (2023) study the evolution of AI and big data research in Information Systems (IS) from 1997 to 2022, finding IS as the most cited discipline. The study identifies influential authors, articles, and institutions, as well as gaps in existing research. Haldar (2023) analyzes research published in Library Herald from 2017 to 2021, revealing key themes, influential authors, and emerging research areas. Iyengar et al. (2023) analyze citation trends in the Journal of Orthopaedics articles, while Wiseman et al. (2023) analyze citation patterns in the American Journal of Surgery. Kaur & Verma (2022) examine citations within doctoral theses related to citation analysis in the Maharashtra region using Shodhganga, providing insights into scholarly communication dynamics. Shukla & Bhatt (2022) analyze citations within doctoral theses in commerce and financial studies from the University of Delhi, aiming to understand citation frequency and sources. Bachalapur et al. (2021) scrutinize research productivity and citations at BLDEA's professional institutions, emphasizing highly cited publications and collaborative endeavors. Gayan, M. A.& Singh (2021) review citation analysis of mathematics PhD theses from Tripura University,

utilizing scientometric methods to evaluate trends and offer recommendations. Khandare & Sonwane (2021) investigate citations within economics Ph.D. theses from BAMU Aurangabad, employing scientometric methods to assess scholarly impact. Mandrekar et al. (2021) examine citations within economics theses submitted to Goa University, aiming to assess scholarly impact within the discipline. Medhi & Sarmah (2021) analyze citations in the International Journal of Digital Library Services (IJODLS), identifying patterns and authorship trends in digital library services research. Mondalab & Roy (2021) scrutinize citations within doctoral theses in history and law submitted to the University of Burdwan, focusing on understanding citation patterns. Singh & Kumar (2021) focus on citations within doctoral theses in Library and Information Science (LIS) from Indian universities, employing JabRef software to understand citation patterns. Lastly, Rohila et al. (2020) explore citation patterns within doctoral dissertations in the Animal Physiology Division of ICAR – NDRI, Karnal, shedding light on resource allocation and collection development in academic libraries.

6. CONCLUSION

In conclusion, the literature review provides a comprehensive overview of various studies focusing on citation analysis across different academic disciplines and institutions. Through these studies, several key themes and insights emerge, highlighting the importance of citation analysis in understanding research productivity, scholarly impact, and citation patterns within specific domains.
The reviewed studies employ diverse methodologies, including comprehensive analysis of publication databases like Scopus, manual data collection and analysis, and utilization of specialized software for citation management and analysis. These methodologies enable researchers to identify highly cited publications, collaborative efforts, and citation patterns, offering valuable insights into the significance of research conducted within specific institutions and academic disciplines.

Moreover, the literature review underscores the importance of citation analysis in informing resource allocation, collection development strategies in academic libraries, and optimizing citation practices. By identifying trends in citation behavior, sources of citations, and influential works/authors, researchers, educators, and policymakers can make appropriate decisions to enhance scholarly communication and collaboration within their respective fields.

Overall, the reviewed studies contribute significantly to our understanding of citation practices, scholarly impact, and research productivity, offering insights that can guide future research initiatives, determine policy decisions, and facilitate collaboration among scholars. Moving forward, continued efforts in citation analysis research will be essential for advancing knowledge and promoting excellence in academic scholars.

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Exploring the Role of Knowledge Management in Enhancing Library Services

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ABSTRACT

Libraries have traditionally been seen as guardians of knowledge, acting as repositories of information and resources for the betterment of their communities. The emergence of knowledge management (KM) practices in recent years has brought new dimensions to the operations and services of libraries. This research delves into the complex interplay between knowledge management and library services, seeking to uncover the synergies and advantages that arise from their integration. Through an extensive literature review, the study examines how libraries in various contexts implement knowledge management strategies to improve their services. Key areas of focus include knowledge acquisition, organization, dissemination, and utilization within library services. The results indicate that effective knowledge management practices are crucial in enhancing library services. Additionally, knowledge management promotes a culture of continuous learning and development among library staff, enabling them to adapt to changing user needs and technological advancements. Moreover, the research reveals the challenges and obstacles faced in implementing knowledge management initiatives in libraries, such as ongoing budget cuts, lack of incentives, inadequate staff training and expertise, absence of a KM strategy, insufficient information and communication technology (ICT) infrastructure, and a deficiency in a knowledge-sharing culture. Ultimately, the study aims to explore effective measures for integrating knowledge management into library services.

Keywords: *Knowledge, Information, Knowledge management, Libraries, Library services.*

1. INTRODUCTION

We currently reside in a period characterized by an abundance of information and a rapid expansion of knowledge. This remarkable growth in knowledge and information has had a profound effect on all types of organizations, including libraries. Libraries serve as valuable repositories of knowledge and play a crucial role in education. Throughout history, libraries have evolved from chained and restricted access establishments to modern digital and virtual libraries that leverage cutting-edge technology to offer information through a range of services. The effectiveness of libraries and information centers (LICs) hinges on their capacity to harness the information and expertise of their staff in order to cater to the needs of the user community. In today's age of information and knowledge, knowledge has emerged as a crucial resource. With the rise of competition and rapidly changing environments, organizations are starting to recognize the extensive and mostly unexplored asset dispersed throughout the organization - knowledge. Knowledge has perpetually held significance in establishing an organization's competitive advantage. Knowledge Management (KM) revolves around treating knowledge as valuable corporate assets and endeavours to generate and implement the organization's resources. KM represents the capacity of an organization to generate, distribute, and utilize the combined knowledge encompassing its products, procedures, and personnel, thereby enhancing productivity in the workplace and minimizing superfluous tasks. Academic libraries have the opportunity to enhance their services in the knowledge economy by implementing knowledge management strategies. Establishing a culture of knowledge sharing and expertise within the library is key to achieving this goal.

2. DATA, INFORMATION, KNOWLEDGE

Data refers to basic, discrete pieces of information, such as names, attributes, and quantities. For instance, data can be presented in the form of a table showcasing circulation statistics. However, when these statistics are systematically arranged, graphed, annotated, or structured in a manner that

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conveys meaningful insights, they transform into valuable information. According to Oxford Learner's Dictionaries "data is a facts or information, especially when examined and used to find out things or to make decisions.". According to Cambridge Dictionary "data is information especially facts or numbers collected to be examined and considered and used to help decision-making, or information in an electronic form that can be stored and used by a computer.".

Information refers to a set of data that has undergone processing, refining, structuring, and/or presentation to establish significance and utility. It is described as knowledge acquired through study, communication, research, or instruction. In essence, information is the outcome of examining and understanding various data points.

Knowledge is an awareness of facts, a familiarity with individuals and situations, or a practical talent. Knowledge is a familiarity, recognition, or expertise of a person or something, consisting of information, facts, descriptions, or abilities, which is acquired via experience or education via perceiving, discovering, or learning. Knowledge can refer to a theoretical or realistic expertise of a subject.

3. TYPES OF KNOWLEDGE

Knowledge is classified mainly into two types:

i) **Tacit Knowledge:** Tacit knowledge refers to the knowledge acquired through practical experience, encompassing both personal and professional aspects of life. This type of knowledge is typically subjective, informal, and challenging to communicate due to its connection with individual beliefs and values. The concept of 'tacit knowledge' was introduced by Michael Polanyi, a former chemical engineer who later became a scientist, in his 1958 publication Personal Knowledge: Towards a Post-Critical Philosophy. Polanyi argued that there exists a form of knowledge that cannot be easily expressed in words. Tacit Knowledge is often expressed in the form of behaviour, action, habit, routine, instincts, responses and intuition.

ii) **Explicit Knowledge:** Explicit knowledge refers to knowledge that is easily articulated and exchanged among individuals. It is extensively recorded in a tangible format, such as a Standard Operating Procedure or a marketing report. How-to-guides and onboarding documentation are examples of explicit knowledge. This type of knowledge can be codified, meaning it is documented, accessible, and stored in databases, corporate intranets, and intellectual property portfolios. It is also known as declarative knowledge.

4. THE RISE OF KNOWLEDGE MANAGEMENT

Drucker (1993 and 1998) emphasized that "Knowledge" would supersede land, labor, capital, machines, and other factors of production. He further asserted that knowledge had integrated into productivity and emerged as the paramount resource in the worldwide economic landscape. Unfortunately, his visionary perspective went largely unnoticed at the time. It was not until 1991 when Ikujiro Nonaka raised the concept of ―tacit‖ knowledge and ―explicit‖ knowledge as well as the theory of ―spiral of knowledge‖ in the Harvard Business Review that the time of ―knowledge-based competition‖ finally came. In his latest book, Building Organizational Intelligence: a Knowledge Management Primer, Jay Liebowitz(2000) stated: "In today's movement towards knowledge management, organizations are trying to best leverage their knowledge internally in the organization and externally to their customers and stakeholders. They are trying to capitalize on their organizational intelligence to maintain their competitive edge.". The primary focus of knowledge management is to establish a system for recognizing the organization's intangible assets to effectively utilize knowledge both within and outside the organization. Knowledge management involves the creation, protection, acquisition, coordination, integration, retrieval, and dissemination of knowledge. The goal is to cultivate an environment that promotes knowledge sharing, where the act of sharing knowledge holds power, contrary to the traditional belief that knowledge itself is power.

4.1. What is Knowledge Management

Knowledge management refers to the systematic approach of acquiring, disseminating, and efficiently utilizing knowledge within an organization. It encompasses the creation, sharing, utilization, and management of knowledge and information within the organization. This includes the strategies and methods employed to identify, acquire, organize, evaluate, and leverage the intellectual

assets of the organization to enhance productivity and competitiveness. The ultimate goal of knowledge management is to improve organizational efficiency, effectiveness, and innovation by ensuring that employees have timely access to the relevant information.

4.2. Steps of Knowledge Management

Few steps of Knowledge management are:

1) Knowledge discovery
2) Knowledge capture
3) Knowledge organization
4) Knowledge assessment
5) Knowledge sharing
6) Knowledge reuse
7) Knowledge creation

4.3. Principles of Knowledge Management

Thomas H Davenport has established ten principles for knowledge management as follows:

1) Knowledge Management is expensive.
2) Effective management of knowledge requires hybrid solutions of both people and technology.
3) Knowledge Management is highly political.
4) Knowledge Management requires knowledge managers.
5) Knowledge Management benefits more from maps than model, more from markets than from hierarchies.
6) Sharing and using knowledge are often unnatural acts.
7) Knowledge Management means improving knowledge process.
8) Knowledge access in only the beginning.
9) Knowledge Management never ends.
10) Knowledge Management requires a knowledge Contract.

4.4. Need of Knowledge Management

1) To enhance users' satisfaction.
2) To interact and retain new information seeker.
3) To increase public faith in the organization to strive meet and manage needs of user community.
4) To be able to justify the spending of funds allocated to the organization library and information center by the parent body.
5) Recruiting the best people for the job.
6) Exposing professional to the complexity of real problem to stimulate and cultivate professional's knowhow to retain professionals to react in problem solving techniques.

4.5. Challenges of Knowledge Management

1) Some important challenges of Knowledge management are:
2) Outdated Technology
3) Employee shortage
4) Lack of time
5) Failure of management commitment
6) Resistance to organizational change
7) Untrustworthy source of information
8) Inaccessible information

5. KNOWLEDGE MANAGEMENT IN LIBRARIES

Libraries are adapting to the evolving business environment and digital era in the new knowledge economy. In today's world, libraries need to become learning and knowledge centers, serving as intellectual hubs for their communities. As organizations focused on learning, libraries must lead in knowledge management and enhance their services in all important areas. To keep pace with the rapid growth of human knowledge, libraries must shift from traditional printed resources to electronic and digital formats, improving access to and sharing of resources. Libraries, as learning

organizations, have a crucial role to play in knowledge management. While businesses focus on utilizing knowledge for competitive advantage, public, academic, and research libraries have a distinct purpose and perspective. Unlike company libraries, which are often referred to as corporate libraries, special libraries, or knowledge centers, these libraries prioritize expanding knowledge access for their users rather than internal competition and limited knowledge sharing. With their mission in mind, libraries should strive for ambitious knowledge management goals. Knowledge management plays a vital role in promoting connections among libraries, as well as between libraries and users, by enhancing knowledge sharing and facilitating the flow of information. In today's knowledge-driven economy, libraries are actively involved in researching the advancement and utilization of information resources, creating virtual libraries, and protecting intellectual property rights in the digital era. These efforts serve as the basis for knowledge innovation.

5.1. Need for Knowledge Management in Libraries

The rapid expansion of human knowledge across various formats has prompted libraries to enhance their resources, access, and sharing strategies from traditional print to electronic and digital resources. With budget constraints, limited technological capabilities, inadequate staffing, and space limitations, libraries must carefully assess user needs and implement cooperative acquisition plans to meet those needs. A significant portion of the library budget is dedicated to staff and the acquisition and cataloging of materials. Maximizing the utilization of staff resources and enhancing the efficiency and effectiveness of technical services operations are key aspects of knowledge management in academic libraries. The primary objective is to leverage organizational knowledge to boost operational efficiency and productivity.

5.2. Importance of Implementing Knowledge Management in Libraries

Libraries, as organizations dedicated to learning, play a crucial role in promoting effective knowledge management. In today's information-driven society, knowledge management has become a fundamental principle for both libraries and the wider community. The primary objective of libraries, whether they are public, academic, or research-oriented, is to enhance knowledge accessibility for their users. With this objective in mind, libraries should prioritize the implementation of robust knowledge management practices. By integrating knowledge management into their daily operations and adopting a systematic approach, libraries can effectively allocate resources, plan strategically, and reap the benefits of improved services and user satisfaction. Given the abundance of knowledge across various domains, managing this knowledge is essential for providing high-quality information sources, making informed decisions, enhancing employee performance, and remaining relevant to their parent organizations. Knowledge Management (KM) emphasizes the management of tacit knowledge that is ingrained in employees through their experience and expertise. Valuable knowledge in the form of tacit knowledge is held by individual employees within the organization and should be utilized, as it is through this expertise that significant advancements can be made. Aharony (2011) asserted that KM is a process that involves transferring knowledge resources through capturing, identifying, organising and sharing, in order to improve organisational effectiveness. By effectively utilizing its intellectual capital and knowledge assets, the organization can create fresh knowledge, leading to growth opportunities. It is essential for the organization to manage these assets efficiently in order to maintain competitiveness in the global market. A significant driving force behind the adoption of Knowledge Management (KM) in libraries is the enhancement of existing library practices and the provision of better services for library patrons. There is a clear necessity for improved library services and increased customer satisfaction. The rapid advancements in information and communication technologies, coupled with the evolving needs of library users, have created a heightened demand for a more refined approach to delivering library services. KM empowers librarians to effectively capture, store, organize, share, and disseminate the right information to the appropriate customers at the right time. However, library and information professionals encounter various challenges when implementing KM in libraries, including constant budget reductions, a lack of incentives, inadequate staff training and expertise, absence of a KM strategy, insufficient ICT infrastructure, and a dearth of knowledge sharing culture.

5.3. Knowledge Management in Library Operations

Knowledge management is being utilized to enhance the functioning of libraries. While special libraries have taken the lead in this endeavor, other libraries are now also implementing knowledge management practices. This section focuses on how organizational knowledge can be generated and utilized within internal library operations. The discussion of these factors can be expanded to benefit institutions of higher education as a whole. From a theoretical standpoint, knowledge can be visualized as a pyramid. The foundation of this pyramid consists of data and unfiltered facts. When context is added, such as through cataloging or metadata in libraries, data transforms into information. Further, when inference is applied, often through public services like reference, information evolves into intelligence. Intelligence, when combined with certainty, becomes knowledge. And at the pinnacle, knowledge combined with synthesis becomes wisdom. Libraries have excelled in creating scholarly information and intelligence from data, but they have not been as successful in generating knowledge from intelligence. Additionally, they have struggled to develop organizational knowledge that aligns with library objectives. Knowledge management serves as a means to cultivate and apply the organizational knowledge necessary to enhance library operations and, ultimately, improve library effectiveness. It also empowers libraries to generate organizational knowledge for institutions of higher education.

6. ROLE OF LIBRARIAN IN IMPLEMENTING KNOWLEDGE MANAGEMENT IN LIBRARY

In order to facilitate the implementation of knowledge management, it is essential to establish a well-defined and operational knowledge management system. The libraries should utilize the most up-to-date information technology. In this context, the library director or librarian should assume the role of the chief knowledge officer for the entire organization. They should collaborate with the chief information officer, heads of the planning department, the computer and information technology center, the human resource management department, and the finance department, among others, to design and develop such a system. This knowledge management system should be constructed based on the existing computer and information technology infrastructure, which includes upgraded intranet, extranet, internet, and available software programs. Its purpose is to facilitate the capture, analysis, organization, storage, and sharing of both internal and external information resources, thereby promoting effective knowledge exchange among users. The role of librarians is crucial in shaping the processes and policies that effectively make use of the vast amount of knowledge within an institution. As protectors and providers of information, librarians play a significant part in the successful implementation of knowledge management initiatives. By integrating knowledge management practices into libraries, the traditional functions of the library, such as collecting, arranging, sharing, storing, and utilizing information, are further improved. This allows librarians to offer comprehensive services that meet the varied personal and professional needs of library users.

7. CHALLENGES FACED IN IMPLEMENTING KNOWLEDGE MANAGEMENT IN LIBRARY SERVICES

There are several challenges that may arise when implementing knowledge management in library services:

i) **Resistance to change:** Libraries frequently stick to traditional methods and systems, causing staff members to be reluctant to adopt new technologies or methodologies for knowledge management.

ii) **Lack of Resources:** Libraries may face challenges in implementing knowledge management due to budget constraints, as it often involves investing in technology, staff training, and infrastructure.

iii) **Technological Infrastructure:** Libraries might lack the essential technological framework needed to facilitate knowledge management efforts, including integrated library systems, digital repositories, and collaboration platforms.

iv) **Data quality and accessibility:** Libraries frequently contain extensive data collections, yet maintaining high standards of quality, relevance, and accessibility can present significant challenges. In the absence of appropriate metadata protocols and indexing systems, locating and accessing information may prove to be a daunting task.

v) **Staff skills and training:** The library personnel might not possess the essential expertise and training required to efficiently execute knowledge management techniques, including information architecture, taxonomy development, and data analysis.
vi) **Cultural shift:** Knowledge management necessitates a cultural transformation that emphasizes collaboration, sharing, and continuous learning. Libraries might encounter challenges in cultivating this culture, particularly in settings where hoarding knowledge or keeping information isolated is common.
vii) **User engagement:** Engaging library users in knowledge management initiatives, such as contributing content, providing feedback, or using new tools, can be challenging. Without user participation, knowledge management efforts may not be sustainable.
viii) **Privacy and Security concerns:** It can be challenging to implement knowledge management systems in libraries while also ensuring compliance with the strict privacy and security standards that govern the management of user data and sensitive information.
ix) **Measuring Success:** Evaluating the effectiveness of knowledge management initiatives in libraries can pose a challenge, as traditional metrics may not fully reflect their influence on user satisfaction, information accessibility, and organizational productivity.
x) **Sustainability:** Sustaining knowledge management initiatives over the long term can be challenging for libraries without dedicated resources and support. Ongoing maintenance and continuous improvement are essential for effective knowledge management.

8. CONCLUSION

In the realm of business, knowledge management has been recognized as a crucial factor for organizations to gain a competitive edge, enhance the value of their products, and ensure higher customer satisfaction. The library sector can draw valuable insights from the business world. Knowledge management holds equal importance for libraries, albeit without the focus on competition, proprietary concerns, and financial gains. Libraries, in fact, possess extensive expertise in information management, which can be effectively applied to knowledge management. To successfully implement knowledge management, libraries must have strong leadership and a visionary top administration that can positively influence the organization's efforts in knowledge sharing. As libraries embrace the knowledge age of the 21st century, they should actively participate in the advancement of knowledge management rather than taking a passive role.

9. FUTURE SCOPE

Academics are the most proficient creators of knowledge. Universities excel in the process of knowledge creation. In order to enhance their role as institutions dedicated to learning and knowledge, universities should enable their libraries to establish comprehensive knowledge management systems across their campuses. The time has come for libraries to redefine their position and emerge as prominent contributors in the field of knowledge management. Collaboration between libraries and Information Technology Professionals, along with other stakeholders, is essential for the development of effective knowledge management systems. Despite facing constraints such as limited budget and human resources, libraries can leverage existing management structures and technology to successfully implement KM strategies, whether through a bottom-up or top-down approach. By investing in KM initiatives, libraries can enhance operational efficiency and better meet the evolving demands of their patrons.

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Web 3.0:
Artificial Intelligence in the Digital Library

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ABSTRACT

Web 1.0 was the first generation of the World Wide Web. Web 2.0 is a new generation of web technologies that highlight user-generated content, social media, and participating online experiences. Academic libraries have initiated the development of integrated web technologies for online library services. By the leveraging semantic web and interrelated data, libraries have transformed into dynamic stages that offer personalized references and effective search facility. The integration of artificial intelligence, machine learning, and natural language processing enables libraries to provide intelligent chatbots and virtual assistants, creating immersive user involvements. Moreover, block chain technology confirms the security, transparency, and credibility of digital collections and intellectual property rights (IPR). These an improvements of an empower libraries to adapt to evolving user needs and effectively serve their communities in the digital age. As technology continuously changes, libraries must stay up-to-date of Web 3.0 advancements to continue at the front of information dissemination and user engagement.

Keywords: *web 3 0, user-generated content, social media, semantic web, linked data, artificial intelligence, block chain technology.*

1. INTRODUCTION

Decade 1990s, web technologies have been extensively used and have subjective online library services (McKenna, 1994) . In the digital age, there is an evolving learning process, innovative pedagogy, and technology-based educational applications that emphasize just-in-time learning, constructivism, student-centered learning, and collaborative approaches to learning and teaching (Isaias, Dirk, Kinshuk, Sampson, & Michael, 2012). Academic libraries have pioneered the development and deployment of integrated library service platforms and web technologies to enable interactive, semantic, and responsive user experiences through search technologies, electronic resources, audiovisual tools, blogs, and social networking. Web applications and social media for user services are widely used to empower users and take online information delivery to a new level (Shoniwa & Hall, 2007). Strategies for information marketing, user engagement, and outreach have become essential, so library web content of libraries and social media tools are organized into a coherent process of workflows to manage library websites as hubs for information. With the emergence of new applications, the notions of scholarly communication are changing. Academic libraries should reposition themselves strategically and competitively reposition themselves to be the places to go-to places for research and improve the user experience in accessing resources seamlessly.

2. WEB 1.0 WEB 2.0 AND WEB 3.0

2.1. WEB 1.0

This Web 1.0 term was first developed by Tim Berners-Lee in 1989. This is considered the first generation of the World Wide Web. This era is also known as the “read-only web," as society could only view information on websites. Websites developed in the Web 1.0 generation were static and did not change frequently. Manufacturers and service providers began publishing online catalogs to promote their products and services. The main purpose of the website was to make information accessible to everyone at any time and to establish an online presence. (Aghaei, Ali, Nematbakhsh, & Farsani, 2012) . With the advent of shopping carts, people started buying goods and services online

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instead of offline stores. The distribution of information to customers was done through a "push model," as customers were unable to interact through valuable feedback or contribute to content creation. Web 1.0 sites were developed in HTML, and the basic communication protocol was HTTP.

2.2. WEB 2.0

The concept of Web 2.0 was coined by Dale Dougherty, web pioneer and O'Reilly Vice President, in 2004 at a conference with O'Reilly and Media Live International. Web 2.0 is also referred to as the Wisdom Web, People-centric Web, Participative Web, and read/Write Web. (Sen Murugesen, 2007) Web 2.0 is a collection of open-source, interactive, and user-driven online applications that extend the experiences, knowledge, and market power of the users as participants in business and social processes. Web 2.0 applications support the creation of informal user networks that facilitate the flow of ideas and knowledge by enabling the efficient creation, dissemination, sharing, and editing/refinement of information content. Web 2.0 presents companies with new challenges, but also with new opportunities to engage and stay in touch with their markets, to learn about the needs and opinions of their customers, and to interact with them in a direct and personalized way. Several technology principles, which will be briefly explained in the next chapters, are common to Web 2.0 applications. As far as Web 2.0 categories are concerned, we propose a basic classification based on application types, which are divided into five main categories: (Fountain, 2008). The flow of information between content providers and viewers began to flow in both directions. For example, a visitor counter roughly indicates the relative popularity of a website, while user comments provide a measure of user engagement.

As an AI language model, I can't look at pictures or numbers. However, based on your description, you seem to be referring to the era of Web 2.0, which revolutionized the internet by emphasizing user-generated content, social media interaction, and a shift towards interactive and participatory online experiences. Here is an overview of some of the technologies and applications associated with Web 2.0 A tag cloud showcasing Web 2.0 topics (O'Reilly, 2004) Web 2.0's greatest gift to humanity is social media, i.e. Facebook, Twitter, Linked-In, Zynga, Google+, Flickr, Foursquare, YouTube, etc. Social media has connected people around the world in ways that were unimaginable just a few decades ago. (Hurlburt, 2012) One of the key drivers for the development of Web 2.0 is the emergence of a new generation of web-related technologies and standards. Ajax, JavaScript, Cascading Style Sheets (CSS), Document Object Model (DOM), Extensible HTML (XHTML), XSL Transformations (XSLT)/XML, and Adobe Flash offered users a rich and enjoyable interactive experience. These technologies display and deliver web services just like desktop software and make difficulties in distributed processing invisible. (Building, 2007).

2.3. WEB 3.0

Web 3.0 is the third generation of Web technology development. The Web, also known as the World Wide Web, is the foundation layer that uses the Internet to provide web and application services. Web 3.0 is still evolving and being defined, so there is no consensus on the canonical definition. Web 3.0 will focus on decentralized applications and make extensive use of blockchain-based technologies. Web 3.0 will use machine learning and artificial intelligence (AI) to enable smarter and more adaptive applications. Another emerging aspect of the Web 3.0 definition is the concept of the Semantic Web. One of the supporters of introducing word technology to the Internet is Tim Berners-Lee, the creator of the website. The transition from the original Web 1.0 to Web 2.0 has taken more than 10 years, and the full implementation and redesign of the Web and Web 3.0 should take just as long, if not longer. Long. (David, Sean, & Alexander, 2022) Word networks are not new networks but extensions of existing networks. For example: If someone searches for flight times from a country, a keyword search will return flight times from that country along with information about weather conditions during the trip, maps, city guides, and other useful information such as hotels, restaurants, and transportation. Save. Picture. Web.3.0 architecture is based on URI (Uniform Resource Identifier) and Code, which supports global character sets. Data in Semantic Networks is represented using RDF (Resource Description Framework) based on XML format. The category and attribute taxonomy is represented by RDFS (RDF Schema). The Web Ontology Language (OWL) is a standard set of words. RIF/SWRL can write rules outside of RDFS and OWL. The Simple Access and RDF Query Language (SPARQL) is used to query RDF data. (Dwiwedi, Rani, & Anju, 2011). Layers

of logic and evidence validate the reliability of the input. The input data source is verified by digital signature. User applications are developed on top of all layers. The Semantic Web provides the infrastructure for developing various web applications, reducing the work required to search for products or services. Google Squared, Hakia, Wolfram Alfa, Watson, and many more. Semantic Web search engines and other applications such as Zemanta (search engine plug-in), Facebook (like a button), and Trip It (e-commerce travel service website) have proven their importance in people who live their daily lives on the Internet.

3. KEY FEATURES OF WEB 3.0

3.1. Semantic Web

The semantic web (Tem, 1998), a prototype of Web 3.0, is an information and data network that aims to link all the data in the virtual world. With the rapid development of science and technology, proposals to manage the abundance of web data (e.g., data sharing, integration, reuse, and mining) are one of the biggest obstacles (Procter, 2009) . (Nigel, Berners-Lee, & Wendy, 2006) Resource Description Framework (RDF) (Miller, 1998) is a syntax-neutral data model (i.e., subject, predicate, and object). RDF records the relationship between the elements subject (e.g. links) and object (e.g. resources) and describes the properties of web resources. Above all, it provides an infrastructure for various applications of metadata and exchanges metadata between applications on the web, which promotes the automatic processing of web resources (Nupur, 2014). Subsequently, the Web Ontology Language (OWL) (McGuinness & and Frank Van, 2004) was proposed to improve the comprehensibility of web content to machines and play a role in semantic web activity. It is a family of knowledge representation languages for the creation of ontologies. Ontologies are similar to class hierarchies in object-oriented programming, and the core idea of OWL is to represent the ontology explicitly and efficiently (Hitzler, 2021) . OWL is used to make web resources more accessible to automated processes by adding resource information that describes or provides web content. Furthermore, knowledge graphs (KG) (Piero Andrea, Stefan, Axel, & Valentina, 2019) , (Amit, 2012) could be the next direction for knowledge representation in the semantic web. A knowledge graph consists of a set of interconnected typed entities and their attributes (Maurizio, Georgia, Barbara, & Letizia, 2020) (Abraham, James, & Natalya, 2016) According to the study (Dieter & Umutcan, 2020) , there are four main steps for KG generation: 1) knowledge creation; 2) knowledge hosting; 3) knowledge curation; and 4) knowledge deployment. KG can be the best possible way to realize the concept of the "Internet of Behaviors" (IoB) (Jiayi, Wensheng, Han-Chieh, Yu, & Weiping, 2023) , which can establish connections between people and things or things and things.

3.2. Artificial Intelligence

Thanks to the improvement in computing power and big data technologies (Wensheng, Lin, Han-Chieh, & and Justin, 2017), AI has entered a phase of intensive development. AI is becoming a part of our daily lives as more and more fields are using AI applications (Chael & Andreas, 2019) (Yoseph, Hailemariam; Abbas, Yazdinejad; Reza M, Parizi; Gautam, Srivastava; Ali, Dehghantanha, 2020) . We can provide numerous datasets and use AI training models for solving problems such as image recognition, information extraction, and automatic speech recognition. In the era of Web 3.0, huge amounts of data are generated daily through the perception of devices, content services, and intelligent life. AI helps machines to realize the closed loop of “perception-decision-behavior-feedback" and thus improves the user experience. As the integration of computing and storage capacity overcomes the bottleneck of AI computing power, the development of collaborative IoT perception and 5G communication technologies will enable collaboration between multiple agents, meeting people's needs for real-time perception and decision-making. Many other areas have made great strides through the use of AI. For example, autonomous driving (Ru-Xi & Iván, 2020) offers the best route planning and control for vehicles through the deep integration of IoT and AI. Market forecasting and risk management in the financial markets, medical support in healthcare, recommendation systems, unmanned retail in the retail industry, voiceprint payment, face scanning in payment systems, and voice in the smart home are all examples of how technology is changing our lives (Yaga, Mell, Roby, & Scarfone). All of the above cases illustrate how AI makes Web 3.0 more

intelligent and user-friendly. However, because AI products have a great impact on our lives, fairness, and non-discrimination (including objective and subjective) in the development of AI will be particularly important. For example, the usage of big data is Unethical and malicious behavior by companies toward their customers. In some cases, AI products serve some groups but ignore the requirements of specific groups (e.g., the elderly and the disabled). In the Web 3.0 era, data ownership belongs to users because they generate new data every day. These data may be meaningless to users, but companies can profit from a variety of data using AI technologies, such as user profiles and personalized advertising. The definitions of fairness are distinct in different historical periods and even in different ideologies. Fortunately, AI technologies can improve fairness and transform it into a global and comprehensive understanding, which provides a powerful guide to achieving fairness. Moreover, with the development of technology (e.g., federated learning, trusted computing, the Internet of Things, Internet of Behaviors, and encryption), most negative effects that technology brings will be eliminated in most cases (Yao, Yijie, Hong, Wensheng, & Yongdong, 2022).

3.3. Block chain

The block chain began to be developed in the 1980s and 1990s and was officially released in 2008 (Nakamoto, 2008); (Dylan, Peter, Nik, & Karen, 2018). Many experts, scholars, and activists are interested in the potential of block chain technology because of its decentralization, trustlessness, independence, anonymity, vulnerability, and surveillance (Zibin, Shaoan, Hong-Ning, Xiangping, & Huaimin, 2018) . One of the most famous success stories is Ethereum. Ethereum provides a Turing interpretation language that can help developers write smart contracts and create their decentralized applications. The Ethereum Yellow Paper ("canonical version") (Gavin, 2014) provides a Turing-complete machine called the Ethereum Virtual Machine. To protect smart contracts from malicious attacks, the Ethereum Smart Engine provides a sandboxed working environment. It can be said that the new basic technologies that are being considered, such as token systems, identity and name systems, file storage, and private management in the blockchain, can help to fight the control of technology giants. Several metrics are proposed to evaluate block reduction. For example, research (Shumo & Sophia, 2018) (Adem, Soumya, Ittay, Robbert-van, & Emin-Gün, 2018), (Soo Jin, 2021)) shows some relevant points. (Kyle & Christian, 2016) Propose a more intuitive approach. They believe that the more information on the blockchain, the more decentralized the blockchain will be.

In addition, semantic blockchain and knowledge-based blockchain may be the next most accepted technologies in Web3 (not Web 3.0) (Michele, Floriano, Saverio, Giovanna, & Eugenio, 2017) Semantic and knowledge-based blockchain Network services within block chains. Not only are there aspects of division and distrust, but they all take advantage of the advantages of knowledge. Furthermore, the "intractable triple problem" (i.e., decentralization, privacy, and aggregation) seems unsolvable in the long run. This case will encourage researchers and developers to look for alternative solutions to isolated solutions. The development of decentralized networks is one of the most remarkable aspects of Web 3.0.

3.4. Decentralization

Distributed and decentralized networks are an important part of the Web 3.0 framework, allowing users to trade or exchange information without intermediaries, lack of ownership, or interference in user privacy. Web 3.0 focuses on the concept of "decentralized data", i.e. the commercialization of data management. Peer-to-peer transactions are recorded on a blockchain, a decentralized ledger. Participants can use technology to verify transactions without requiring authorization. The app can be used to donate, make decisions, vote, and more. Therefore, Web 3.0 applications (also known as dApps) run on blockchains, peer-to-peer networks, or a combination of the two (Chiradeep, 2022)

3.5. Redefined Data Ownership

Data ownership is also defined as the ability of users to have more control over their data and how it is used. This is an important part of Web 3.0, designed to give users more control over their data and its use. One of the key technologies for redefining data ownership in Web 3.0 is the use of decentralized storage. This allows users to store data on a distributed network, making it harder for

hackers to access and steal personal information. In addition, distributed storage gives users more control over how their data is accessed and how it is used.

Another important aspect of redefining data ownership in Web 3.0 is blockchain technology. Blockchain technology enables the creation of decentralized platforms such as decentralized finance (DeFi) and decentralized organizations (DAO), which enable secure and transparent transactions and new ways of managing data and transactions. Especially on the internet. Additionally, the redefinition of data ownership in Web 3.0 brings with it privacy. This concept allows users to control and manage their data, and based on the use of blockchain technology. This gives users more control over their data and allows them to share it with the parties they trust (Shardeum, 10 Key Features of Web3 – What You Should Know, 2022)

3.6. 3D virtual environments with realistic spatial user experiences

Likens points out that Web 2.0 metaverse experiences are two-dimensional and flat. In Web 3.0, the virtual world becomes three-dimensional. Likens predicts that "VR, AR, and XR [augmented reality] technologies will converge." "So companies have an opportunity to engage employees in a bigger way. And employees want that. (Metex, 2023)

3.7. Metaverse

While talking about the key features of Web 3.0, you should also know about metaverse integration. The metaverse is a concept. One that refers to a virtual world where users can interact and engage with each other and digital platforms in a seamless and immersive way. This concept is becoming increasingly important in Web 3.0 as virtual and augmented reality technologies evolve.

The metaverse combines virtual reality, augmented reality, and the internet, where users can participate in various activities such as gaming, socializing, shopping, and entertainment. It also has the potential to be used in multiple industries, such as education, tourism, and real estate. The metaverse also allows users to create and customize their avatars, which can interact with other users and digital objects in the virtual world.

The metameres can bring people from all over the world together, regardless of their physical location. It can also create new forms of entertainment, education, and work. Additionally, the metaverse also has the potential to develop new business models and revenue streams for companies and individuals. However, the development of the metaverse also raises concerns about privacy, security, and regulation. These concerns must be addressed as the metaverse continues to develop as one of the main features of Web 3.0.

Curious to know some more information related to the Metaverse? Here are some blogs you can go through about Best Metaverse Wallets, Best Metaverse Platforms & How to Buy Land in Metaverse (Shardeum, 10 Key Features of Web3 – What You Should Know, 2022)

4. APPLICATIONS OF WEB 3.0 IN LIBRARIES

4.1. Web OPAC:

Web OPAC stands for "Web Online Public Access Catalog". It is a web-based cataloging system that allows users, usually librarians, to search and access library and collection resources over the Internet. The Web OPAC system provides a user-friendly interface to search, locate, and access books, journals, multimedia, and other materials in the library. Search function. Browsing functions, availability, and location information, viewing book details user accounts, multimedia integration: communication functions, mobile accessibility, advanced search filters: alerts and notifications, accessibility features, online OPACs have become an integral part of modern library services, providing convenient and convenient effective use of library resources access to users. They promote a more user-centered and technically advanced library experience.

4.2. Ontology:

In informatics and computing, ontology refers to the formal and explicit definition of a common concept of a domain. It represents a structured framework that defines the concepts, relationships, and units of a certain domain of knowledge. Ontologies play an important role in information representation, data integration, and the development of intelligent systems. Here are the

key aspects of ontologies: conceptualization, formalization, explicitness, shared understanding, hierarchy and taxonomy, properties and attributes, relationships, semantic interoperability, RDF and OWL, applications, ontology design, domain specificity, ontology languages, ontologies are powerful tools for representing and organization of information, which enables better information service, data integration and the development of intelligent systems with a unified understanding of a specific domain.

4.3. Ubiquitous Content

Ubiquitous content is people's content that is continuously stored online in the form of movies, blog posts, Real Simple Syndication (RSS) feeds, wikis, stories, articles, music, games, and more. They are always online and accessible anywhere via the Internet on all mobile devices and Internet devices. This generation of content must be created in various formats, as well as easily shareable, transferable, and accessible through all means of communication. Libraries can use this technology to provide faster information services in the future.

4.4. Geo Tagging

It is a simple marking of various media or digital contents like images, photographs, videos, websites RSS feeds, etc. Most cell phones and mobile devices have GPS (Global Positioning System) facilities, which allow users to add metadata exactly where the data image or video was created. This helps users to find specific information located at a specific location. Adopting this feature in libraries can work as a part of cataloging and helps the library users to mark the information in which they are interested for their future reference.

4.5. Virtual Reference Service

Virtual reference services are library services that allow users to ask reference questions and receive assistance from librarians online or through digital channels (such as email, chat, conferencing, or video). This service is designed to provide quick and convenient access and support to information resources for users who do not have access to a physical library or who wish to seek help remotely. According to (Lankes, 2008) , virtual communication is a consultation service that is initiated electronically, usually, clients use a computer or other online technology to communicate with a consultant. Without physical presence. The most commonly used communication channels in virtual conversations are chat, video conferencing, voice-over IP, peer browsing, email, and instant messaging.

Virtual reference services usually consist of staff trained to assist users with a variety of information needs, such as finding books, articles, or other resources, answering research questions, and guiding appropriate use of library resources and services. Some virtual reference services can also provide specialized support for certain fields of study (such as science, engineering, or business). As more and more users seek information and support through online channels, virtual reference services are becoming increasingly popular in the digital age. They can be a valuable tool to connect users with the resources and expertise they need to succeed academically or personally. (Ashikuzzaman, 2023)

4.6. 3D Web

The term "3D networking" refers to the concept of extending a traditional two-dimensional (2D) network into a three-dimensional (3D) space to create an immersive and interactive online experience. The goal is to bring a new dimension to web content and applications, allowing users to navigate and interact with digital environments spatially and engagingly. The development of 3D networks has opened new opportunities for online interaction, communication, and content collection, pushing the boundaries of what is possible with flat 2D networks. As technology advances, 3D networking will play an increasingly important role in shaping the online experience of the future.

4.7. Cloud Computing

The advent of the high-speed Internet era has brought with it many innovations, which have greatly changed the way we understand and manage computer systems. Gone are the days of

being limited by the user's device. In the blink of an eye, systems can be reconfigured at a fraction of the cost. The introduction of cloud computing represents a paradigm shift in traditional computing, prompting beneficial changes. Offering a mobile and flexible work model for online stores of the 21st century. Cloud computing is a method of using the Internet to remotely provide basic services, such as storage, databases, and specialized equipment. (Such as high-performance GPUs), operating systems, applications, and development environments. An overview of the most popular and influential cloud computing solutions. A high-speed and reliable network connection is a prerequisite for accessing electronic resources managed in the cloud. Instead of connecting all devices/computers to their system, users can log into their accounts from anywhere and use the facilities available when the resources are connected locally. This eliminated the need to carry heavy equipment and carry time marked by increased mobility (Hinddeep & Ravirajsinh, 2022)

4.8. Unique Search

Unique search unique search is a major advantage of Web 3.0. There are so many databases available to search for information; these databases require different logins for searching and printing. It would be easy for users to find search results that appear in one place and one way, just like a Google search. The unique search of new days has become more common in libraries because information technology has a strong influence on the development and progress of libraries. Advances in science and technology have greatly improved and changed the entire functioning of library management. Much of the library management software has been developed in the world, and unique search capabilities already exist in management software and open-source software.

4.9. Mobile Library Catalogues

Mobile library catalogs, often referred to as mobile library apps, are smartphone and tablet applications that provide users with access to the library and its catalog and related services. These mobile apps offer library patrons a convenient way to search, borrow, and manage library resources on the go. Here are the main features and aspects of mobile library catalogs: such as search and discovery, barcode scanning, real-time book availability, user account management, push notifications, digital resource integration, GPS and location services, personalized recommendations, offline language support, Access, interactive maps, social features, accessibility features, event information Secure authentication Mobile library catalogs enhance the overall user experience by providing patrons with a convenient and accessible way to access library resources using their mobile devices. These applications contribute to the modernization of library services in the digital age.

5. CONCLUSION

Web 3.0 technologies have profoundly revolutionized library services, enhancing accessibility, collaboration, and knowledge discovery. By leveraging semantic web and linked data, libraries have transformed into dynamic platforms that offer personalized recommendations and efficient search functionalities. The integration of artificial intelligence, machine learning, and natural language processing enables libraries to provide intelligent chatbots and virtual assistants, creating immersive user experiences. Additionally, block chain technology ensures the security, transparency, and credibility of digital collections and intellectual property rights. These advancements empower libraries to adapt to evolving user needs and effectively serve their communities in the digital age. As technology continuously evolves, libraries must stay abreast of Web 3.0 advancements to remain at the forefront of information dissemination and user engagement.

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SWOT Analysis on Traditional and Digital Libraries: An Overview

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ABSTRACT

Libraries are the hubs of knowledge and learning. They crossed many boundaries and evolved as a new platform for their users. Libraries have many distinguishing features and uses. It plays a very crucial role in traditional as well as digital contexts. Libraries, as guardians of knowledge, face a complex landscape characterized by both challenges and opportunities in both traditional and digital realms. This paper delves into the multifaceted issues libraries encounter, encompassing budgetary constraints, technological advancements, changing user expectations, digital preservation, copyright concerns, and information security. However, amid these challenges lie remarkable opportunities. The digital era offers libraries a chance to enhance accessibility, engage patrons through innovative technologies, and foster global collaboration. The challenges faced by libraries in both traditional and digital contexts are formidable. However, these challenges are not impossible. Libraries that adapt, innovate, and embrace technology stand to gain immensely.

Keywords: *Traditional library, Digital library, Information landscape., Technology Integration*

1. INTRODUCTION

Libraries have long been regarded as repositories of knowledge, serving as essential hubs for education, research, and community engagement. However, in the ever-evolving landscape of information and technology, libraries face a complex array of challenges, issues, and opportunities in both traditional physical spaces and the rapidly expanding digital realm. The coexistence of these two dimensions presents a dynamic environment that requires libraries to adapt and innovate to remain relevant and effective in meeting the diverse needs of their users. Libraries, once strongholds of printed knowledge, have undergone transformative changes in the face of the digital revolution. The shift from traditional print materials to digital formats has brought forth numerous challenges and opportunities for libraries worldwide. As guardians of information, libraries play a vital role in preserving cultural heritage, fostering education, and supporting research activities. Library and information science professionals should explore the challenges posed by technological advancements, budget constraints, and changing user expectations in both traditional and digital contexts. Despite these challenges, libraries are also presented with unique opportunities to enhance accessibility, collaborate globally, and engage patrons in innovative ways. By understanding these challenges, libraries can strategically position themselves to seize emerging opportunities, ensuring their relevance and impact in the ever-evolving information landscape.

2. CONCEPT OF LIBRARY

The term "library" has diverse interpretations, originating from the Latin word "liberarium", which means "book." Libraries hold varying significance for individuals and organizations. For some, they serve as repositories for books and various materials. Others view libraries as institutions dedicated to acquiring, organizing, storing, retrieving, and distributing books and information resources. (Cletus, 2022)

UNESCO defines a Library as, "Any organized collection of printed books and periodicals or any other graphic or audio-visual materials with a staff to provide and facilitate the use of such materials as are required to meet the informational research, educational, and recreational needs of users."

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Harrods librarian's glossary and reference book defines a Library as, "A collection of books and other literary material kept for reading, study, and consultation; a place, building, and rooms, set apart for the keeping and use of a collection of books, etc".(Cletus, 2022)

A location where literary and artistic materials, such as books, magazines, newspapers, brochures, artworks, recordings, and digital media, are stored for reading, reference, or borrowing. In the digital era, a library extends beyond a physical structure, as the Internet offers a vast array of online and electronic resources for accessing documents across diverse subjects. It can also refer to a compilation of texts, images, and other content encoded to be stored, retrieved, and read using a computer.

3. TRADITIONAL LIBRARIES

The traditional library is a tangible institution primarily designed to store printed materials, with a focus on the physical collection rather than the people who use it. This description of the traditional library serves as a reference point that librarians can use to gauge their progress as they navigate the transition into the digital age, ensuring that they are indeed advancing the field into the future.

Librarians often mention "the traditional library," but no universally agreed-upon definition exists for this term. The concept of a "traditional library" is so ingrained that even those who challenge it still find themselves using the term. It serves as a foundational point of reference, without a traditional library, there would be no basis for the modern library. (Cletus, 2022)

3.1. Strengths of Traditional Library

A conventional library is characterized by the following features:

- A focus on the storage and conservation of physical materials, notably books, and magazines, and the use of general cataloging methods, such as author and subject indexes, instead of comprehensive full-text indexing.
- From this viewpoint, the traditional library aligns with the physical library concept, emphasizing physical items and spaces. In such a library, as evident in the design of traditional library buildings, the primary concern is to provide shelter and security for both the existing and upcoming print collections.
- In the past, libraries primarily consisted of gatherings of books, manuscripts, journals, and various forms of documented information. In a traditional library, the catalog was employed to locate conventional library resources.

3.2. Issues and Challenges of Traditional Libraries

The traditional library, while valuable, faces several issues and challenges in today's evolving information landscape:

- **Limited Access**: Traditional libraries often have limited physical access, which can be a barrier for individuals who cannot visit the library in person due to geographical, physical, or time constraints.
- **Space Constraints**: Physical libraries require space for bookshelves and reading areas, which can limit their ability to accommodate a growing collection or expand services.
- **Resource Management:** Maintaining physical collections requires significant resources for acquisition, preservation, and storage. Budget constraints can limit the acquisition of new materials.
- **Accessibility:** Traditional libraries may not fully meet the needs of patrons with disabilities, making it challenging for all members of the community to access information and services.
- **Outdated Cataloging Systems**: Traditional libraries often use cataloging systems designed for physical materials, which may not effectively organize and retrieve digital resources.
- **Limited Opening Hours**: Many traditional libraries have limited operating hours, restricting access for those who need resources or assistance outside of standard business hours.
- **Technology Integration**: Integrating digital resources and technology into traditional libraries can be complex and costly. Keeping up with technological advancements is a continuous challenge.

- **Information Overload**: The proliferation of information in the digital age can overwhelm traditional libraries, making it difficult to curate relevant and valuable resources.
- **Copyright and Licensing**: Libraries face legal and licensing challenges when providing access to digital materials, as copyright laws can be complex and restrict certain uses.
- **Funding Challenges:** Traditional libraries often rely on government funding, which can be inconsistent or insufficient to meet the evolving needs of the community.

3.3. Opportunities of Traditional Library

Traditional libraries continue to offer a wide range of opportunities and benefits in today's digital age. Here are some opportunities that traditional libraries can still provide:

- **Access to Physical Resources:** Traditional libraries house extensive collections of physical books, magazines, newspapers, and other materials.
- **Community Spaces**: Libraries serve as important community spaces where people can come together to read, study, collaborate on projects, attend events, or simply socialize.
- **Expert Librarians**: Librarians are trained information professionals who can help patrons find, evaluate, and use information effectively.
- **Children's Programs**: Libraries offer Storytime sessions, reading challenges, and other programs to support early childhood literacy and foster a love of reading.
- **Cultural Resources**: Libraries often feature art exhibitions, cultural displays, and archives that showcase the history and heritage of the community.
- **Quiet Study Spaces**: Libraries provide quiet and focused study environments that are conducive to academic success.
- **Digital Services**: While known for their physical collections, libraries have also embraced digital technology. They offer e-books, audiobooks, digital magazines, and databases accessible from home through library memberships.
- **Interlibrary Loan Services**: Many libraries participate in interlibrary loan systems, allowing patrons to borrow materials from other libraries, thereby expanding the range of available resources.

4. DIGITAL LIBRARIES

Digital Libraries (DLs) are becoming increasingly vital within the global information infrastructure, integrating the most current information and communication technologies. They serve as interconnected repositories on the internet, encompassing digital content like texts, documents, images, audio, data, software, and more. These libraries form the foundation of the present-day internet and are poised to evolve into universally accessible digital archives containing the sum of human knowledge in the future.

According to the Digital Library Federation, "Digital libraries are organizations that provide the resources, including the specialized staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily and economically available for use by a defined community or set of communities".(Sreekumar & Sreejaya, 2008)

According to R. Smith digital libraries are "Controlled collection of information bearing objects (IBOS) that are in digital form and that may be organized, accessed, evaluated and used by means of a heterogeneous and extensible set of distributed services that are supported by digital technology. (Suradkar et al., n.d.)

4.1. Strengths of Digital Library

Digital libraries (DLs) are designed to store, manage, and provide access to digital resources. Here are some key features of digital libraries:

- **Digital Content**: Digital libraries store a diverse range of digital materials, including texts, documents, images, audio, video, datasets, and software.
- **Search and Retrieval**: Users can search for specific content using keywords, metadata, or advanced search options.
- **Accessibility**: Digital libraries are accessible from anywhere with an internet connection, making them available to a global audience.

- **User Accounts**: Many digital libraries allow users to create accounts, enabling features such as saving searches, creating playlists, and bookmarking favorite resources.
- **Remote Access**: Digital libraries support remote access, making it possible for users to access materials from home, schools, universities, or any location with an internet connection.
- **Open Access:** Some digital libraries follow the open access model, providing free and unrestricted access to their content.

4.2. Services of Digital Library

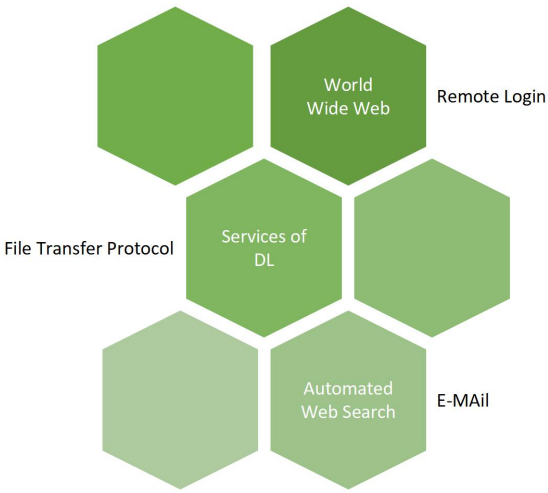

Figure 1: Services of Digital Library

4.3. Software for Digital Library

Here are some of the major software commonly used for implementing digital libraries:

Table 1: Examples and Details of Digital Library Softwares

SN	Name	Logo	Details
1	Eprints	eprints repository software	Eprints is an open-source software platform designed for building institutional repositories of digital documents and scholarly materials. It enables academic institutions, research organizations, and other entities to create online repositories.
2	Fedora	fedora	Fedora is an open-source digital asset management system, also known as a digital repository, which is designed to manage, preserve, and provide access to digital content in various forms, including text, images, audio, and video.
3	Dspace	DSPACE	DSpace is an open-source digital repository software designed to manage, share, and preserve digital content. It is commonly used by academic, non-profit, and commercial organizations to create repositories for various types of digital assets, including scholarly publications, theses, datasets, images, videos, and more.

4	Greenstone		Greenstone is an open-source digital library software used for building and distributing digital library collections. It provides a suite of software tools that allows users to create, organize, and publish digital library collections on the web or on portable media such as CD-ROMs and USB drives.

4.4. Issues and Challenges of Digital Library

- **Cost Limitation:** The initial setup cost for implementing a digital system within a traditional library can be relatively high.
- **Skill Person:** To operate and maintain a digital system effectively, it's essential to have skilled personnel with the necessary expertise.
- **Effect of Technology**: The functionality of a digital library relies entirely on telecommunications and computers. As new technologies become available in the market, the digital system must adapt or incorporate these technologies.
- **Copyright and Licensing**: Managing copyright and licensing issues for digital content can be complex and may restrict the availability of certain materials.
- **Security and Privacy**: Protecting digital content from unauthorized access and ensuring user privacy are significant concerns, particularly with sensitive or proprietary materials.
- **Digital Preservation**: Keeping digital content safe from loss, degradation, and obsolescence is a constant challenge due to rapidly evolving technology and formats.
- **Metadata Quality:** High-quality metadata is crucial for effective search and retrieval, but creating and maintaining metadata can be labor-intensive.
- **User Training**: Users often require training to navigate and utilize digital libraries effectively, which can place an additional burden on library staff.
- **Interoperability:** Ensuring that different digital library systems and platforms can work together seamlessly can be challenging, hindering resource sharing and collaboration.
- **Data Curation:** Curating and organizing large volumes of digital data can be resource-intensive, requiring ongoing management and curation efforts.

4.5 Opportunities of Digital Library

Digital libraries present numerous opportunities that can benefit both users and institutions. Here are some of the key opportunities associated with digital libraries:

- **Global Access:** Digital libraries offer access to resources from anywhere in the world with an internet connection, providing a global reach that transcends geographical boundaries.
- **24/7 Accessibility**: Users can access digital resources at any time, allowing for flexible and convenient learning, research, and entertainment.
- **Vast Content Variety**: Digital libraries can host a wide range of digital content, including e-books, academic papers, multimedia, historical archives, and more, catering to diverse interests and needs.
- **Remote Learning**: Digital libraries support remote education by providing access to educational materials and resources.
- **Customization:** Users can personalize their digital library experience, bookmarking resources, saving searches, and receiving recommendations based on their interests and preferences.
- **Space Efficiency**: Unlike physical libraries, digital libraries do not require physical space for storing and maintaining collections, making them highly space-efficient.
- **Data Analytics:** Libraries can gather data on user behavior and preferences, enabling them to improve services, collections, and user experiences through data-driven insights.
- **Collaboration:** Digital libraries facilitate collaboration among researchers, educators, and institutions by allowing the easy sharing of resources and information.

5. DIFFERENCE BETWEEN TRADITIONAL LIBRARIES AND DIGITAL LIBRARIES

Table 2: Difference Between Traditional and Digital Libraries

SN	Traditional Libraries	Digital Libraries
1	Immutable and develops Slowly	Dynamic and reflect high imagination
2	Typically, lethargic and one-sided communication.	Engagement involves two-way communication and concurrent, substantial interaction.
3	The initial content primarily comprises text and individual printed textual information, with clear categorization of their content groups.	Digital content comprises multimedia elements of various sizes and lacks clear, distinct divisions.
4	It appears that the content leans towards an academic or scholarly nature, given that it has undergone evaluation and revision prior to being published.	The content's reliability doesn't stem solely from its academic nature but is instead derived from its practical usage.
5	Access methods to information are restricted, as they are integrated into centralized content and group management.	Access methods to information are not inherently restricted and are subject to similar management controls for distributed groups.
6	They support the tradition of free and universal access.	Digital libraries can endorse a different approach: being both open and creative simultaneously.

6. CONCLUSION

The journey through the challenges, issues, and opportunities that libraries face in both traditional and digital contexts reveals a complex and evolving landscape for these respected institutions. In the dynamic landscape of information management, libraries stand at the crossroads of tradition and digital innovation. The challenges faced by libraries in both the traditional and digital contexts are formidable and demand strategic, forward-thinking solutions.

Furthermore, libraries can embrace their role as community hubs by utilizing social media and digital platforms to engage with patrons. Online book clubs, virtual tutorials, and interactive campaigns not only foster a sense of belonging but also position libraries as dynamic, interactive spaces for learning and collaboration.

In conclusion, libraries find themselves at a pivotal juncture, where challenges and opportunities converge. They must navigate the complexities of the digital era with innovation, adaptability, and a steadfast commitment to their foundational principles.

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Building Bridges: Transforming Traditional Knowledge to Today's World

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ABSTRACT

This paper highlights the key challenges, issues, and opportunities that libraries face in both the traditional and digital contexts. Digital objects can be classified as text, visual, video, audio, etc. Digital libraries store these items as standardized and adapted electronic media formats rather than print, microform, or other media. Most importantly, it stores content in a central location to provide access across devices. Traditional libraries are brick-and-mortar buildings that house a mix of print and online resources. In addition to offering users in addition to the diversity of print resources, many traditional libraries offer patrons access to e-books, tablets, online library catalogs, and electronic databases. In the traditional setting, challenges include limited space and resources, accessibility concerns, a technological lag, and changing user behavior. Digital Library is an innovative technology for professionals to learn and develop new essential skills to deal with digital libraries. Digital transformation offers libraries a chance to reach a broader audience and provide services beyond physical constraints. Collaboration and partnerships enable the pooling of resources and knowledge, maximizing the impact of libraries.

Keywords: *Traditional knowledge, Traditional library, Digital library, Bridge-building, Contemporary relevance*

1. INTRODUCTION

In the digital age where information is just a click away, traditional libraries remain steadfast as custodians of knowledge and bastions of community engagement. These physical institutions have a unique charm that equally captures the imagination of the seekers of knowledge. With rows upon rows of books, quiet reading corners, and the expertise of dedicated librarians, traditional libraries hold a special place in our hearts. Digital library services have revolutionized the way information is accessed and used in the digital age. These services include a wide range of offerings that meet the diverse needs of users, providing convenient and comprehensive access to digital resources. From e-books and online magazines to multimedia content and archival materials, digital library services offer a vast range of materials that can be accessed anytime, anywhere. Additionally, it goes beyond simple accessibility by providing advanced features such as collaborative platforms and interactive learning tools. With their user-centric approach and innovative technologies, digital library services have become indispensable tools in empowering individuals, enhancing research capabilities, and promoting lifelong learning in an increasingly digital and interconnected world. This assignment will explore the traditional library services, opportunities, and challenges.

A digital library can be defined as one type of library in which all the materials are in electronic format. The materials including books, magazines, newspapers, and other library resources have been converted into digital format. The digital library includes a lot of meanings related to function, purpose, components, concepts, and much more.

While the digital revolution has changed the way we access information, traditional library resources remain an invaluable asset. This article will explore the importance of traditional library resources and their enduring relevance in today's technologically driven world.

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Traditional library resources are distinct from digital resources, which have become increasingly prevalent in libraries with the advent of technology and the Internet. While libraries have adopted digital resources to increase accessibility and convenience, traditional resources retain their importance and are valued for their tangible nature, historical significance, and the unique experience they provide to library patrons.

2. OBJECTIVES OF DIGITAL AND TRADITIONAL LIBRARIES

- To properly record acquired resources, both print and digital
- To Process materials and classify books for access by catalogue, prepare and organize index words.
- To provide indexing, abstracting reference services, information services, etc.
- To provide information from traditional sources

3. TRADITIONAL LIBRARY

A traditional library is a physical institution that serves as a repository of knowledge and information. It is a place where individuals can access a wide range of books, journals, and other resources for educational, entertainment, or research purposes. The tangible collections of printed materials found in traditional libraries are categorized and arranged for simple retrieval. These libraries frequently offer peaceful reading areas, study areas, and librarians who help patrons find and use the resources provided. Traditional libraries have a significant impact on literacy promotion, intellectual curiosity expansion, and community building for visitors interested in delving into the world of reading. A traditional library is a physical institution that serves as a repository of knowledge and information. It is a place where individuals can access a wide range of books, journals, and other resources for educational, entertainment, or research purposes.

Figure 1: Traditional Library

Traditional libraries are places where books, periodicals, and other materials are collected and made available for public use. They contain a wide range of items, including books, periodicals, newspapers, journals, maps, and other reference materials, and are typically arranged by subject. Traditional libraries frequently offer a wide range of services as well, including computer access, interlibrary lending, and reference assistance.

3.1. Traditional Library Services

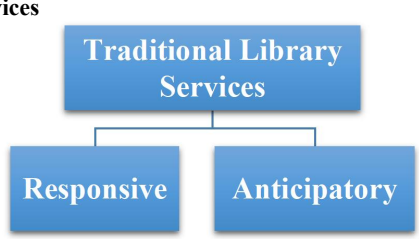

Figure 2: Traditional Library Services

Library services are generally known as reference and information services. These are considered the most essential and important among all the activities of a library. There are traditional libraries are divided into two different categories *(see Figure 2).*

3.1.1. Responsive Services

Responsive services are provided to assist users in responding to requests from users, to use library equipment and facilities, or to obtain answers to reference questions of any kind. Requests can be initiated by individuals through various means, including in-person interactions, telephonic communication, written correspondence, email correspondence, and online submissions via the Internet. Modern technology facilitates the ability for users to submit their requests to the library at any given moment and from any geographical location across the globe.

These services are listed below:

i) Assistance in the use of the library and its equipment
ii) Credit service or operating service
iii) Inter-library loan
iv) Reference service
- *Short-Range Reference Service*
- *Long distance reference service*

v) Literature search
vi) Compilation of subject bibliography
vii) Photocopy service
viii) Referral Service
ix) Translation Service

3.1.2. Anticipatory Services

Anticipatory services also termed active services, encompass provisions tailored to meet users' perspective requirements. These services are meticulously devised by evaluating users' informational requisites, extending beyond science and technology libraries or information centers to encompass a diverse array of libraries. Various types of libraries are now customizing services in anticipation of their users' specific needs.

Some of the anticipated services are;

i) Preparing a list of reading material
ii) Current Awareness Services
- *accession list*
- *Journal-by-Contents Service/Table of Contents Service*
- *Selective Dissemination of Information (SDI) Service*
- *Newspaper clipping services*

iii) Indexing and Abstracting Services
iv) user education

3.2. Characteristics of Traditional Libraries

There are some of the key characteristics of traditional libraries:

i) Traditional libraries usually contain a large physical collection of books, magazines, newspapers, journals, and other materials.
ii) Traditional libraries usually have staff members who can help users find information.
iii) Many traditional libraries provide access to computers to the public.
iv) Traditional libraries are generally quiet spaces where users can study without distraction.
v) Traditional libraries have professional librarians who have in-depth knowledge of the library's collection and can help users find relevant resources.
vi) Traditional libraries provide facilities for borrowing and lending materials.

3.3. Challenges and Issues of Using Traditional Library

Traditional libraries provide myriad benefits, but there are also some challenges associated with their use. Here are some common challenges that individuals may face when using a traditional library;

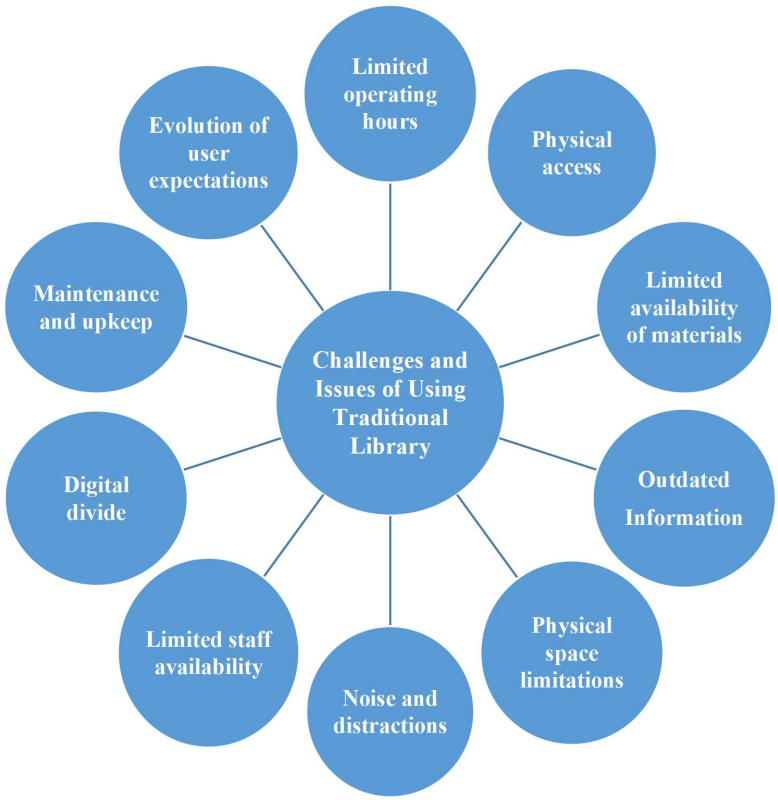

Figure 3: Challenges and Issues of Using Traditional Library

i) **Limited operating hours: -** Traditional libraries typically have specific operating hours, which may not always align with individuals' schedules. This can be a challenge for people with busy lifestyles or limited free time, as it may be difficult for them to visit the library during open hours.

ii) **Physical access: -** Physical access may be a problem for some traditional libraries. Older library buildings may lack ramps, lifts, or other accessibility features for people with disabilities. People who use assistive equipment or need specific accommodations may find it difficult because of the limited access.

iii) **Limited availability of materials: -** While traditional libraries strive to provide a wide range of resources, there may be instances when some materials are not readily available.

iv) **Outdated Information:** - It might be difficult for traditional libraries to keep their collections current. Information may quickly become outdated in fields that advance swiftly, like science or technology. Users might not always have access to the most recent information because it can take some time for new publications to be received and added to the library collection.

v) **Physical space limitations: -** To hold their collections, traditional libraries have a finite amount of space. As a result, libraries might have to give some resources a higher priority or decide what to include in their collections. The number of lounging places, study rooms, and other amenities offered to library patrons may also be constrained by a lack of space.

vi) **Noise and distractions: -** Libraries strive to provide a quiet and focused environment, yet noise and distractions can be a challenge. Some library users may engage in conversation, use electronic devices without headphones, or engage in other disruptive behaviors. These distractions can affect the overall environment and hinder individuals looking for a quiet study or reading environment.

vii) **Limited staff availability: -** Libraries may face challenges in terms of staffing and resources. With limited personnel, it may be difficult for librarians to provide comprehensive one-on-one assistance to every library user. This may result in longer wait times for research assistance.

viii) **Digital divide: -** While many traditional libraries have adopted digital resources and technology, there may still be a digital divide that affects certain communities. Not all individuals have access to a personal computer, Internet connection, or digital literacy skills.

ix) **Maintenance and upkeep: -** Traditional libraries require constant maintenance and updates to ensure that facilities, equipment, and resources are in optimal condition.

x) **Evolution of user expectations: -** As society and technology advance, users' expectations of libraries may also shift. Traditional libraries will need to respond to these new demands by embracing new technologies, delivering more digital materials, or offering flexible service methods.

3.4. Opportunities of Traditional Library

There are few opportunities for traditional libraries;

- Stable collection
- Free and universal access to the collection
- Can be used without electricity
- Documents can easily be photocopied
- No computer expertise is required on the part of the staff.

4. DIGITAL LIBRARY

- The terms electronic library, digital library, and virtual library have been used interchangeably and are now widely accepted as descriptions of the acquisition, storage, preservation, and use of digital technology by libraries.

Figure 4: Digital Library

- Make their content available to remote users. In the foreign sense, a digital library can be defined as an organized and managed collection of high-quality information materials in various types of media (text, still image, moving image, sound, or their combinations).
- But all are accessible in digital forms over various electronic networks. Such digital libraries include a set of search and navigation tools that can be used within the library itself or access other information databases connected to a global network.

4.1. Digital Library: An Overview

The definition of a digital library by Arms is "A digital library constitutes a systematically curated aggregation of informational resources complemented by corresponding services. The information is stored in a digitalized format, enabling access through a network."

The digital library differs from the virtual library, in O'Donnell's opinion, "because it can still maintain a physical presence, as opposed to the virtual library, which is a huge, ideally universal collection of information and may be used anywhere. This information is available right away."

"Digital Library Services" refers to "the collection of digital computing, storage, and communication equipment and equipment necessary to reproduce, emulate, and extend the services

provided by traditional libraries based on paper and other material means. is defined as a collection of software. Finding and disseminating information." (Gladney H.M., et al., 1994)

"Digital libraries serve as gathering places that, in addition to digital collections and information management technologies, support the life cycle of information." (Paul Duguid, 1997)

"All information resources are accessible through computer processing in a digital library, and digital technologies are used to carry out the activities of acquisition, storage, retrieval, access, and display." (Oppenheim & Smithson, 1999)

4.2. Digital Library Services

Digital library services encompass a variety of offerings that use digital technology to increase access to information and resources. These services include online catalogs for easy search and retrieval of books and other materials, electronic versions of books and journals (e-books and e-journals), comprehensive databases covering various subjects, multimedia collections, digital archives, and institutional repositories.

There are four of the major digital library services;

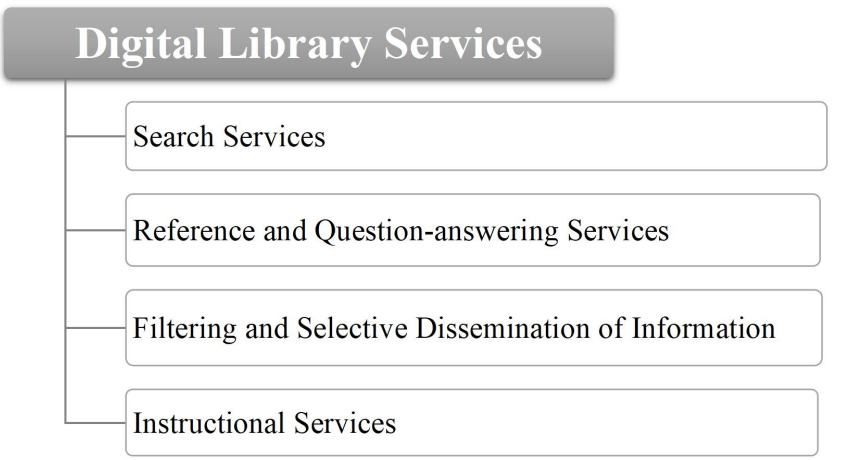

Figure 5: Digital Library Services

i) Search Services

The most basic access service is a search of a library's collection. Online catalogs have been provided author, title, and limited subject access to local holdings (and more recently to union holdings across multiple libraries). The most common search mechanism, to search digital library contents, is a query line or form that allows users to enter terms or terms as a query. Depending on the type of indexing the library uses, a ranked list or exact-matched set of results is returned to the users. There is a rich history of query-based searching from the information retrieval research community and online service industry that digital libraries may build upon.

ii) Reference and Question-answering Services

Although digital libraries may provide communication channels (e.g., chat rooms, Internet "news" groups) in which people may interact to answer each other's questions, many users come to librarians for answers to questions. Librarians may provide answers, references to literature that may contain the answers, or referrals to other people or services. These reference services are an essential part of the mission of most libraries, and an important question is how such services will evolve as a result of technology. The Internet is the solution to the entire problem. Users can ask questions from experts by sending their queries through the Internet and getting answers. The Internet is an important component of digital library services.

iii) Filtering and Selective Dissemination of Information

The selective broadcast of information, also referred to as routing, alerting, or filtering, is a service that is crucial in special libraries. Users create interest profiles, and as new resources are

acquired by the library or made known to the staff, these are compared to the profiles to determine which materials should be made available to the users.

iv) Instructional Services

More importantly, libraries are essential in supporting informal and professional learning beyond the formal school system. Digital libraries are providing closer integration among formal, informal, and professional learning processes. Digital libraries offer new opportunities to break down classroom walls and allow people to learn wherever they are and whenever they want. Many digital library projects seek to bring multimedia resources to teachers and students on demand.

4.3. Issue of Challenges of Digital Library

Digital library services play a vital role in the modern information landscape. Here are some key digital library services;

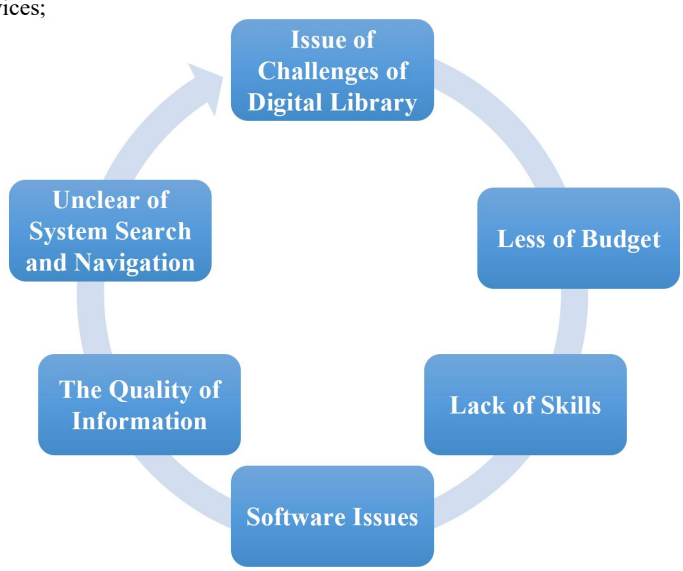

Figure 6: Issue of Challenges of Digital Library

i) Less of a Budget

The development and implementation of the digital library require a large amount of budget to be used in all aspects of digital libraries such as establishing, managing, maintaining, providing equipment, recruiting personnel, and much more. However, most of the digital libraries are faced with major issues of budget. As we know digital libraries are not the type of common libraries that exist today in which they easily make a profit by promoting the libraries with the activity and services provided for the user.

ii) Lack of Skills

To ensure that the digital library will be managed correctly by following the needs and meeting the user's request, the digital librarian must have ICT skills in any aspect of the digital library, from using the database to, there is skill involved in updating. Adding new digital library collections, promoting the digital library, attracting new users to use the services, providing user consultation, and much more.

iii) Software Issues

Software is another crucial topic that requires attention because it comprises a portion of the components of a digital library. When choosing a software vendor for their digital libraries, today's existing digital libraries have to cope with software-related challenges. The majority of digital libraries handle their systems by subscribing to packages from software vendors. The fundamental cause of their excessive reliance on the vendor is that they lack their own software and lack the skills to create software.

iv) The Quality of Information

This is one of the issues that digital libraries face when they provide their collection to their user. The rapid advance in technology today has had a huge impact on the information that is created by the individual or any organization. Most of them are to make their information latest and updated. Information includes any element related to the digital library such as the content, context, connectivity consideration, collaboration, construction, confidence, and continuity. All the elements will be adapted during the development and implementation of the digital library.

v) Unclear of system search and navigation

Other issues that are addressed by most of the digital libraries in the digital library context are unclear system search and navigation. Although the system is already subscribed by the vendor and the way to handle the system has been taught, sometimes digital librarians still seem unclear about the system search and navigation. System navigation is usually related to the visual face interface of the system. Either the librarian or the user should know how to use the system.

4.4. Opportunities of Digital Libraries

There are Key opportunities for digital libraries;

- Libraries are becoming technology hubs
- Expanded access through information sharing
- Libraries have a strong role in communities
- Libraries are being shaped by cuts in the budget
- Printed materials still dominate reading, despite the growth of contents.

5. DIFFERENCES BETWEEN TRADITIONAL AND DIGITAL LIBRARIES

Table 1: Difference between Traditional and Digital Libraries

Sr. No.	Traditional Library	Digital Library
01	Predominantly Print Collection	All Resources in digital form
02	Stable, with slow evolution	Dynamic and ephemeral
03	Individual objects not directly linked with each other	Multi-media and linked objects
04	Flat structure with minimal contextual metadata	Rich data structures and richer contextual metadata
05	Limited access points and centralized management	Unlimited access points, distributed collections, and access control
06	The physical and logical organization correlated	The physical and logical organization may be virtual
07	One-way interactions	Dynamic real-time interface

6. CONCLUSION

Concluding, a digital library is a library where you can find digital repositories, digital collections, and online databases of digital objects that may include text, still images, audio, video, digital documents, or other digital media formats. Objects can include digital materials such as prints or photographs, as well as primarily produced digital materials such as word processor files or social media posts. In addition to storing content, digital libraries provide a way to organize, search, and retrieve a collection's content. While traditional libraries emphasize the collection and preservation of physical objects, especially books and periodicals the librarians were the custodians of the library. Traditional libraries are places where books, periodicals, and other materials are collected and made available for public use. They contain a wide range of items, including books, periodicals, newspapers, journals, maps, and other reference materials, and are typically arranged by subject. This conclusion provides a comprehensive overview of the current landscape, allowing for a better understanding of the dynamic environment libraries operate in and the strategies needed to navigate it effectively.

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Research Data Repositories: Tools, Services and Challenges in Academic Institutes

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ABSTRACT

Research Data Repositories are the warehouse of research data. It is a solution to preserve research data which is basically an outcome of scientific collection and information collected by previous researchers. It can be collected through offline and online methods and various tools and methods are used to collect research data. For the long-term preservation and access of research data in the form of a system is termed as Research Data Repository. There are various tools for Designing and developing a research data repository for preservation of research data, access of research, data discovery and curation of research data. There are many tools which will be described in the paper including the HTML, CSS, PHP, JavaScript and SQL etc. which can be used for designing research data repositories. The present study will also highlight the services of research data repositories includes access, finding, use and share of needed data by the users. Besides, the study will investigate the issues and challenges facing in framing and implementing the RDM policies including the design and development of RDR for public university so that the RDM practices can be executed effectively in academic institutes of the country.

Keywords: *Research Data, Research Data repository, Research Data Management*

1. INTRODUCTION

'Data is the new gold' (Neelie, 2011), and has become an instrument of scientific exploration and advancement. As the growth and development of any society is related with the methods and tools of innovation and research, the data is contributing as the key constituent of such processes representing the originality and implications of research. Our society is becoming more data intensive and collaborative. Currently, the data is said as the new instrument and infrastructure of science with new scientific discoveries and innovations, commonly known as fourth paradigm of scientific research, are all driven by data (Tenopir, et.al, 2011). The importance of managing and curating research data has become more relevant, as the data is fundamental to any research and modern scientific communications needs more quantification to make an impact. Such a process of collecting, managing, caring and organizing suitable research data is known as research data management (RDM). The sharing and re-using of academic research data is an initiative to enhance research efficacy and reduce research cost. As a part of the implementation process of research data management, one has to store the academic research data for further use on suitable platforms so that the academic research data can be well showcased and ensuring its public accessibility. Just as we have institutional repositories which are meant for the preservation and conservation of scholarly publications, similarly the repositories meant for displaying and preserving the academic research data, we need research data repositories (RDR). Such systems ensure public accessibility of research data to a larger extend and makes it possible to display the research content to academic communities worldwide. Digital Repositories are said to be publicly accessible (usually) or accessible for a group of people, document server or managed directory, used for uploading and storing digital forms of data. The landscape of digital research data repositories includes funders (for providing financial assistance in meeting expenses related to designing and development of digital repositories), journals (for collecting research data for the purpose of digital preservation in repositories), scientists (for designing and developing digital repositories) and universities and research labs (for providing suitable infrastructure to the scientist) Zenodo (2018). Such repositories allow the researchers to deposit and re-use the research data and makes it easy for users to access the research data from everywhere. Pal and Singh (2019) classified repositories of academic institutions into three parts

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which are Data Repository, Institutional Repository cum Data repository and Institutional to Data Repository. The Data repositories covers only data sets whereas Institutional Repository cum Data repository covers both institutional output (Ph.D theses, dissertation, research paper, etc.) and datasets. Institutional to Data Repository means those repositories where publications are provided along with their research data. For designing and developing such repositories for any institution, we have to make arrangement of sufficient funds for meeting expenses related to training of staff, expert consultancy, updated infrastructure, licensing and legal compliances and many other related aspects, however the tools and services that can be used and consulted may be discussed as under:

i) **Registry of Repositories (Re3Data.org):** It is the global registry of research data repositories launched in December 2012. This registry facilitates searching and identifying research data repositories developed by different academic institutions all over the world. Data can be searched on the basis of subject, country and content (https://www.re3data.org/).

ii) **UK Data Service:** This service is the digital data repository of Social Science in United Kingdom. It manages and provides long term accessibility to the economic, social and population data in UK. It also provides learning platform to the students, teachers and researchers in the form of training, workshops and conferences (Economic and Social Research Council, 2024).

iii) **Science Data Bank:** It is the digital platform to provide long term accessibility, sharing, publishing and storage of scientific data worldwide. This repository is developed and maintained by the Computer Network information Centre of the Chinese Academy of Sciences. It ensures the trustworthiness among the users and follows the FAIR data principles for continuing healthy data sharing practices (Computer network Information Centre, Chinese Academy of Sciences, 2024).

iv) **Dryad:** It gives the open platform to the users for accessing, re-using, citing and publishing research data effortlessly. Academic Research Institutions, Investors, Researchers and Publishers uses Dryad. It initiates for the healthy research environment and endeavour to overcome research participation barriers (Dryad, 2024).

v) **Figshare:** It is a repository that provides services of discovering, sharing and citing of research output to the research institutions and publishers, having mission of changing the dynamics of academic publishing. It facilitates open access, open research, research empowerment and knowledge dissemination (Figshare, 2024).

2. DESIGNING AND DEVELOPMENT OF RESEARCH DATA REPOSITORY

Designing and development of a research data repository is creating a web-based platform for providing easy accessibility and global availability of research data in digital format. The objective behind the development of digital academic research data repository should be long term preservation of academic research data in order to increase the re-use of research data, reduce the efforts in data collection and save the money required for field survey. Different tools are required in the form of computer languages and database management software. We will discuss some of the important concepts and tools to design and develop an effective web-based system in order to provide research data support to the users in a library:

2.1. Front-end Development

Front-end commonly known as client-side and includes the designing of user interface in such a way that users can easily avail the services of system. Web designers provide an attractive and user-friendly interface to make the interaction of users with the web-based interface, easier and more enjoyable. Front-end developers create a graphical user interface where they use different techniques to make an attractive working environment. They use background images, videos, modified icons and other attractive features for providing an effective user interface. The processes for giving a magnificent outlook to the user interface includes use of different colours, images, icons, font styles, and buttons, etc. There are various tools for developing frontend and designing user interface and some of the important tools are discussed below:

i) **HTML:** Hyper Text Mark-up Language (HTML) is a basic programming language used for web designing. We can use HTML for writing the code to create the website frame. Title, Headings, Paragraphs and other contents can be added into the webpage with the help of HTML. It uses tags for performing various functions such as <title> <head> and <body> etc.

ii) **CSS:** Cascading Style Sheet (CSS) or Style Sheet is used for managing the appearance of website. We can give different colours to the text, change the fonts, upload background images with the help of CSS. It helps in designing the layout of web page and making the website attractive.
iii) **JavaScript:** It is a scripting language used for frontend development. It manages the behavioural aspect of a website. Features like animation, moving pictures, clicking on buttons etc can be added with the help of JavaScript (Brar, kaur and kaur, 2022; Siam, et. al., 2022a; Elakiya, 2023a).

2.2. Backend Development

It deals with server-side interface, which user can't see in the browser. All the changes and updates happen due to backend development. Backend developers give the instructions to the database for providing various services to the users in the back of the screen. A site on which content constantly changes and updates is known as dynamic site. Backend development is required to develop a dynamic site. It creates a link between front-end and database (Siam, et.al., 2022b; Elakiya, 2023b). Some of the important backend tools are discussed below:

i) **PHP:** It is a scripting language which is developed by Rasmus Lerdorf and released first in 1995. It is used for server-side scripting, creating dynamic pages, data processing, command line scripting and creating API's. There are various well-known organizations who are using PHP such as Facebook, Wikipedia, Yahoo, etc. (Apiag, Cadiz and Lincopinis, 2023).
ii) **Java:** In the year 1995, James Gosling developed Java Programming Language. It is popular due to its various features including, object-oriented programming, simple syntax, high security and independent platform etc. This language is mostly used to develop mobile application and games (Martinez, Remegio, and Lincopinis, 2023).
iii) **Python:** It is a modern, easy to learn, open source, object oriented and high-level programming language. Applications of this language includes development of web application, graphical user interface, software, business applications and multimedia applications, etc. (Karmore and Girhe, 2020).

2.3. Selection of Suitable Repository Software

The designing and development of a data repository requires a selection of suitable repository software for hosting and manging research data. Frontend development and use of coding languages like HTML, CSS and JavaScript would be done to make an attractive interface of the client-side server and customization of repositories but for preserving and storing data we need to design a perfect model through a suitable repository software. In institutions, software like DSpace, Greenstone and Eprints are required to design an institutional repository. But here, in this study we have to focus on preserving and managing academic research data not academic publications, so our criteria will be different for selecting repository software. Some of the research data management repository software are given below:

i) **CKAN:** It is an open-source data management system used for Cataloguing, Storing and Accessing Datasets. Government, Research institutions and other organizations uses CKAN for managing data. Users can search, browse and preview published data through CKAN. The process of registration should be done to log in to CKAN by the users (GitHub, 2024).
ii) **DKAN:** It is Drupal based open-source data platform having four modules which are management, aggregation, discoverability and usability and its development is sponsored by civic actions (Civic Actions, 2023).
iii) **Dataverse:** It is an open-source research data repository, mainly used for providing research data services including data preservation, data citation and data management. this repository was developed by the institute for quantitative social science at Harvard university. researchers, journals, institutions, and developers use Dataverse. Total 112 installations of Dataverse have been done in all over the world (Dataverse Project).

3. CHALLENGES IN RDM

Academic institutions are now making efforts for implementing RDM and providing Research Data Management Services in their libraries but they have to face different issues and

challenges. Different academicians and scholars have noticed and opined that the lack of funds, inadequate IT infrastructure, absence of required skills, less awareness about the subject, legal and copyright issues, etc. are some basic issues facing library professionals in academic institutes. It is also noticed that in many libraries there are no formal policies and guidelines for governing RDM. Along with this, because of unawareness, researchers don't want to share their data. They feel uncomfortable and more conscious about their privacy. Motivating them to share their collected research data is also a big challenge for researchers. Making good collaborations with partners, arranging financial assistance, increasing the number of faculty members and researchers, and providing training to the staff is also a challenge in RDM (Rong and Zhan, 2019). It is also difficult to decide the work load of RDM and its services to be imposed on library staff (Nishtha, 2018). Legal obligations such as copyright issues, institutional RDM policy, access control, and data protection, are also impediments during RDM process (Nancy, 2017). There may be some restrictions of private data in academic research data but relatively less in comparison to government data (Patel, 2016). While describing the importance of data citation (Silvello, Gianmaria, 2017) discussed that data citation is required to give scientific recognition to the scientist and researchers, making interconnections between data and publications, discovering hidden datasets and motivating researchers for sharing research data etc.

4. CONCLUSION

The RDM is being pursued as an initiative in many academic and research institutions across the globe with fewer takers in our country. The services, tools and RDM practices are acting as a boon for academic research as it helps to make the valuable research data available for re-use and sharing among the scholarly community. The time and resources used for collecting and analysing the research data is huge and once the reports are submitted and research is being published, the innumerable and essential research data dies its own death and if a proper procedure in terms of RDM is available for curating and managing such a useful data, same can be used for different perspectives of other research and enhance the existing available research in different domains of knowledge. Developing such a system and infrastructure in an academic institution is the need of the hour and the present study delves around the designing of a research data repository and the necessary tools and services needed to learn about RDR and the process of implementing the RDM practices and services to the users. Now many libraries have undertaken such initiatives, however at a very small level and are facing many concerns both at the institutional as well as the governmental level. The lack of polices and its implementation is the nub of all major issues facing the institutions willing to actively take part in the RDM practice and developing systems for better curate and cumulate the valuable research data generated from the academic and research institutions of the country.

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Awareness and Perception of Research Data Management Practices among Researchers in Aligarh Muslim University and University of Delhi

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ABSTRACT

Research data plays a key role in research and developmental activities in higher educational institutes. The analysis, interpretations and findings are directly interrelated and allied to research data. Researchers face a lot of challenges to collected the research data. They go to different universities, government department and research institutes to gather research data. For that, they have to employ their funds, resources and energy. As the academic paradigm has been changing due to technological support, the Institutions are engaged in depositing their published material on web-based systems in order to facilitate users to find and access their needed information and data. Designing and development of various institutional or public repositories are being undertaken to assist researchers in providing research data management services. But the awareness regarding the concept is still less. Most of the students and researchers are unaware about research data management. We have designed a questionnaire related to RDM practices, awareness challenges and policies and 30 questionnaires have been distributed to the research scholars and faculty members of Aligarh Muslim University (AMU) and University of Delhi (DU), out of which 22 questionnaires have been received from AMU whereas 18 questionnaires have been received from DU. It is being found that due to unavailability of institutional policies and engagement of various challenges including financial assistance, technological upgradation, lack of skilled workforce etc, there is very less awareness regarding the concept. Researchers hesitate to submit the research data in the repositories and there is no such policy has been executed which accelerate the sharing of research data in universities, however many researchers are excited with the concept of RDM and opined that such initiatives can enhance the research process in academics and help saving lot of resources.

Keywords: *Research Data, Research Data Management, Research Data Repository, Digital Preservation, Research Data Sharing*

1. INTRODUCTION

Scientific Investigation or Systematic Search, in order to reveal hidden truth, find new facts, provide answers to the question and sort out problem through systematic and scientific procedure can be termed as research (Mimansha & Nitin, 2019). Research and developmental activities are the key factor to the economic and social growth of the nation. Re-searching of facts and re-thinking about the creature can lead towards the modesty, advancement, intellectuality and wisdom. No matter, whether the result have been found or not, but making efforts uninterruptedly, to know the revealed secrets and hidden gems, give label to ourself, a literate society. Impact of research can be seen in the individual progress but societal advancement and national growth are the major paybacks of having research familiarity among individuals. Researchers are the stakeholders of data, information and knowledge and making such assets in an organized, categorised and classified version to provide safe environment zone in order to give required access to the public should be the major responsibility of research community. Academic institutions are becoming the literacy hub not only for the present generations but also for forthcoming generations. Scholarly communication is becoming digitalized, having an objective to preserve for future generations. As we can see a lot of changes in research practices commenced by academic institutions, the role of libraries in managing and digitizing information has also been increased. Lot of data has been produced on daily basis in digital format, which needs to be store and managed properly (Sanjeeva, 2018). The impact of this initiative, can be seen in the raise of sharing and re-using scholarly communicative products including research papers,

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PhD theses, masters or bachelor's dissertation and research data. Sharing of scholarly output for societal benefit is becoming the major movement in today's era. Openness to research publication and free accessibility to the users, opens the doors for the concept of Open Science. But in this paper, we have to specifically discuss about the awareness of researchers regarding preservation, storage and management of research data. Research data or unprocessed data means the data generated or collected by researchers, specifically for their research project. Enforcing submission of such data in open access repositories, is the prior concern of research funders, in order to facilitate accessibility, usability, sharing and validating research data (Tripathi, Shukla and Sonker, 2017). Well managed and freely accessible research data to the public have its long-lasting impact on research quality, transparency and data sharing. Funding agencies are now being examining the keys regarding researchers' motivation in favour of data submission in digital repositories (Li Si, et.al., 2015). Practices for upholding research data, in digital repositories, including creation of research data, creation of data management plans, organisation of data, accelerate sharing and re-use of data, for the purpose to make research practices smooth, transparent, and valuable, is known as Research Data Management (Anuradha & Madhusudhan, 2023a). Having lack of institutional policies regarding, Research Data Submission in open access digital repositories in India in comparison to European countries, we are art the initial stage of RDM development and it will take a time to become a smooth function for our academic institutions (Anilkumar, 2018). Because of less investment have been done on data management practices by India or some other developing countries, have not a good data maintenance record. Naseema and Suvekan (2022a) recommended such countries to follow the strategies for good data maintenance practices, as followed by other developed countries, having good management practices. Anuradha and Madhusudhan (2023b) surveyed the status and awareness of researchers towards RDM in IIT Delhi and found that there is lack of awareness regarding RDM among researchers in IIT Delhi and training is required to accomplish RDM practices effectively. Regarding RDM policies in IIT Delhi, researchers have also been found unaware.

2. LITERATURE REVIEW

Well Equipped libraries and data archiving policies are required to manage research data. Research data, whether statistical, experimental and observational, should be manage properly in research data repositories, to ensure data preservation and re-use. Research data of any type should be openly accessible to the users in order to facilitate them as per their needs. In India, the development of research data practices is at preliminary phase because no institutional policy has been framed for Research Data Management in the country. In this study 25 research institutes and 5 academic institutes of India have been selected for the research survey through questionnaires, out of which 11 research institutes and 5 academic institutes have been responded. It is being found that most of the research institute doesn't involve in data arching whereas some of the institutes are planning to archive data. Regarding academic institutes, it is being found that there is a division known as data & Information division, having responsibility to archive data **(Anilkumar, 2018)**. Academic institutions, in support with technological tools, digital equipment's, policy framework, and knowledge organisation system, can play the major role in research data preservation. As RDM is becoming an emerging area around the globe, libraries are the foremost stakeholder in the RDM landscape. There are still some higher institutions, specifically in European countries, including University of Edinburgh, Tufts University and University of Virginia etc, which provides and implements RDM services and RDM System respectively whereas also designs roadmaps and framework for RDM but the situation is might different in India. In India, KRISHI Research Data Management, developed by Indian Council of Agricultural Research (ICAR) for providing information in agriculture and implementation, taken by IIM Ahmedabad for research data preservation can be seen as RDM initiatives. This study enlightens the current scenario of RDM practices in higher educational institutes of India, specifically Biju Patnaik Central Library, NITR, Rourkela, Odisha. A proposal for research enhancement and RDM implementation at NITR was recommended in the paper. Along with this various issues and challenges regarding RDM practices are also described in the paper **(Gunjal & Gaitanou, 2017)**. As the academic architype is shifting into digital realm, diverse circumstances and complicated practices are becoming the part the Librarians job. Unlike the previous era, a lot data is generating into digital form. Preserving such type of data is a big challenge for today's librarians. The data preservation process, required skilled professional workforce, to provide RDM services including

creation of Data Management Plan, Analysing Research Data and Designing Data Repositories etc. This paper highlights the role of librarians and practical approach towards RDM practices in academic and research libraries **(Sanjeeva, 2018)**. The objective behind the offline and online surveys, led by researchers for their investigation, is to collect research data. Research data is a tool which supports researcher to find the research output. If the research data doesn't preserve properly, then the new researchers will again follow the same route which have been followed by previous researchers. This situation leads towards the unnecessary expenditure on data collection activities, otherwise if data have been preserved in digital repositories, then it can save the time, energy and money of researchers. In this paper, 47 central universities of India and 20 best universities of the world have been selected, having an objective to highlight the current scenario of RDM practices in these institutions. It is being found that in 20 best universities of the world, libraries support researchers in developing data management plans, publish and deposit research data, save data files in proper file format, Data back-up, Data Organizing, Data Citation and data licensing etc whereas in Indian universities the position of RDM practices is at initial stage **(Tripathi, Shukla and Sonker, 2017)**. Research Data Management is evolving globally, specifically in European countries. The importance of RDM is now being understandable to the researchers, in order to safeguard their research data for future use. There are some studies, have been taken place in India, including Anilkumar (2018), Bunkar and Bhatt (2020), Gunjal and Gaitanou (2017) and Tripathi, Shukla, and Sonker (2017), which discusses the RDM paradigm, issues and challenges and policy framework. In this study, scientometric analysis have been done, having various objectives including analysis RDM publications and author network, highlight relevant sources for RDM publication and core areas for RDM research. Web of Science and Scopus database have been used for data retrieval. The findings of the paper comprise of various results regarding scientometric profile of RDM, It is being found that from 1926 to 2020, total 6263 documents related to RDM have been published, 6.23 is the average number of publication per year, 1666 publication sources have been there and 15545 authors have published these documents etc. Biblioshiney tool have been used to extract such results (**Naseema and Sevukan, 2022b).**

3. OBJECTIVES OF THE STUDY

The present study identifies the perception, views, opinions, awareness and understanding of researchers of Aligarh Muslim University and Delhi University. The objectives of the present study include:

i) To identify the researcher's awareness regarding Research Data Management
ii) To understand the role of libraries towards research data management
iii) To know about the perception of researchers regarding data submission policies
iv) To understand the current status of RDM in the selected universities
v) To find researchers familiarity towards data sharing practices
vi) To find the views of researchers towards designing of data repositories

4. METHODOLOGY

We have designed a questionnaire for research scholars and faculty members comprising of 23 questions related to RDM awareness, practices, issues, challenges and policies for surveying 15 central universities, which is a part of ICSSR funded major research project related to RDM practices prevalent in Indian Universities. For the present study, we have distributed 30 questionnaires to the faculty members and research scholars of both the institutions, out of that, we have received 22 completely filled questionnaires from the respondents of Aligarh Muslim University (AMU) and 18 completely filled questionnaires from the respondents of Delhi University (DU) for the present study. We have used MS Excel for the analysis of these questionnaires. Tabular representation along with their interpretation is given in the study.

Table 1: Tabular Representation and Interpretation of Responses

Questionnaire Distribution	AMU	DU
Questionnaires Distributed	30	30
Questionnaires Received (Completely Filled)	22 (73.33%)	18 (60%)
Questionnaires Received (Incomplete)	01 (3.33%)	02 (6.66%)
Questionnaires Received from Faculty Members (Completely Filled)	09 (40.90%)	3 (16.66%)

Questionnaires Received from Research Scholars (Completely Filled)	13 (59.09%)	15 (88.88%)

5. DATA ANALYSIS, INTERPRETATION AND DISCUSSION

The data collected has been categorised into different sections based on the set of questions asked for answering the objectives and variables of the present study. The following are the broader sections of the data collected and the its interpretation:

5.1. Awareness about Research Data Management

Although, there is no suitable and effective RDM policy, still RDM awareness is increasing in the higher educational institutes. The technological support to research practices and increase in the use of Information and communication Tools in higher educational academic institutes make researchers able to understand the significance of modern tools in the academic research. Researchers of the present era are aware and updated towards the modern initiatives and current scenario of academic activities, for making research easy and effective, with the help of technology. Awareness regarding the conceptual framework of RDM is increasing continuously. Some the researchers found fully aware about RDM whereas some have been found not fully aware but having some knowledge regarding the concept. Some of the researchers have already been heard about RDM but they forgotten what they have heard related to the concept. It is being found that the maximum number of researchers in AMU knows about the concept of RDM very well, whereas in DU most the of researchers are also aware but having limited knowledge about RDM. Researchers having confusions regarding the concept whereas researchers with no knowledge of RDM have already been found in the survey. In AMU 27% researchers are not fully aware due to limited knowledge whereas the same percent of researchers have forgotten, what they have heard regarding the concept. Researchers in DU, who have confusions related to RDM are 27%, followed by 22% researchers who are fully aware about RDM. In AMU, few researchers have been found i.e. 4%, who have heard about the concept but forgotten and no researcher have been who is unaware about the concept of RDM. In DU, 22% researchers know about the concept very well whereas few researchers i.e. 11% have been found unaware about RDM. No researcher in DU, have been found forgotten, what they have heard about RDM.

Table 2: Awareness about Research Data Management

Awareness about RDM	AMU	DU
Yes, but I have limited knowledge about the concept	6 (27.27%)	7 (38.88%)
Yes, I know about the concept very well	9 (40.90%)	4 (22.22%)
I know about the concept but still have some confusions	6 (27.27%)	5 (27.77%)
I have heard about the concept but doesn't remember	1 (4.54%)	0
No, I didn't have any idea about the concept	0	2 (11.11%)
Any other, please specify	-	-

5.2. Role of Libraries in Research Data Management

Libraries play a major role in providing research support services to the researchers. In today's era, Libraries require a well-equipped infrastructure, technological support and skilled workforce, in order to introduce new initiatives for supporting research practices. RDM is an evolving area and require librarians' attention toward the concept. First highest number of researchers in AMU whereas third highest number of researchers in DU, believe that libraries should involve in drafting institutional policies for executing RDM in academic institutions and creating or designing data repositories for ensuring preservation of academic research data. First highest number of researchers in DU and second highest number of researchers in AMU opine that libraries are the institutions, having responsibility of providing institutional support to RDM practices. In AMU half of the respondents 11 (50%), believe that libraries should involve in drafting institutional policies for executing RDM in academic institutions and creating or designing data repositories for ensuring preservation of academic research data. About 36% (8) researchers in AMU think that libraries are the institutions, having responsibility of providing institutional support to RDM practices followed by 7 (31.81%) researchers, who feel that libraries should involve in creating research data management plans, although the same percent of researchers opine that, libraries should become the household of

various RDM related resources, helpful in providing conceptual understanding and required information. Less researchers have been found in AMU, 6(27.27%) feel that libraries should give attention towards staff training related to RDM practices. In DU, 12 (66.66%) researchers feel that, libraries should provide institutional support to RDM whereas 6 (33.33%) think that libraries should become the household of various RDM related resources, helpful in providing conceptual understanding and required information, followed by 4 (22.22%) researchers, opine that libraries should frame institutional policies and guidelines for RDM practices in academic institutes and create data management plans. Few researchers 3 (16.66%), have been found, who believe that libraries should provide training to staff related to RDM.

Table 3: Role of Libraries in Research Data Management

Role of Libraries in RDM	AMU	DU
Designing institutional policies and guidelines related to Research Data Management activities	11 (50%)	5 (27.77%)
Creating Research Data Management Plans	7 (31.81%)	3 (16.66%)
Providing Institutional Support for RDM	8 (36.36%)	11 (61.11%)
Providing Training to staff related to RDM	6 (27.27%)	3 (16.66%)
Designing Research Data Repositories for the institution	11 (50%)	6 (33.33%)
Providing resources to understand the conceptual framework of Research Data Management in Universities	7 (31.81%)	6 (33.33%)
Any other, please specify	-	-

5.3. Steps Required for RDM Awareness

In Indian research institutes, fewer RDM practices and absence of any suitable policy discourages researchers about RDM and it contributes sometimes for their knowledge also about RDM practices. They know about the concept but unaware about each and every aspect of RDM. They are still unaware regarding the significance and advantages of data sharing and data preservation. Because of unfamiliarity regarding RDM practices they feel uncomfortable to be involved in such type of practices. Highest number of researchers 14 (63.63%) and 12 (66.66%) in both AMU and DU respectively, have been found in favour that, libraries should Conduct workshops, seminars, conferences and webinars related to RDM. Second highest number of researchers in both AMU and DU, i.e. 13 (59.09%) and 10 (55.55%) respectively, opine that libraries should become the household of free and online learning material, which should be helpful to understand RDM. Third highest percent of researchers in AMU, i.e. 8 (36.36%), being found in favour that libraries should encourage and motivate professional to contribute in RDM practices whereas on the same point, only 3 (16.66%) researchers of DU are agreed. Fourth highest percent of researcher in DU 6 (33.33%), think that libraries should Identify the Stakeholders and users of RDM, and recruit experts to raise RDM awareness whereas in AMU, 4 (18.18%) and 6 (27.27%) respectively, are agreed on these points.

Table 3: Steps Required for RDM Awareness

Needed steps to raise awareness regarding RDM	AMU	DU
Identification of RDM Stakeholders and users	4 (18.18%)	6 (33.33%)
Recruitment of RDM experts, to raise awareness about the concept	6 (27.27%)	6 (33.33%)
Development of free online resources for learning about RDM	13 (59.09%)	10 (55.55%)
Conducting workshops, seminars, conferences and webinars related to RDM	14 (63.63%)	12 (66.66%)
Encouraging professionals to participate in different events related to RDM	8 (36.36%)	3 (16.66%)
Any other, please specify	-	-

5.4. Support of Academic Libraries to RDM Initiatives

Libraries of today's era, unlike traditional libraries involve in initiating and introducing new services in order to facilitate and support researchers in order to improve research and developmental practices, including Establishment of Well-Equipped Infrastructure and providing Research

Supporting Tools including plagiarism checker, online databases, digital repositories, analysis tools and software's, etc. Highest number of researchers in both the universities think that libraries should provide relevant tools for Data Management, Data Management Plan and other research related services, i.e. 14 (63.63%) and 12 (66.66%) in AMU and DU respectively. Second Highest number of researchers in both the universities, opine that academic libraries should focus on preservation of research data, i.e. 9 (40.90%) and 6 (33.33%) in AMU and DU respectively. Third highest number of researchers in both the universities, think that academic libraries should ensure research data storage, i.e. 8 (36.36%) and 8 (44.44%) in AMU and DU respectively. It is being found that, in AMU 7 (31.81%) and in DU 5 (27.77%) researchers opine that academic libraries should focus on Research Data Information Literacy. In DU 5 (27.77%) researchers and in AMU 4 (18.18%) think that academic libraries should give attention towards Research Data Documentation and Description. Only few researchers in both AMU and DU, i.e. 1 (9.09%) and 3 (16.66%), feel that libraries should indulge in research data curation practices.

Table 4: Support of Academic Libraries to RDM Initiatives

RDM initiatives should be supported by Academic Libraries against	AMU	DU
Providing relevant tools for Data Management, Data Management Plan and other research related services	14 (63.63%)	12 (66.66%)
Research Data Storage	8 (36.36%)	8 (44.44%)
Research Data Curation	1 (9.09%)	3 (16.66%)
Research Data Preservation	9 (40.90%)	6 (33.33%)
Research Data Information Literacy	7 (31.81%)	5 (27.77%)
Research Data Documentation and Description	4 (18.18%)	5 (27.77%)
Any other, please specify	-	-

5.5. Motivation Regarding Submission of Research Data

Awareness regarding relevancy and significance of research data preservation is rising continuously among researchers. They feel motivated, if someone tries to explain them new techniques and tips for removing problematic aspects in research. They seek relevant suggestions and find new solutions for making their research planned, strategic and effective. Importance of RDM is now understandable to researchers as it ensures safety and security to research data. Researchers know that after completing their research work, they ignore to gather their research data at one place. Due to displacement, theft and technological error, research data may be lost by researchers. So, they feel motivated and encouraged if they get proper guidance regarding preservation of research data in digital repositories. There may be various measures to motivate and encourage researchers to deposit their research data in data repositories. Sharing of research data lead towards successful implementation of open access education initiatives. It allows users to access needed research datasets in order to use in their research projects. It is being found that the maximum researchers in both the universities understand that highlighting the significance of data sharing and its importance in Research is the major source to motivate researchers. Developing attentive working behaviour and finding relevant result, requires proper appreciation to workforce. More than 30% researchers in AMU and more than 40% researchers in DU are agreed on the point that giving appreciation in the form of academic reward and recognition, which can be given through data citation, academic ranking and institutional support etc. results in motivation of researchers towards data sharing. Research data is the tool to analyse relationship between research variables. It helps researcher to reach to the final stage of assessment. Research data must be cited, in order to give appreciation and academic recognition to the author. In AMU 40% researchers whereas in DU 27% researchers are satisfactory to the point that describing the importance of Research Data and Data Citation creates motivation among researchers in order to submit research data in repositories. Academic institutions are the back power to the researchers. Researchers need their support in order to gain strength and intellectual capacity in research environment. Weather becoming financially sound, technically updated and intellectually aware, institutional support is must. Faculties, libraries, labs, and other resources associated with the institution help research to go forward in the research practices. A good percent of researchers i.e. 45% and 38% in AMU and DU respectively, opine that, to encourage researchers for sharing researcher data, institutional support should be provided. One of the most important

advantages of sharing research data is that, it increases the usage of already collected data in further research data which leads towards deduction in research expenses and increase transparency and quality of research. If RDM professionals can successfully admire researchers regarding this point then they can easily convince them to submit research data in repositories. In AMU 22% researchers whereas in DU 11% researchers have this view regarding researchers' motivation towards data sharing. Arranging financial resources or getting monetary support is always a major issue in research activities. Getting sufficient funds for research practices is must in order to find relevant results but in most of the cases, researchers face the lack of funds while during their research. Managing limited funds and imposing budgetary control techniques is a challenging task for researchers. If research data becomes re-usable and facilitates new researchers in order to re-use research data in different research project then the amount required for field survey or physical data collection can be save. That's why researchers must be aware of this importance of sharing research data. In AMU 18% whereas in DU 22% researchers thinks that this point is very important to encourage researchers towards data sharing. High quality and transparent research are the output of properly managed research data. Data submission in digital repositories ensures proper management and classification of research data. For inspiring researchers to submit their research data in repositories, it should be clearly described to them that it will increase the research quality and integrity. In AMU 5% whereas in DU 1% researchers are agreed on this point.

Table 5: Motivation Regarding Submission of Research Data

Measures to encourage and motivate researchers to deposit their research data in data repositories	AMU	DU
By providing them academic rewards and recognition	7 (31.81%)	8 (44.44%)
Highlighting the significance of data sharing and its importance in Research	15 (68.18%)	9 (50%)
Describing the importance of Research Data and Data Citation	9 (40.90%)	5 (27.77%)
Providing them institutional support for using and sharing Research Data for their research work	10 (45.45%)	7 (38.88%)
The availability of Research Data can be re-used for further research	5 (22.72%)	2 (11.11%)
The use and re-use of research data can save financial burden on institutions and funding agencies	4 (18.18%)	4 (22.22%)
Enhance research integrity and transparency of Research Data	5 (22.72%)	1 (5.55%)
Any other, please specify	-	-

5.6. Use of Research Data Repositories

Research data repositories, are the households of digital content. Shifting of written material into digital format is being done in various information centres and academic institutions. Online traffic on information sites is increasing day by day and researchers, having busiest schedule, likes to be present at various information sites in order to be aware and updated. For collecting research data and finding relevant data as per their needs, there is a role of digital repositories or databases. Research data repositories means digital warehouses, which provides access to research data and facilitates users in order to read, re-use, share and download research data. Highest number of researchers in AMU and second highest number of researchers in DU i.e. 16 (72.72%) and 9 (50%), thinks that RDR' s provides easy and global accessibility of the Research Data. Highest number of researchers in DU and second highest number of researchers in AMU, i.e. 10 (55.55%) and 9 (50%) respectively, opine that RDR is useful to Deposit and download of research data. In AMU 7 (31.81%) and in DU, 7 (38.88%) researchers think that RDR facilitates Display of research data on global platforms. In AMU, 3 (13.63%) whereas in DU 3 (16.66%) researchers feel that RDR Provides transparency to research data. In AMU, 5 (22.72%) and in DU 3 (16.66%) researchers, think that RDR facilitates Research Data preservation. In AMU, 7 (31.81%) and in DU, 3 (16.66%) believe that RDR promotes Research Data Citation. In DU 4 (18.18%) researchers think that RDR is required to assign DOI to Research Data whereas no researcher in amu is agreed on this point. In AMU, 1 (4.54%) and in DU 3 (16.66%) researchers think that RDR is required to archive research data. Followed by 13 (59.09%) researchers who thinks that RDR facilitates deposit and download of research data. Most of the researchers, having same rate of percent i.e. 6 (27.27%) have their views related to RDR are that RDR; s Display of research data on global platforms, facilitates in Research

Data Preservation and enables research data citation. Some of the researchers in AMU, 4 (18.18%) believes that RDR Provides transparency to research data whereas 3 (13.63%) researchers thinks that RDR's are the solution for Research Data Archiving. Only 2 (9.09%) researchers opine that RDR helps in Assigning DOI to Research Data. In DU, 10 (55.55%) researchers thinks that RDR facilitates deposit and download of research data, followed by 9 (50%) researchers, who opines that RDR provides easy and global accessibility of the Research Data. A good percent of researchers in DU 8 (44.44%), believes that RDR's are usable and helpful to provide world-wide platform to research data, whereas 4 (18.18%) researchers opine that research data repositories facilitates for research data transparency, research data citation, assigning DOI to research data and research data archiving.

Table 6: Use of Research Data Repositories

Use of Research Data Repositories	AMU	DU
Deposit and download of research data	9 (50%)	10 (55.55%)
Display of research data on global platforms	7 (31.81%)	7 (38.88%)
Easy and global accessibility of the Research Data	16 (72.72%)	9 (50%)
Providing transparency to research data	3 (13.63%)	3 (16.66%)
Research Data Preservation	5 (22.72%)	3 (16.66%)
Research Data Citation	7 (31.81%)	3 (16.66%)
Assigning DOI to Research Data	0	4 (18.18%)
Research Data Archiving	1 (4.54%)	3 (16.66%)
Any other, please specify	-	-

5.7. Avoiding Sharing of Research Data

Although RDM awareness is continuously increasing among researchers, but researchers hesitate and feels uncomfortable to submit their research data in data repositories. They feel it challenging and difficult to public their research data without assuring the safety and security related aspects. Weather the field survey has been done properly or not, the probability of having some mistakes and errors remains there. Researchers thinks that submission of research data means revealing all the mistakes to the public, they have done. Although the concerned data may contain some personal or restricted element which should be remain in privacy and safety. However, the proper classification of restricted and unrestricted research data is required in RDMS but most of the researchers are unaware about such practices. Highest number of researchers in both the universities, i.e. 14 (63.63%) and 11 (61.11%) in AMU and DU respectively think that researchers don't want to public their research data due to privacy, safety and security issues. Second Highest number of researchers in AMU and third highest number of researchers in DU, i.e. 11 (50%) and 7 (38.88%) in AMU and DU respectively, feel that researchers don't public their research data because there is lack of awareness about RDM and they don't know about the advantages of sharing research data. Third Highest number of researchers in AMU and Second highest number of researchers in DU i.e. 10 (45.45%) and 8 (44.44%) don't share their research data due to avoid raising of uncertain questions regarding the relevancy and authenticity of their research. In AMU, 5 (22.72%) don't share their research data due to avoid scooping and embarrassment whereas in DU no researchers have been found who don't share his/her research data due to this reason. Few researchers have been found in AMU and DU, i.e. 3 (13.63%) and 1 (5.55%) feels that don't want to reveal the mistakes held during the data collection, that's why they avoid to public their research data. In DU 3 (16.66%) researchers have been found think that researchers don't like to public their research findings whereas in AMU no researcher have been who is agreed on this point.

Table 7: Avoiding Sharing of Research Data

Researchers avoid to share research data	AMU	DU
They feel uncomfortable to share data because they want to avoid the raising of uncertain questions regarding the relevancy and authenticity of their research	10 (45.45%)	8 (44.44%)
They are cautious about their privacy of those, who are being discussed in the research findings	14 (63.63%)	11 (61.11%)
They have lack of awareness about RDM and don't know about the advantages of sharing research data	11 (50%)	7 (38.88%)

They want to avoid scooping and embarrassment	5 (22.72%)	0
They don't want to reveal the mistakes held during the data collection	3 (13.63%)	1 (5.55%)
They don't like to public their research findings	0	3 (16.66%)
Any other, please specify	-	-

5.8. Research Data Sharing

Research data sharing is an important practice for open scholarly environment. Academic institutions are promoting, encouraging and appreciating sharing of scholarly output and research findings for the benefit of public and future usage. Researchers who want to contribute for nation development and scholarly progress likes such type of practices. Research data sharing opens the door for data preservation and global accessibility of research data. It contributes to give reward and recognition to researchers and field surveyors and plays an important role in generating new data and findings. Highest number of researchers in both the universities i.e. 13 (59.09%) and 10 (55.55%) in AMU and DU respectively. Second highest number of researchers in both the universities i.e. 12 (54.54%) and 7 (38.88%) in AMU and DU, respectively think that research data sharing provides access to the available research data, also the same percent of researchers in DU, whereas 7 (31.81%) in AMU believe that research data sharing creates the requirement of depositing research data in data repositories. In AMU 6 (27.27%) and in DU 3 (16.66%) opine that research data sharing ensures research data citation. In AMU 7 (31.81%) and in DU 3 (16.66%) think that shared data may be used to create new data and findings.

Table 8: Research Data Sharing

Reasons for supporting Research Data Sharing	AMU	DU
It creates the requirement of depositing research data in data repositories	7 (31.81%)	7 (38.88%)
It provides access to the available research data	12 (54.54%)	7 (38.88%)
It ensures the usage of data in different research projects	13 (59.09%)	10 (55.55%)
It ensures research data citation	6 (27.27%)	3 (16.66%)
Shared data may be used to create new data and findings	7 (31.81%)	3 (16.66%)
Any other, please specify	-	-

5.9. Compulsory Submission of Research Data

Research held in academic institutions generates academic research data, and creates the responsibility of researcher to deposit the data in publicly open data repositories. Researchers doing investigation under institutional support and getting scholarship against their hard work and intellectual struggle should come towards to share the data came with the help of public institutions. Obviously, mandating research data submission will increase the rate of overall data submission among academic community whereas the we should find a way where there is less strictness and harsh laws. We should motivate researchers regarding the importance of data sharing and make them aware in accordance to Research Data Management System. Highest number of researchers in AMU whereas second highest number of researchers in DU i.e. 15 (68.18%) and 12 (66.66%) opines that compulsory submission of research data facilitates new research project. In DU, highest number of researchers whereas in AMU second highest number of researchers i.e. 14 (77.77%) and 7 (31.81%) respectively think that compulsory submission of research data is beneficial for all over the public. Third highest number of researchers in both the universities i.e. 5 (22.72%) and 4 (18.18%) in AMU and DU respectively, think that there should not be compulsory submission of research data. No researcher has been found in both the universities who feel that there is no need to submit research data.

Table 9: Compulsory Submission of Research Data

Compulsory submission of Research data	AMU	DU
It is beneficial for all	7 (31.81%)	14 (77.77%)
It facilitates new research projects	15 (68.18%)	12 (66.66%)
Submission should be made compulsory	5 (22.72%)	4 (18.18%)
There is no need to submit research data	0	0
Any other, please specify	-	-

6. FINDINGS AND CONCLUSION

It is being found that the researchers of AMU and DU have been inspired and showed their interest in discussing on RDM practices and implementation. They are cautious about research data preservation for future usage. Due to lack of practical experience regarding RDM, they want to participate in different workshops, seminars, conferences and training programmes related to the RDM. Well-equipped labs comprise of different software's and other tools for successfully performing RDM practices should be there in higher educational institutes. On governmental level there should be necessary initiates on institutional or university level should be done in order the increase the awareness of RDM and provide relevant tools and software's. Certain set of policies should be framed and execute for ensuring research data submission in repositories by academic institutions including academic libraries and training of RDM tools and software's should be given to the library professional. Special focus should be given on data privacy, licensing and copyright issues whereas restricted data should no be publicly accessible except to those who are authorized. Academic recognition should be given to the authors and proper citation of data should be provided, if someone is using the data from repositories, which will encourage researchers towards data sharing. RDM is and emerging area which promotes the open accessibility of scholarly output. It is very beneficial for academic stakeholders and higher educational institutes. It increases research quality, integrity and transparency along with gathering of research data at one place, although it reduces the expenses on data collection and field survey. In India, the scenario of RDM is not so good as comparison to European countries. No library we have found where RDM services and training has been provided in a proper format. An initiative was done by ICSSR for preserving government organizational data but regarding academic data, no such initiative has been done. We have surveyed AMU and DU to know the awareness of RDM among researchers. They have been found willing to contribute in data sharing and RDM practices but because of lack of policies and regulations regarding the concept, no activity can be performed for implementing RDM in our institutes.

7. REFERENCES

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AI-Powered Revolution: Automating Information Management in Libraries

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ABSTRACT

Artificial Intelligence (AI) is revolutionizing library operations by streamlining cataloguing, enhancing search functionalities, and optimizing resource allocation. This paper explores the impact of AI on library operations, focusing on information management. AI streamlines cataloguing, enhances search functionalities, and optimizes resource allocation. It also plays a role in user experiences, enabling data-driven decision-making and addressing information overload challenges. The proposed system automates librarian and user tasks, simplifies book searches, locates paths within the library, and streamlines interactions. The paper highlights the importance of understanding AI technologies for progress in intelligent systems and the potential for AI to revolutionize libraries by creating a more efficient, accessible, and responsive information ecosystem.

Keywords: *Artificial Intelligence, Automation, Libraries, Information Management*

1. INTRODUCTION

Artificial intelligence (AI) encompasses a broad spectrum of research domains including but

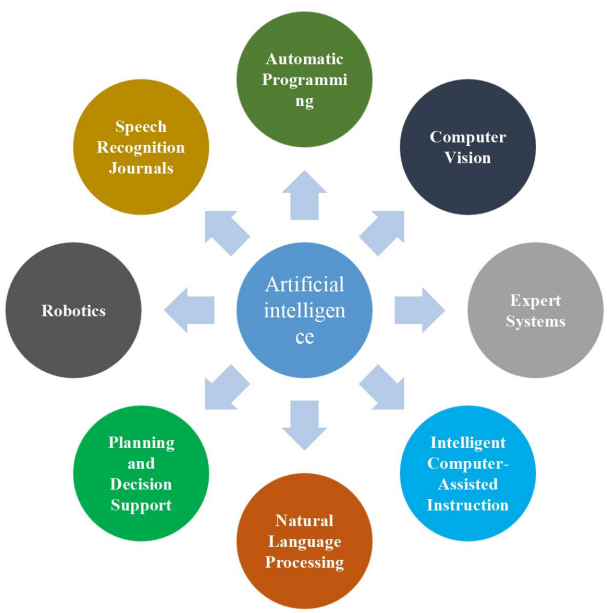

Figure 1: Research Domain of AI

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not limited to: (a) Automatic Programming, (b) Computer Vision, (c) Expert Systems, (d) Intelligent Computer-Assisted Instruction, (e) Natural Language Processing, (f) Planning and Decision Support, (g) Robotics and (h) Speech Recognition. (see fig. 1). Intelligent library systems leverage AI technologies to deliver knowledge-based services to both library patrons and staff.

Libraries have issues in maintaining huge volumes of material while providing customers with seamless access in the internet age. To satisfy these demands, libraries are being automated using cutting-edge technology. Artificial intelligence (AI) is one of many revolutionary forces that have the potential to improve library operations and user experiences. The use of AI in library automation encompasses a variety of services. It improves cataloguing and provides AI-driven recommendation systems, hence increasing user engagement, similar to collection management. AI adoption poses hurdles, ranging from technological complications to ethical implications. The Use of Artificial Intelligence in Library Automation. examines AI uses, user viewpoints, and ethical concerns. It seeks to provide insights into how AI might improve library services while also addressing possible problems. Libraries may employ AI to make more informed choices, increasing their ability to successfully serve people in the digital era. AI integration in library automation promises to elevate libraries as knowledge centers, providing users with frictionless access to information.

As science and technology continue to rapidly advance, artificial intelligence (AI) is increasingly integrated into various aspects of our daily lives, catalysing societal development. Broadly speaking, AI encompasses intricate computational processes, logical reasoning, knowledge acquisition, intelligent retrieval, information recognition, and voice recognition. These advancements are fuelled by rapid progress in Internet, computer, and Internet of Things technologies (Yan, 2019; Xu, 2020).

A competent librarian, by engaging with a user, may give a significantly more specialized service, perhaps eating up time saved by AI. - IFLA Library Policy and Advocacy Blog.

2. OBJECTIVES

i) To undertake a thorough examination of library automation, including identifying flaws in conventional library systems and successfully managing data and services in the digital world.
ii) To explore and assess the use of artificial intelligence in library automation, collection management, cataloguing, user services, and data analytics, make appropriate suggestions, and comprehend their potential, effect, and efficiency.
iii) To understand the benefits and drawbacks of incorporating AI into library operations, with an emphasis on operational efficiency, user-centric experiences, cost-benefit analysis, and long-term viability.
iv) To learn about the experiences of librarians, library personnel, and users in using AI in libraries via a mix of surveys and interviews.
v) To find and assess successful case studies and best practices from libraries that have deployed and effectively used AI-driven automation technology.
vi) To investigate the ethical and privacy aspects of AI in libraries, as well as to produce comprehensive guidelines and recommendations for AI deployment that address possible concerns such as data privacy, algorithmic prejudice, and the role of human librarians.

Contribute significantly to the current body of knowledge on harnessing cutting-edge technology, especially AI, to improve library services and reinforce information institutions, so enabling their efficient functioning in the modern technological environment.

3. CHALLENGES

Libraries have traditionally acted as repository of comprehensive knowledge, catering to persons seeking information, research materials, and amusement. However, as the world becomes more computerized and networked, conventional library systems need assistance in organizing and giving seamless access to the large amount of accessible information. To address these challenges, libraries have started to use automation and information technology, with Artificial Intelligence (AI) emerging as a disruptive solution. The main problem is understanding the function of artificial intelligence in library automation and its influence on improving library services. Despite AI's potential advantages, incorporating AI technologies into library operations presents various complications and uncertainties:

3.1. AI in Library Automation: Challenges and Implications

i) **Integration Challenges:** AI systems in library automation require seamless integration with existing infrastructure and operations. Questions arise about compatibility with older systems and resources needed for effective application.
ii) **User Experience:** AI-driven automation can improve user experiences but privacy preservation and understanding user preferences raise ethical concerns.
iii) **Expertise and Training:** Successful AI integration requires staff competency in AI technology, requiring adequate training and upskilling opportunities.
iv) **Cost and Sustainability:** Smaller and underfunded libraries may face cost limits when implementing AI technology. Evaluating AI deployments' cost-effectiveness and long-term viability is crucial.
v) **Ethical Considerations:** Use of AI in libraries raises ethical concerns about data privacy, algorithmic prejudice, and the influence on human librarians' duties and job security.
vi) **Ethical Considerations and Data Privacy**: Libraries must develop explicit rules and procedures for data collection, storage, and processing to ensure compliance with privacy requirements and ethical standards.
vii) **Algorithmic Prejudice and Fairness:** Libraries must address algorithmic bias and fairness problems, including bias detection and mitigation measures, evaluating AI systems for justice and equality, and encouraging diversity and inclusion in dataset curation and algorithm design.
viii) **User Trust and Acceptance**: Libraries must interact with stakeholders to gather input, resolve issues, and reach an agreement on AI deployment tactics.

4. AI IMPLEMENTATION IN LIBRARIES

Implementing AI in libraries involves overcoming technical challenges, ensuring legal compliance, addressing scalability and interoperability, providing user training, fostering collaboration, and conducting evaluation studies. See figure 2, for an overview.

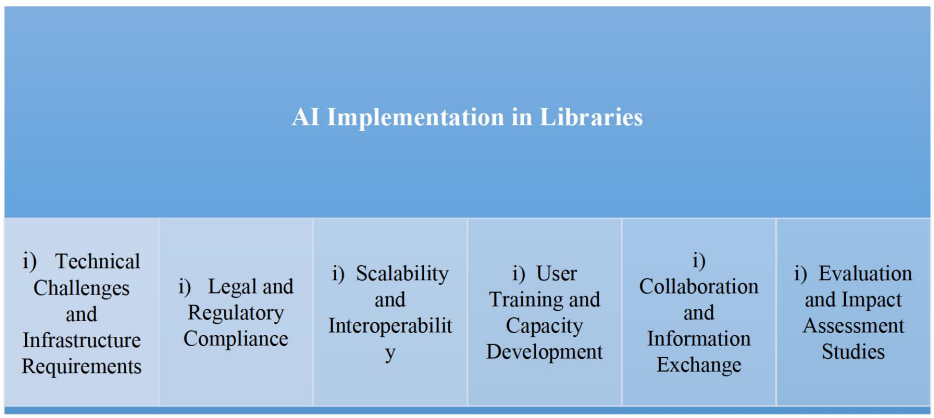

Figure 2: Overview of Key Considerations in AI Implementation in Libraries

i) Technical Challenges and Infrastructure Requirements

- High-performance computer resources, scalable storage systems, and reliable network access are essential for AI technology implementation.
- Libraries must upgrade their IT infrastructure, identify gaps, and modernize systems to support AI deployment.
- Cloud-based solutions and Software-as-a-Service (SaaS) platforms offer scalable and cost-effective access to AI tools and services.
- Collaboration with external partners can provide specialized experience and resources to overcome technical barriers.

ii) Legal and Regulatory Compliance

- Libraries must comply with intellectual property rules, copyright restrictions, and data protection legislation.
- Legal counsel and privacy specialists can help navigate these legal and regulatory hurdles while adhering to responsible data management and governance.

iii) Scalability and Interoperability

- Libraries must address scalability and interoperability needs to ensure smooth integration and compatibility with current systems.
- Open standards and interoperability frameworks can improve data sharing and interoperability across systems and platforms.
- Scalable and modular architectural designs provide flexible deployment choices.

iv) User Training and Capacity Development

- Libraries should engage in user training and capacity development efforts to provide knowledge and skills for proper AI interaction.
- User-centered design concepts and usability testing procedures ensure AI-powered systems are intuitive, accessible, and user-friendly.

v) Collaboration and Information Exchange

- Libraries should collaborate with academic institutions, research organizations, and industry partners to create AI solutions.
- Participation in professional societies, conferences, and seminars allows libraries to network and stay updated on AI research and applications.

vi) Evaluation and Impact Assessment Studies

- Comprehensive evaluation and impact assessment studies are necessary to determine the efficacy, efficiency, and influence of AI-powered systems on library operations.

Addressing these problems and uncertainties is critical for realizing AI's full promise in library automation. Thus, the purpose of this study is to investigate, analyse, and give insights into the role of artificial intelligence in library automation, as well as its consequences for library services. This research will provide vital information to help libraries make educated choices on AI integration, boosting their capacity to serve people successfully in the digital age.

5. APPLICATION OF AI IN LIBRARIES

i) **Cataloguing and Metadata Enhancement:** Artificial intelligence can help in cataloguing and organizing library materials by automatically tagging, categorizing, and improving metadata. Users may now search for and retrieve information more efficiently.

ii) **Recommendation Systems:** AI-powered recommendation engines may propose appropriate books, articles, or resources based on user preferences, borrowing history, and behaviour, so improving user experience and engagement.

iii) **Natural Language Processing (NLP) for inquiries:** NLP methods help libraries comprehend and react to natural language inquiries. Users may utilize AI-powered chatbots or virtual assistants to navigate the library, access materials, and get tailored suggestions.

iv) **Predictive Analytics for Collection Development:** AI algorithms may use consumption patterns, trends, and demand to forecast future resource requirements. This allows libraries to optimize their collections by collecting resources that are expected to be in high demand.

v) **Improved Accessibility Services:** AI technology may improve accessibility by transforming texts into different forms (audio, braille, etc.) and supporting people with impairments in efficiently accessing and browsing library resources.

vi) **Preservation & Conservation:** AI can help digitize and preserve delicate or uncommon items using technologies such as picture recognition and restoration, providing long-term access to precious resources.

vii) **Workflow Optimization:** Artificial intelligence-powered solutions can automate mundane processes like inventory management, scheduling, and resource allocation, freeing up human resources for more complicated and specialized services.

viii) **Content Curation and screening:** AI may help with content curation by screening out irrelevant or low-quality materials, ensuring that the library collection maintains high levels of information quality.

ix) **Cybersecurity and Data Protection:** AI technologies may help libraries improve their cybersecurity procedures by recognizing and mitigating possible attacks while also protecting sensitive user data and library resources.
x) **Learning and Training Support:** AI-powered educational solutions may help patrons and staff by providing individualized learning routes, tutorials, and training materials based on their specific requirements and learning styles.

These examples highlight the many ways AI may transform information management in libraries, eventually improving user experiences and maximizing library services.

Artificial intelligence (AI) has found extensive utility in library information services, encompassing various applications such as:

i) Employing optical character recognition (OCR) for automatic cataloguing and categorization, as noted by Picard & Pentland (1996).
ii) Utilizing natural language processing (NLP) for automatic translation of foreign language resources, as demonstrated by Ragab et al. (2022).
iii) Implementing Expert Systems for automatic indexing, as highlighted by Arif et al. (2019).
iv) Facilitating the retrieval of audiovisual content through optical character recognition and speech recognition, enabling swift access to music and photographs in library collections alongside printed materials, thereby enhancing information storage and management, as discussed by Wactlar et al. (1999).
v) Offering interactive bibliographic education through diverse mediums, as observed by Samuel & Williams (2020).
vi) Serving as intelligent gateways to internet sources, as articulated by Hobohm (2018).
vii) Creating user-structured information environments, as suggested by Okunlaya et al. (2022).
viii) Providing portable computer reader services tailored for individuals with disabilities, as highlighted by Hamad et al. (2023).
ix) Delivering Intelligent Document Delivery Services (DDS), as outlined by Park et al. (2021).

These applications demonstrate how intelligent library systems leverage artificial intelligence technology.

6. IMPACT OF AI IN LIBRARIES

i) **Information professionals:** They are the first to be impacted. It improves the accuracy and efficiency of information and retrieval, allowing users to access relevant resources. (Makri et al., 2022).
ii) **Library operations** are being combined with robotic procedures, automation, and smart technology to properly manage resources. (Harper et al., 2021).
iii) **User Services:** Artificial intelligence has transformed the way people access information, engage with library resources, and get help. Some important implications include improved search, 24/7 availability, user recommendations, resource access, data analysis, and so on. (Samuel & Williams, 2020).
iv) **Data and AI literacy:** Libraries develop to include the essential technologies. The personnel must understand how to utilize the AL. They aid users in obtaining and changing data, developing resources, providing technical support and assistance, ensuring ethical behaviour, and doing research. (Hobohm, 2018).
v) **Library Analytics:** The systematic analysis of data acquired from diverse sources allows them to make choices and enhance library services. There are five important components of applying age metrics: user behaviour analysis, collection creation, decision assistance, and library evaluation and improvement. (Hobohm, 2018).

7. AI IN LIBRARIES: TRANSFORM SERVICES AND OPERATIONAL EFFICIENCY

Implementing AI in libraries revolutionizes services by automating cataloguing and classification processes, enhancing user discovery and access, and improving operational efficiency. See figure 3, for a visual representation of how AI transforms library services.

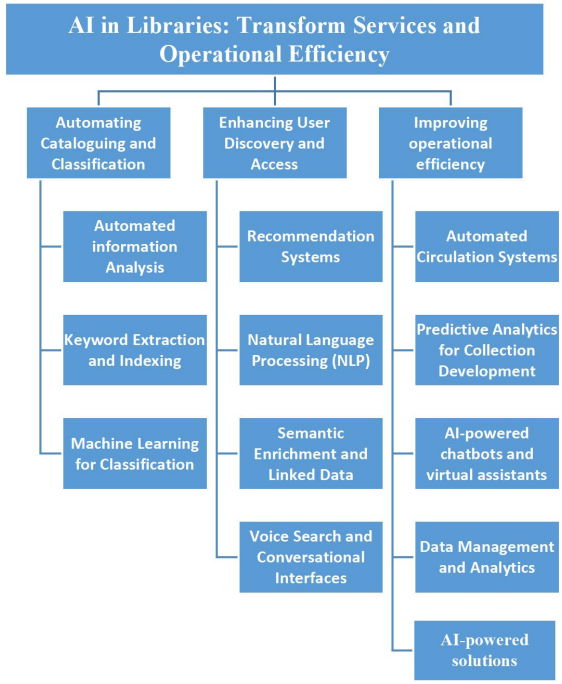

Figure 3: AI in Libraries: Transforming Services and Operational Efficiency.

7.1. Automating Cataloguing and Classification

The amount of information accessible to libraries has expanded tremendously in the digital era, making it difficult to efficiently organize and classify resources. AI-powered solutions show promise for automating cataloguing and categorization operations, optimizing workflows, and increasing library collection accessibility. (Wactlar et al., 1999)

i) **Automated information Analysis:** Artificial intelligence systems can automatically extract useful information from textual material such as book titles, abstracts, and topic headers. Natural Language Processing (NLP) approaches enable computers to grasp and interpret text's semantic meaning, allowing for more accurate metadata extraction. Libraries may speed up the cataloguing process and maintain uniform metadata quality throughout their holdings by automating the analysis. (Ragab et al., 2022)

ii) **Keyword Extraction and Indexing:** Machine learning models may be taught to recognize keywords and ideas inside text texts, allowing for automatic indexing and categorization. AI algorithms may improve discoverability and searchability by assigning relevant topic headers, keywords, and tags to books, articles, and other materials after assessing their content. Keyword extraction approaches, such as Term Frequency-Inverse Document Frequency (TF-IDF) analysis and word embeddings, allow computers to recognize important words and phrases related to the content's subject matter. (Arif et al., 2019)

iii) **Machine Learning for Classification:** Supervised machine learning algorithms may use labelled training data to categorize library materials into predetermined categories or topic areas. Librarians may train machine learning models using current cataloguing procedures and metadata standards, enabling computers to automatically classify new resources. Libraries may use machine learning for categorization to decrease human work, assure consistency in cataloguing methods, and improve collection management. (Picard & Pentland, 1996)

iv) **AI-powered solutions:** AI-powered solutions may help with quality assurance and mistake detection in library catalogues. Machine learning algorithms may detect inconsistencies, errors, and missing information in metadata entries and mark them for inspection by library personnel. Libraries may maintain high standards of data integrity and correctness in their catalogues by

automating quality assurance operations, which improves search result dependability and customer happiness. (Arif et al., 2019)

7.2. Enhancing User Discovery and Access

In the digital era, people demand easy access to information resources as well as customized suggestions based on their interests and preferences. AI technologies provide novel solutions for boosting user discovery and access in libraries, hence improving overall user experience and engagement. (Samuel & Williams, 2020)

i) **Recommendation Systems:** AI-powered recommendation systems leverage user behaviour, preferences, and previous interactions with library materials to provide tailored suggestions. Collaborative filtering algorithms employ user profiles and item similarities to recommend books, articles, and other items that fit the user's interests. Content-based filtering approaches employ metadata and content attributes to propose resources based on their relevance to the user's preferences. Libraries may improve user happiness, encourage serendipitous discovery, and boost engagement with their resources by providing tailored suggestions. (Makri et al., 2022)

ii) **Natural Language Processing (NLP):** approaches provide sophisticated search capabilities in library catalogues by enabling users to engage with the system via natural language queries. NLP systems analyse user queries, extract key phrases, and provide meaningful search results based on semantic similarity and contextual relevance. Understanding the meaning and purpose underlying user searches enables NLP-powered search engines to increase the accuracy and precision of search results, allowing users to get the information they need more effectively. (Ragab et al., 2022)

iii) **Semantic Enrichment and Linked Data:** AI technology may enhance library metadata with semantic annotations and linked data, improving interoperability and discoverability. Semantic enrichment algorithms examine textual material and metadata to discover entities, ideas, and connections, then supplement metadata records with contextual information. Libraries may use linked data principles to connect their catalogues to external knowledge graphs and ontologies, allowing for seamless integration with other data sources while also improving cross-referencing and navigation capabilities. Libraries may increase the visibility and accessibility of their collections by implementing semantic enrichment and linked data practices, allowing users to better locate relevant materials and explore interlinked subjects. (Okunlaya et al., 2022)

iv) **Voice Search and Conversational Interfaces:** Voice-enabled search and conversational interfaces use voice recognition and natural language understanding technology to provide hands-free interaction with library catalogues. Users may audibly express their search queries or preferences, and AI-powered voice assistants can comprehend and process them in real time. Voice search interfaces make it easier and more accessible for users to browse library resources, especially those with visual or movement disabilities. Libraries that offer voice search and conversational interfaces may improve accessibility, inclusiveness, and usefulness for all users, regardless of technical skill or physical limitations. (Park et al., 2021)

7.3. Improving Operational Efficiency

In addition to boosting user experiences, AI technologies have the ability to improve operational efficiency and streamline internal operations in libraries. AI-powered solutions may help libraries increase productivity, save costs, and better distribute resources by automating repetitive operations, optimizing resource allocation, and improving decision-making processes. (Harper et al., 2021)

i) **Automated Circulation Systems**: AI-powered circulation systems automate the handling of library items such as book loans, renewals, returns, and holds. Machine learning algorithms can use previous circulation data to forecast demand, improve inventory levels, and automate reordering operations for popular items. Automated circulation systems may also identify irregularities, such as overdue goods or lost volumes, and notify library personnel to take appropriate action. By automating typical circulation procedures, libraries may improve service efficiency, minimize administrative stress, and increase customer satisfaction. (Samuel & Williams, 2020)

ii) **Predictive Analytics for Collection Development:** Libraries may utilize predictive analytics approaches to estimate user demand, evaluate collection use trends, and make data-driven resource purchase and deselection choices. Machine learning algorithms may leverage circulation data, user preferences, and demographic information to discover trends, predict future demands, and improve collection development methods. Predictive analytics algorithms may also propose content for purchase based on their expected popularity, relevance, and effect. Libraries that employ predictive analytics for collection creation may optimize resource allocation, increase collection value, and assure alignment with user requirements and preferences. (Makri et al., 2022)

iii) **AI-powered chatbots and virtual assistants:** provide automated help and support to library patrons by answering questions, delivering information, and directing them through library services and resources. Natural Language Processing (NLP) technologies allow chatbots to interpret and reply to user questions in real time, offering tailored suggestions, search aid, and procedural instruction. Chatbots may also help with interactive communication, gathering customer input, and collecting statistics to enhance service quality and satisfaction. Libraries may increase service hours, improve customer support, and provide customized help on a large scale by introducing AI-powered chatbots and virtual assistants. (Samuel & Williams, 2020) (Panda & Chakravarty, 2022)

iv) **Data Management and Analytics:** AI technology may help libraries manage and analyse data more effectively, allowing for data-driven decision-making and performance improvement. Machine learning algorithms can evaluate enormous amounts of library data, such as circulation records, use statistics, and user comments, to extract insights, detect patterns, and provide meaningful suggestions. Data visualization tools and dashboards provide user-friendly interfaces for viewing and analysing library analytics, allowing stakeholders to monitor performance, track key performance indicators, and discover areas for improvement. Libraries may improve operational efficiency, optimise resource allocation, and adapt their services to changing customer demands and preferences by using data management and analytics. (Hobohm, 2018)

8. CASE STUDIES

i) **Singapore National Library Board (NLB):** The NLB used AI-powered Chatbots to improve the user experience and aid users in accessing materials, navigating the library catalogue, and offering real-time support with queries.

ii) **University of Oklahoma Libraries:** This institution used AI algorithms to improve cataloguing operations, metadata correctness, and information retrieval for its vast academic resources.

iii) **The New York Public Library (NYPL)** used machine learning algorithms to assess borrowing habits and user preferences, allowing users to get tailored suggestions for books, events, and services.

iv) **Bibliothèque nationale de France (BnF):** The BnF used artificial intelligence (AI) to digitize and handle large volumes of historical documents and manuscripts, using Optical Character Recognition (OCR) and Natural Language Processing (NLP).

v) **The Library of Congress** used AI systems to automate metadata tagging and classification, which streamlined the categorization and retrieval of various media kinds within its vast collection.

vi) **Calgary Public Library, Canada:** This library used AI-powered tools to manage inventory and improve resource allocation, allowing for more efficient borrowing and forecasting demand for certain resources.

vii) **Oodi Library** in Helsinki has used AI-driven space management tools that analyse foot traffic patterns to optimize layout and resource allocation for better user accessibility.

viii) **The British Library** has utilized AI-powered solutions for digitization, metadata enhancement, and preservation. Machine learning algorithms have improved digitization workflows, metadata quality, and material access. AI technologies have also automated preservation tasks, prioritizing items based on condition and historical significance.

ix) **Stanford Libraries** have utilized AI to enhance research support services and improve access to scholarly resources. AI-driven recommendation systems and natural language processing tools

provide personalized research assistance, analysing user preferences and queries for valuable scholarly content.

x) **The National Library of Medicine (NLM)** has utilized AI to improve biomedicine information retrieval and knowledge discovery. AI-powered search algorithms and text mining tools have enhanced accessibility of biomedical literature, facilitating new discoveries in healthcare and life sciences. This has led to advancements in medical research and patient care.

These case studies highlight how AI technologies have been used to simplify information administration, improve user experiences, and optimize resource allocation in a variety of library environments.

9. NEXT-GEN LIBRARIES

The emergence of shelf reading robots and other AI-driven applications signifies a significant shift in the future landscape of libraries. Artificial intelligence, much like the transformative impact of the electric lightbulb, is poised to revolutionize various facets of human existence, including the domain of libraries. As a result, librarians may find themselves liberated from conventional tasks such as reading books for information gathering and decision-making. Instead, computers equipped with AI capabilities can efficiently perform a multitude of functions, including reference services, shelf organization, circulation activities, library data management, cataloguing, and categorization.

The potential of AI encompasses the creation of an ideal librarian capable of addressing users reference inquiries through speech recognition, natural language processing and neural networks. Such advancements promise swift, efficient, and effective processing of library materials, delivering state-of-the-art services to patrons regardless of their location. Embracing technological advancements, future libraries are anticipated to adapt and integrate new technologies rather than shying away from them. Initiatives like the Center for the Future of Libraries aim to identify trends pertinent to libraries and their communities, fostering innovation techniques to aid librarians and library professionals in shaping the future. Collaboration with experts and innovative thinkers is crucial for addressing emerging challenges. However, there remains a need to develop the skill sets of librarians, scholars, and other stakeholders to ensure the establishment of intelligent information systems that uphold core library values such as inclusivity, privacy, intellectual freedom and social justice. Additionally, fostering imagination, knowledge creation, and human learning remains a priority in this evolving landscape.

The Center for the Future of Libraries endeavours to discern trends that hold significance for both libraries and the communities they serve. Its mission includes advocating for the adoption of futuring and innovation methodologies among librarians and library professionals, empowering them to actively shape the future of their field. Additionally, the center seeks to establish collaborations with experts and innovative thinkers to assist libraries in addressing emerging challenges. - American Library Association (ALA).

Garcia-Febo (2019), the President of the American Library Association, has advocated for the incorporation of artificial intelligence into the professional agenda of libraries and national discussions aimed at evaluating and addressing associated challenges. Libraries are embracing AI in its early stages to enhance information literacy and foster critical thinking skills, including computer programming. Moreover, they are utilizing AI to assist users in formulating inquiries for these systems and learning to assess the outcomes. These significant advancements in library practices globally indicate a widespread adoption of AI that will shape the future of libraries. As Jacknis (2017) points out, the pivotal question is not a binary choice between "AI or libraries," but rather how libraries can effectively harness technology to deliver optimal services to their communities.

10. CONCLUSION

The integration of Artificial Intelligence (AI) into library systems offers a substantial potential for enhancing information management. It is evident that AI is capable of streamlining operations, customizing user experiences, and redefining library services. Effective integration, nevertheless, necessitates the consideration of personnel skills, budgetary constraints, and ethical considerations. Collaboration among stakeholders is of the utmost importance in order to optimize the benefits of AI while upholding ethical principles and fundamental library values. By effectively managing the competing demands of innovation and inclusivity, libraries can redefine their role as

crucial repositories of information and endure in the digital age. In conclusion, the integration of AI technology holds tremendous potential for transforming library operations, enhancing patron experiences, and advancing library information services. Automation propelled by artificial intelligence may be utilized by libraries to expedite cataloguing and categorization, enhance user discovery and access, boost operational efficiency, and provide individualized services and recommendations in accordance with patron preferences and needs. Cooperation, user training, and assessment initiatives, in addition to ethical, technical, legal, and social considerations, are necessary to ensure the responsible and effective application of AI technologies in libraries. Libraries can leverage artificial intelligence (AI) to identify emerging opportunities, address escalating challenges, and maintain their relevance and responsiveness in the digital era through proactive planning, strategic investment, and stakeholder engagement.

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Academic Libraries as Social Hubs: Role in Reducing the Digital Divide among Students

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ABSTRACT

The present society is perceived as information society. The new innovations in the field of information technology have revolutionized the process of preservation, communication and receiving of information. Information technology has significantly transformed the nature and process of academic teaching and learning. The use of digital tools such as computers, smart phones, and internet has become an integral part of the teaching and learning process. Certainly, the incorporation of information technology and adoption of digital tools and techniques has changed the approach and methodology of the teaching and learning process. However, it carries a number of fundamental shortcomings. The most visible limitations include the economic unfeasibility for the economically marginalized sections; inaccessibility for seekers living in the rural, tribal of other distant places. Moreover, it is not easy to be adequately used by those who are not imparted formal training about the digital tools in the educational institutes. Language is another barrier for those students who preferably use regional or local languages as medium of expression as well instruction. Hence, the significant reliability on digital information sources and tools by the academic institutes have actually created digital inequalities in society and in fact resulted in the explicit construction of digital divide in society. At the once side, there is a group of economically sound, socio-demographically modernized and academically trained students who have been making very significant use of digital tools and sources. On the contrary, there exist economically poor, socio-demographically marginalized and educationally backward students who not able to combat with the advanced digital tools and sources of information.The present paper is an attempt to examine the role of academic libraries in bridging the gap between the digitally privileged and digitally deprived students. Conducted while applying the quantitative as well qualitative methods of research, the study corroborates the argument that the academic libraries have been contributing positively in minimizing the digital gap and hence establishing the digital equality among students. The academic libraries offer the students a socio-cultural atmosphere with equal opportunities to the access of the advanced tools of information technology.

Keywords: *Academic Libraries, Social Hubs, Digital Divide, Students, Role of Libraries*

1. INTRODUCTION

Information is not only the implicit spirit of a civilized human but also the foundational bases of the civic social life. Information is the exclusive component that separates the human from animals and rather establishes human as the master of world. No social actions, achievements, relationships and institutions can be perceived without information. It is a universal reality in the context of individuals, groups, institutions and organizations that more informant and literate have more chances of success. The most primary and positive feature of information is that it is evolutionary, elaborative and all-embracing in nature. Similar to the nature of information, the sources and mediums of information keep on growing and transforming gradually. In traditional terms, the information has been preserved in written manner in forms of manuscripts, books, articles, write ups etc. The positive desire of human beings to stock the relevant information to consult whenever required and further to preserve the same for successive generations evolved the concept of libraries. For centuries, libraries have been maintained and consulted for the purpose of preserving knowledge to be used by the knowledge-seekers. The origin and rapid growth of the printing press totally revolutionised the

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process of the manifestation and propagation of information. The traditional process which compelled the information seekers to approach the information source was replaced by the trend of information sources reaching to the hands of the seekers in forms of periodicals, booklets and newspapers. The agents of information storage and broadcasting, especially libraries, very successfully adapted in accordance with the newly emerging trends of information propagation. These trends transformed the nature and scope of libraries. The conventional offering of information by libraries through manuscripts and texts further comprehended with the passage of time and libraries got equipped with separate sections delivering the services of periodicals and newspapers.

Undoubtedly, the modern era is the era of information society. The twentieth century witnessed numerous remarkable inventions in various fields and one of the most extraordinary has been in the field of information technology (Lupac 2018). While the innovation of computer has proven to be the most comprehensive and reliable device of stocking up the information, the contraption of internet has provided the wings to information to cross all the territorial barriers and flow worldwide (Castells 2011).

Along with other fields, the use of computer and internet has worldwide become a common practice in the segment of education as well. The trends of the use of computers and internet based teaching-learning process the field of academics, including the schools, colleges and universities became popular firstly among the developed countries during the last two decades of the twentieth century (Mukati 2012). The developing countries were immediately keen to follow the same trends of introducing computer and internet based academic process. India, being country committed to provide quality education to its children and youth, and while realizing its obligations to modernize the process of education has responded to the innovation of computers and internet in the field of education. More particularly, due to the establishment of private corporate sector in various fields including education, there has been an emergence of competitiveness among various channels imparting education to offer more advanced techniques and devices to the students (Davis & Amina 2022). The governmental sector has also felt the pressure of the same competitiveness and therefore, started giving priority to the computer and internet based teaching-learning process in the schools as well as institutions of higher education. Undoubtedly, the introduction and accommodation of computer and internet-based education has contributed very positively in making the process of education more advanced and comprehensive. Nevertheless, this trend has also resulted into a number of limitations (Hope & Fergusson 2002).

Digital Divide

Undoubtedly, the advent of digital literacy has changed the perceptions and prospects of the teaching and learning process. However, it carries a number of fundamental shortcomings. The most visible limitations include the economic unfeasibility for the economically marginalized sections; inaccessibility for seekers living in the rural, tribal of other distant places. Moreover, it is not easy to be adequately used by those who are not imparted formal training about the digital tools in the educational institutes. Language is another barrier for those people who preferably use regional or local languages as medium of expression as well instruction (Karen, Tolbert &Stansbury 2003). Hence, the significant reliability on digital information sources and tools by the academic institutes have actually created digital inequalities in society and in fact resulted in the explicit construction of digital divide in society. At the once side, there is a group of economically sound, socio-demographically modernized and academically trained people who have been making very significant use of digital tools and sources. On the contrary, there exists economically poor, socio-demographically marginalized and educationally backward starta of society that is not able to combat with the advanced digital tools and sources of information. As a consequence, there is explicit emergence of digital divide between students and this shortcoming has divided the students into two unequal categories, i.e. digitally privileged students and digitally deprived students.

Conceptualising Digital Divide

The term ‘digital divide’ is a compound expression made up of two words, i.e. ‘digital’ and ‘divide’. The word digital has been defined by the Cambridge Dictionary as “using or relating to computers and the internet to digital signals and computer technology” (Cambridge Dictionary). The Oxford Dictionary defines the word digital as “A device, piece of equipment, etc., which uses digital

technology" (Oxford English Dictionary). The etymological meaning of the term divide has been explained by the Merriam-Webster Dictionary as a word "used to separate into two or more parts, areas or groups; to cause to be separate, distinct; or apart from one another or a point of line of division or disagreement" (Merriam-Webster Dictionary). Further, the Collins Dictionary defines that "a divide is a significant distinction between two groups, often one that causes conflict" (Collin Dictionary).

The Encyclopedia Britannica explicates the concept of 'digital divide' as a term that explains the unequal division of information and technologies relating to communication in society. That unequal division may cover the divide between the developed and developing countries, or various social or economic groups within a single country. Generally, these differences in the distribution and usage of the means and mediums of information technology further broaden the knowledge gap between those people who have access to the sources of information technology (haves) and those who are deprived of it due to various socio-economic reasons (have-nots)" (Encyclopedia Britannica). As per the Encyclopedia of Library and Information Science, the term "digital divide" is used to explain the unequal access to the channels of information technology including computers and internet. This kind of digital divide can be experienced among individuals, groups, communities or nations (The Encyclopedia of Library and Information Science 2010, p. 1551). Encyclopedia of Global Bioethics defines that 'digital divide' is a concept that was at first used to explain the distinction in access to (digital) information and communication technologies (ICTs). Originally, it was introduced to occupy the question of differences between rural and urban areas. Later, it was comprehended to include differences in terms of social (in)equality based on class, race, and age that were acknowledged as quickly as differences between the Global North and South (Sting, 2016). The International Encyclopedia of Media Effects Explains that the concept digital divide is usually defined as the rift between people who do and do not have access to forms and sources of information and communication technology. These forms and sources are primarily computers and the Internet. Sometimes the cell-phones, particularly the smart phones and other digital hardware and software, are also included to cover the concept of digital divide. The concept involves the debates and discourses about social and information inequality. Generally, inclusion and exclusion in particular social units are common concepts with respect to the concept of digital divide (Dijk, 2017).

The International Centre for Technical and Vocational Education and Training of the UNESCO explicates that digital divide denotes to the distinction between those have access of internet and are in a position to use the services offered on the World Wide Web, and those are do not have same access and are excluded to avail those services….. The digital divide can be categorized as the criteria that reveals the difference to the access of computer and internet due to gender, age, education, income, social groups or geographic location" (UNESCO). According to the OECD (Organisation for Economic Co-operation and Development), "the term "digital divide" refers to the difference between individuals, groups, businesses and geographic areas at different socio-cultural and economic levels with respect to both relating to their opportunities of accessing information and communication technologies (ICTs) and to their access of the Internet for a variety of activities" (OECD 2001).

The concept of the digital divide during the mid-1990s was generally used to explain the inequality between people in their access to ICT with more focus on the inequality in their access to the internet (Srinuan & Bohlin, 2011). During the years 2004 and 2005, the researchers conducting research in the relevant field highlighted the requirement of resolving the digital divide while proposing that it could be realized by making the infrastructure available to variety of users. These researchers agreed on the viewpoint that access to digital technologies was significant and had the caliber to narrow down the digital gap (Bozionelos 2004; Jayakar 2004). There emerged scholars during the years 2006 and 2007 who recommended that the primary factor responsible for the widening of the digital divide was the non-proportionate access to digital technologies. These scholars and researchers revealed that the availability of infrastructure, especially the digital technologies was a prerequisite factor in bridging the digital gap (Deichmann, 2006; Gibbons & Ruth, 2006; Demoussis& Giannakopoulos, 2006). Noticeably, during 2008 and 2010, a number of researchers adopted a more inclusive approach in tackling the problem of the digital divide. Nevertheless, the scholars who were supportive to the digital technological determinism approach firmly argued that technological change can lessen the digital gap while promoting the process of liberalization and

opening up of markets (Cooke & Greenwood, 2008; Wood, 2008; Yuguchi, 2008; Ishmale et al., 2008; Singh &Sahu, 2008). There is other group of academic researchers who have attempted to draw a direct link between the level of the infrastructure of the ICT sector and the level of digital equality. (Pook & Pence; 2004; Noh &Yoo, 2008; Avila, 2009). During times of adversity such as the COVID-19 pandemic's impact on education, there is advocacy for a digital transformation of learning processes. This emphasizes the significance of platforms like FCC (Free Conference Call) in ensuring equal access to online education and eliminating the digital divide (Panda & Chakravarty, 2020). In the recent years, especially during the post COVID-19 era, the issue of digital divide has been discussed as a major challenge not only for the researchers and academicians in the field of ICT and Sociology but the scholars in the field of Library and Information Science have started expressing more keen interest in exploring and handling the issue. The scholars belonging to different disciplines seem to have reached to the consensus that digital divide is visibly increasing and can be curbed through the combined efforts of the scholars belonging to various allied disciplines (Liu & Fan 2022).

The above discussion concludes that digital divide includes various dimensions of inequality in society while measuring the levels of access to sources, services, and benefits of the advanced information and communication technologies between different segments of the population. The digital divide is primarily based on five determinants of the level of the equality of access to information technology. First represents the availability of infrastructure. The second depends on the availability of gadgets and equipment such as computers, smart phones, modems, and the internet connections. The third determinant includes the formal or informal training to the use the computers, smart phones and the Internet; Fourth factor involves the intellectual capabilities of users. Fifth determinant includes the production and use of specific contents adapted to the requirements of the different divisions of the population.

2. OBJECTIVES OF THE STUDY

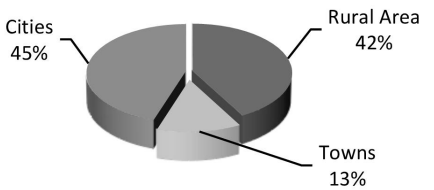
i) To find out the factors responsible for digital divide among the students of universities.
ii) To identify the role of libraries in bridging the digital divide among students in universities.

3. RESEARCH METHODOLOGY

The study is descriptive-analytical in nature. The quantitative method has been applied for the purpose of conducting a precise studying. While applying the sample survey technique, a formally structured and closed-ended questionnaire, comprising of relevant queries, has been designed. The universe of the study is confined to the Guru Nanak Dev University, Amritsar. Total 300 students (184 females and 116 males) pursuing the undergraduate level courses have been selected as units of analysis. The variable of faculties has been taken into consideration and fifty each student from various faculties, i.e. faculty of Agriculture& Forestry, Arts and Social Sciences, faculty of Engineering & Technology, faculty of Languages, faculty of Life Sciences, faculty of Sciences have been approached as respondents. The responses of the respondents are statistically interpreted as tables, graphs and charts. Response of each query has been scientifically and comprehensively analysed.

4. FINDINGS OF THE STUDY

Chart 1: Demogrphic Profile of the Respondents



The first query of the study was framed to with an intention of knowing the demographical profile of the students. Therefore, it was asked to the students to reveal whether they belonged to the rural area, a town or a city. In response, 42 per cent of the respondents disclosed that they belonged to rural areas while 13 percent revealed that they belonged to the towns. The remaining 45 per cent of the respondents belonged to the cities.

The data reveals that fifty eight percent of the respondents belong to the cities or the towns. As there are comparatively least trends of pursuing higher education among the youth belonging to the rural areas, there is less representation of the students belonging to rural areas. However, forty two percent is quite a significant number to be taken notice of.

4.1. Annual Income

The second general query was to obtain information about the annual income of the families of the respondents as the same was acknowledged as relevant for the purpose of study. Reasonably, more economic soundness always increases the chances of the purchase of more advanced means of information and technology and miserable economic condition of the family minimizes the chances of the purchase of the access to the means of information technology. In the study, 16.3 percent of the respondents were found with the family income below 50,000 (Indian Rupees). Further, 29.5 percent of the respondents belonged to the families with annual income between 50,001 to 150,000 (Indian Rupees). There were 14 percent respondent who belonged to the families with annual income between 1,50,000 to 3,000000 (Indian Rupees) and further 25 percent representing the families with annual income above 3,00000 (Indian Rupees).

Table 1. Annual Income of the Families of Respondents

Sr. No.	Income Slab	Number of Respondents	Percentage
1.	Below 50,000	49	16.3
2.	50,001 to 150,000	88	29.5
3.	1,50,001 to 3,00000	42	14
4.	3,00001 to 5,00000	34	11.5
5.	Above 5,00000	75	25

As per the data, approximately sixteen percent of the respondents belonged to the poverty-ridden families with limited resources and dearth of financial resources to expend on the purchase of the advanced means of information technology. There are additional 14 percent who cannot generally afford to purchase the laptops or computers and they have to make several challenging financial adjustments to expend on these commodities. Nevertheless, in case of 25 percent respondents, the economic conditions of their families allow them expend money on the purchase of smart phones of advanced qualities, laptops and unlimited access to the internet facilities.

4.2. Inevitability of the Means of Information & Technology in Academics

To investigate whether the advanced tools information technology were primarily and inevitably significant for the purpose of academic learning at the level of universities, it was asked from the respondents to express the level of their extent if computers/laptops and internet facilities had become an integral part of the study. The responses of the respondents are statistically explained in the table 2.

Table 2. Necessity of Computers/Laptops with Internet Facilities for Academic Learning

Sr. No.	Response	Number	Percentage
1.	Strongly Agree	180	60
2.	Agree	108	36
3.	Neutral	12	04
4.	Disagree	Nil	Nil

Obviously, at the level of higher education, especially in cases of the courses under the faculties of engineering and technology, natural sciences and agriculture, the significance and dependence of the students upon computers, laptops and internet facilities cannot be denied. That is the reason that sixty percent of the respondents have strongly agreed and other thirty-six percent have agreed that availability of the advanced means of information technology has become a primary necessity to pursue the higher studies. Noticeably, only four percent of the respondents have

expressed their neutral stance and there is not even a single respondent who have disagreed to the inevitability of the availability of Computers and internet facilities for the purpose of academic learning.

4.3. Availability of Advanced Means of Information Technology

After obtaining the information about the significance of the advanced means of information technology in the academic learning, the further query was to investigate that how many respondents had availability of these means of information technology at the personal levels. In response, 65 percent of the respondents revealed that they had availability of laptops or computers with the internet facility at the personal levels, while the remaining 35 per cent divulged that they did not have availability of the same means and gadgets at the personal levels.

Table 3. Information about Availability of personal Laptop/Computer and Internet Facility

Sr. No.	Response	Number	Percentage
1.	Yes	195	65
2.	No	105	35

The data corroborates that the sixty-five percent respondents have availability of laptops/computers with internet facility. They are largely those respondents who belong to the cities and/or belong to the families with higher annual incomes. Further, these sixty-five per cent of the respondents are also represented by the students who represent the faculty of engineering and technology where there is more formal requirement of laptops/computers with internet facilities for the purpose of academic learning.

4.4. Extent of the Use of Computers and Internet in the University Library

Further, it was asked from the students that how frequently they were using the facility of computers and internet being provided by the library of their university. The degree of the responses of the respondents has been statistically revealed in the table 4.

Table 4. Use Frequency of the Computers & Internet Facility in the University Library

Sr. No.	Response	Number	Percentage
1.	Regularly	84	28
2.	Quite Frequently	67	22.3
3.	Occasionally	87	29
4.	Not at all	62	20.6

As per the statistical data, twenty-eight percent of the respondents regularly use the facilities of computer section and the internet facility while there are further 22 percent who avail these services at the university's library quite frequently. In addition to this, there are twenty-nine percent of the respondents who use the services occasionally. Noticeably, approximately twenty percent of the respondents do not use these facilities in the library of the university at all. The respondents who do not use the facility of use the same occasionally are the students who have availability of these services at their homes at their personal level. Moreover, the students representing the faculties of languages as well as Arts and Social Sciences have less trends of visiting the libraries especially for the purpose of using the computers and internet facilities. The primary reason is that the students of these faculties comparatively get fewer assignments for which there is primary requirement of computers and the internet facilities.

4.5. Level of Satisfaction over facility of computers and internet in the University library

The most significant query was to verify from the respondents whether they were satisfied from the facilities of computers with internet facilities being provided by the library of their university, and in case they were satisfied what was the level of their satisfaction. The variety of responses received from the respondents is revealed in the table 5.

Table 5. Satisfaction Level over computers and internet facility offered by the University library

Sr. No.	Response	Number	Percentage
1.	Strongly Agree	74	24.6
2.	Agree	128	42.6

3.	Neutral	73	24.3
4.	Disagree	18	06
5.	Strongly Disagree	08	2.6

Noticeably, approximately twenty-four percent of the respondents strongly agreed that they were satisfied from the services of computers and the internet facility being provided to the students. Further, approximately forty-three percent of the respondents agreed that they were satisfied. Noticeably, near about twenty-four percent of the respondents were neutral to the query while respectively six percent and three percent disagreed and strongly disagreed that university library was providing any useful service to the students while offering them access to computers and the internet facility. Reasonably, the respondents who were neutral to the response or who disagreed to the contribution of the university library in bridging the digital gap were those students who do not visit the libraries with the same purpose.

5. CONCLUDING REMARKS

The study corroborates a number of findings. The study establishes the fact that the use of advanced means of information technology such as computers, laptops and internet facilities has undoubtedly become the inevitable part of the academic learning. The study further confirms that there are certain disciplines where there is more formal and frequent requirement of the means of information technology. Further, there are ample numbers of students in the universities who do not have availability of computers, laptops and the internet facilities at their personal levels due the demographic and/or financial reasons. Therefore, the situation where the students feel the significant requirement of the advanced means of information technology for the academic purpose and suffer due to the non-availability of the same due the demographic or financial reasons, creates digital inequality and digital divide in society. These students visit frequently to the library of their university to access the computers with the internet facilities. The study further explores the finding that the university libraries while offering free, easy and equal access to the computers and the internet facilities contribute very positively in reducing the digital divide among students.

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A Case Study of Digital Repositories of India in the Directory of Open Access Repository (OpenDOAR) and Registry of Open Access Repositories (ROAR)

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ABSTRACT

Open access resources refer to digital content that is freely available online, without restrictions on access or use so as to provide anytime anywhere access. These resources cover a wide range of materials, including scholarly articles, research data, educational materials, books, journals, and more and benefit academic community of researchers, students and teachers. Open access institutional repositories (OAIR) are digital platforms or digital repositories established by academic institutions, such as universities, research organizations, and libraries, to store, manage, and provide open access to the scholarly output produced by their faculty, researchers, and students enhancing the visibility of publications by providing access at a global level. These repositories typically include a wide range of materials, such as research articles, theses, dissertations, conference papers, datasets, and other scholarly works. This case study is about digital repositories of Indian institutes. Data obtained from the Directory of Open Access Repositories (OpenDOAR) and Registry of Open Access Repositories (ROAR) was used to analyse the availability and global visibility. Findings indicate that the total number of digital repositories of the world are 5603 according to ROAR and 5899 according to OpenDOAR out of these 137 repositories are present according to ROAR and 107 according to OpenDOAR in India. The position of India in terms of number of repositories in the world in OpenDOAR is 15th and in ROAR is 11th well ahead of countries such as China, Australia, and Canada. DSpace was found to be the most commonly used software for these repositories.

Keywords: *Digital repositories, OpenDOAR, ROAR, Indian Institutional Repositories*

1. INTRODUCTION

Digital revolution has made access to knowledge in unprecedented ways. This knowledge can be made accessible on a global stage by creating open access while balancing the interests of all the stakeholders namely, the authors, the publishers and the users. This can be done through open access repositories (OARs) which need to be regulated to maintain a balance (Koutras, 2022). A digital repository, also known as a digital archive is a centralized online platform or system where digital content is stored, managed, preserved, and made accessible to users. These repositories can contain various types of digital materials, including documents, images, videos, audio recordings, datasets, and more. Digital repositories can be managed by various organizations, including academic institutions, libraries, archives, government agencies, and cultural heritage institutions. They may use different software platforms and standards for managing and organizing digital content, such as DSpace, Fedora Commons, and Islandora. Additionally, repositories may adhere to specific metadata standards and interoperability protocols to ensure compatibility and integration with other systems and services.

Scholarly communication is usually done via Institutional repositories which disseminate and communicate research findings. The Institutional Repositories (IR's) showcase the intellectual output of an institution and provide access to institutions digital assets while preserving this intellectual output (Foster, 2008). According to New World Encyclopaedia; "An Institutional Repository is an online locus for collecting, preserving, and disseminating, in digital form, the intellectual output of an institution, particularly a research institution." Anuradha (2005) explained that Institution Repositories are digital collection which capture, collect, manage, disseminate and preserve scholarly data. Institutional repository provides which provide visibility to the institutions scholarly work by providing access to content as well as research output at a single and other digital documents including the unpublished or "grey" literature can also be accessed via the Institutional repository.

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Institutional repositories (IRs) play a crucial role in providing unrestricted access to the academic works produced by faculty members within an institution. By making these publications freely available, IRs increase the likelihood of these works being cited by other researchers. This not only promotes scholarly activity but also fosters communication within the academic community. In recent years, IRs have emerged as essential tools in advancing the objectives of open access in scholarly communication.

Institutional Repositories have many advantages:

- They are a source of primary research findings
- They assist in avoidance of research duplication
- They can help in information delivery
- Conservation of space is an added advantage
- It gives avenue to cross fertilize ideas without physically meeting

They also have a few disadvantages

- Financial constraints can put a pressure on its use.
- Training is essential to create Institutional repositories
- Many professionals lack knowledge about creation of the repositories.

Institutional repositories (IRs) are typically supported by specialized software designed to manage and facilitate access to digital collections of scholarly materials. Some of them are:

a) DSpace: DSpace is one of the most widely used open-source platforms for building institutional repositories. It was launched by the Massachusetts Institute of Technology (MIT) with support from Hewlett-Packard in 2002. It offers features for managing and preserving various types of digital content, including articles, theses, datasets, and multimedia files. DSpace is highly customizable and has a large user community providing support and development resources.

b) EPrints: EPrints is another popular open-source IR software platform known for its flexibility and ease of use. In 2000, Eprints was developed by Stephen Harnad and team at the University of Southampton (Tansley & Harnad, 2000). It allows institutions to create and manage repositories for scholarly outputs, enabling access to research articles, conference papers, reports, and other materials. EPrints offers a range of customization options and integrations with other systems.

c) Fedora Commons: Fedora Commons is a digital repository software framework that provides a flexible and extensible platform for managing and disseminating digital content. It is designed to support a wide range of use cases, including institutional repositories, digital libraries, and digital archives. Fedora Commons is highly scalable and offers robust preservation features.

d) Digital Commons by bepress: Digital Commons is a commercial IR platform offered by bepress (now part of Elsevier). It provides institutions with tools for creating and managing institutional repositories, scholarly journals, conference proceedings, and other digital collections. Digital Commons offers features for customization, analytics, and publishing workflows.

e) Samvera (formerly Hydra): Samvera is an open-source community-driven framework for building digital repository solutions. It offers a flexible and modular architecture that can be customized to meet the specific needs of institutions. Samvera provides a range of components and integrations for managing and delivering digital content effectively.

f) Invenio: Invenio is an open-source digital library platform developed by CERN. While primarily designed for managing scientific and technical literature, it can also be used to build institutional repositories for a variety of scholarly materials. Invenio offers features for metadata management, search, and access control.

These are just a few examples of the IR software platforms available. Institutions may choose a platform based on factors such as features, customization options, support, and community resources. In India, several libraries have signed MoUs with the INFLIBNET, an autonomous body of MHRD (Ministry of Human Resource and Development), Government of India to submit their research output to a nationwide repository i.e. eShodhsindhu, (eSS) of the e-Theses awarded by the Indian universities. According to the MoU all participating Universities have to maintain a platform to access e-Theses of an institution as well link it to the eSS. Furthermore, this policy mandates that along with maintenance of IR, supervising authority should submit all the research work which should be free from any type of plagiarism. Thus, as per the policy full support is provided to qualitative

research output of an institution (accessible via https://ess.inflibnet.ac.in/). ShodhGanga@INFLIBNET is a reservoir of Indian theses which uses DSpace. Research students; deposit their Ph.D. theses for access to scholarly community in open access. This repository helps researcher to capture, index, store, disseminate and preserve electronic theses and dissertations which they submit on this platform.

OpenDOAR or Open Directory of Open Access Repositories was launched in 2005 as a collaborative project of University of Nottingham and Lund University and funded by OSI, JISC, SPARC Europe and CURL. It is a Directory of Open Access Repositories which provides free and open access to resources throughout the world and primarily catalogs publication repositories, which are repositories containing scholarly publications like articles, theses, and dissertations. It also includes other types of repositories, such as those containing images or datasets, especially if they come with sufficient metadata or documentation to enable reuse of the materials. It also provides information on their policies, types of materials included, and other relevant details. It's a useful resource for researchers and institutions looking for open access content. Repositories listed in OpenDOAR may not always comply with OAI-PMH (Open Archives Initiative Protocol for Metadata Harvesting) standards. OAI-PMH is a widely used protocol for facilitating searches of open access materials, but its use does not guarantee that the content is openly accessible.

ROAR or Registry of Open access Repositories is hosted by University of Southampton, UK and funded by JISC started in 2003. This initiative helps search repositories worldwide and comes under Eprints.org network. ROAR promotes open access development by providing information about growth as well status of repositories at a global level. Both directories play important roles in the open access ecosystem, with OpenDOAR focusing more on providing detailed information about individual repositories, while ROAR offers broader insights and statistics about the landscape of open access repositories.

2. LITERATURE REVIEW

Budapest Open Access Initiative (BOAI) in 2002, (https://www.budapestopenaccessinitiative.org/), Bethesda statement in June 2003 (https://dash.harvard.edu/handle/1/4725199), and the Berlin declaration in October 2003 (https://openaccess.mpg.de/67605/berlin_declaration_engl.pdf) marked the beginning of Open Access (OA). It was commenced by developed countries and later many developing countries including India have joined the effort. OA has made remarkable strides in various facets, including public policy and support, copyright considerations, publisher alliances, and the establishment of technology standards. These advancements have largely been fueled by the common principles that underpin most OA definitions, which emphasize the free, immediate, and unrestricted availability of digital content.

Bist and Mohanty (2006) enumerated that Open Access is free online availability of digital content especially scholarly content wherein authors publish their work freely. The authors retain the copyright to their original work which they may transfer to publishers for web publication, or they may retain rights and self-archive their work in repositories. They enumerated how e-prints@IISC is the first successfully implemented institutional repository, Librarian's Digital Library (LDL) offers to search digital libraries by acting as a selective harvester and INFLIBNET is responsible for the Open access initiative of academic institutions: Dspace@INFLIBNET. They listed the open access initiatives of India in current scenario and discussed the future prospects about how researcher operates in legal framework. This article also talked about the influence of open access in the present era. Das & Roy Chowdhury (2019) explained the operation of open access in terms of legal framework without violating copyrights. They listed the initiatives on the Indian side for open access in various repositories. They informed about 20 Indian Repositories with their hosting agency, software used and number of records including, the first Institutional Repository successfully implemented in India E-prints @ IISc from the Indian Institute of Science (IISc), Bangalore; Librarian's Digital Library (LDL) at DRTC which offers Search Digital Libraries (SDL), a selective harvester for archives and e-journals in library and Information sciences. INFLIBNET, an Inter-University Centre of UGC which connects National Network of Libraries in around 264 Universities, Colleges and R&D Institutions across the country created an OAI repository. Then they discussed the role played by Librarians towards the open access movement. It was concluded that librarians need

more training for organizing their library and need to inspire the user about the benefits of open access. Mali & Deshmukh (2023) examined open access in institutional repositories by studying copyright guidelines and information on web pages of 100 entries from ROAR. They found that 76 % entries were publications and research done by faculty and researchers, 66 % of resources were open access, 78 % archives and repositories had copyright as well as content submission. They further studied about copyright and related queries in this study.

Loan (2014) studied contribution of Asian countries in the Directory of Open Aceess Repositories (OpenDOAR). He found thatAsia ranks as the third-largest region globally in terms of the number of open access repositories, contributing 400 repositories out of a total of 2299 worldwide. Japan leads the region with 138 repositories, followed by India and Taiwan, each with 58 repositories. Most of these repositories, approximately 76.25%, accept content in English, with Japanese and Chinese languages also being commonly accepted. The primary contributors to these repositories are higher education institutions, such as universities and research centers, accounting for 93.50% of the total. A majority of these repositories, around 67.00%, cover multiple disciplines, while approximately 10.75% focus exclusively on Technology and 10.50% on Health/Medicinal Sciences. The repositories archive a variety of materials, with articles being the most common (81.50%), followed by theses (52.50%), conference proceedings (35.40%), and books (26.50%). Administrators utilize twenty-one different software brands to manage these repositories, with DSpace being the most popular, utilized by 67.85% of the repositories, followed by Eprints, which is used by 14.00% of the repositories.

Vyas (2013) studied DOAR which serves as a metadata harvesting service, granting access to open access repositories worldwide. At the time of this study DOAR hosted a total of 2233 repositories from various countries covering diverse subjects. Among these, 54 repositories were based in India. The most commonly employed software for these repositories found was Dspace and Eprints. The Indian Academy of Sciences: Publication led with 89726 number of items uploaded followed by the Open Access repository of IISC Research publication with 34094 items. A noticeable increase was visible in the growth of Indian institutional repositories (IIR) listed on DOAR between 2005 and 2012.The majority of IIR covered multidisciplinary subjects, and the primary sources of information were theses and conference contents. English was the most prevalent language used in items across IIR. Saini (2018) found that many of the IRs in India are as per the OpenDOAR, with 79 IRs have registered by the Indian educational institutions which covers 2.24% of the total IRs registered on OpenDOAR worldwide. A total of 3514 IRs were registered on the OpenDOAR in beginning of 2018 with the USA and UK as the leading countries in creation and maintenance of IRs. Majority of the repository is created through the open source software which are easily available. DSpace and Eprints are used by the majority of IRs as digitization software's as shown on the OpenDOAR.

Kuri, R. and Singh, M. (2020) studies Indian Institutional Repositories listed in OpenDOAR according to subject and countries worldwide. In this study a total of 5414 repositories were found on OpenDOAR from all countries on different subjects and 96 repositories were from India. They also found that the highest proportion of institutional repositories, accounting for 13.54%, were registered in 2013, while none were enrolled with DOAR in 2018. Secondly, the majority of repositories, 84.38%, were institutional in nature. Thirdly, DSpace emerged as the most widely utilized open-source software, being employed in 56.25% of cases. Notably, journal articles comprised the largest type of content at 20.93% within DOAR. Lastly, the "Open Access Repository of IISc Research Publications (ePrints@IISc)" was identified as the earliest institutional repository indexed in DOAR, dating back to December 21, 2005.

3. SCOPE AND LIMITATIONS

This study has collected its data from OpenDOAR and ROAR and is limited to the digital repositories (of Indian institutes mentioned or found in OpenDOAR or ROAR. The limitation of the study lies in the fact that although there are many institutes which have created IR but for the present study only the repositories mentioned in the open directories have been counted and generalization beyond this population is restricted.

4. OBJECTIVES

The main aim of this study is to explore the institutional repositories which are created at Indian Institutions so far for sharing knowledge purpose. This study aims:

i) To know the open digital repositories in India.
ii) To know about the common repositories in OpenDOAR and ROAR.
iii) To assess the repository type distribution in OpenDOAR and ROAR.
iv) To know the discrepancies regarding Indian Repositories available on OpenDOAR and ROAR.
v) To know the digital repository software used for creating the repositories.

5. RESEARCH METHODOLOGY

The researcher has collected data from the Open Directory of Open Access Repositories (OpenDOAR) using the website https://v2.sherpa.ac.uk/opendoar/ and the Registry of Open Access Repositories (ROAR) using the website https://roar.eprints.org/ as the main global directories for open access. The collected data was categorized into year-wise, software used, repository name and country specific registration of Institutional repositories in DOAR. The researcher imported a file named "roar list.csv" into an MS-excel document and organized the repositories alphabetically. Further, the collected data from both websites were tabulated using MS- Excel and data given were analyzed and interpreted by tables, graphs and pie-chart. The data for the present study was collected during last the month of March 2024.

6. DISCUSSION AND DATA ANALYSIS

OpenDOAR and ROAR support academic and research activities. These directories provide different search methods to search the repositories listed with them. The homepage of both the directories has a simple interface as shown in the figures below:

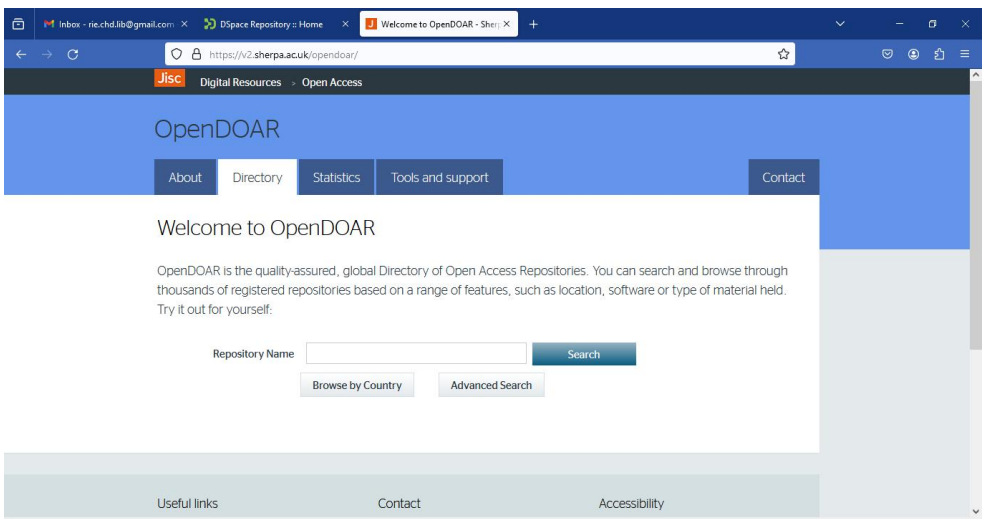

Figure 1: Homepage of OpenDOAR available at https://v2.sherpa.ac.uk/opendoar/

OpenDOAR provides the different search methods to search the listed repositories. It allows the users to search the contents by different search methods like- search by subject area, country-wise searching, searching by content type, searching by type of repository and also according to software platform.

OpenDOAR and ROAR website were visited by the researcher to gather data. This data was downloaded into MS Excel spreadsheet and filtered to get the desired data for the present study.

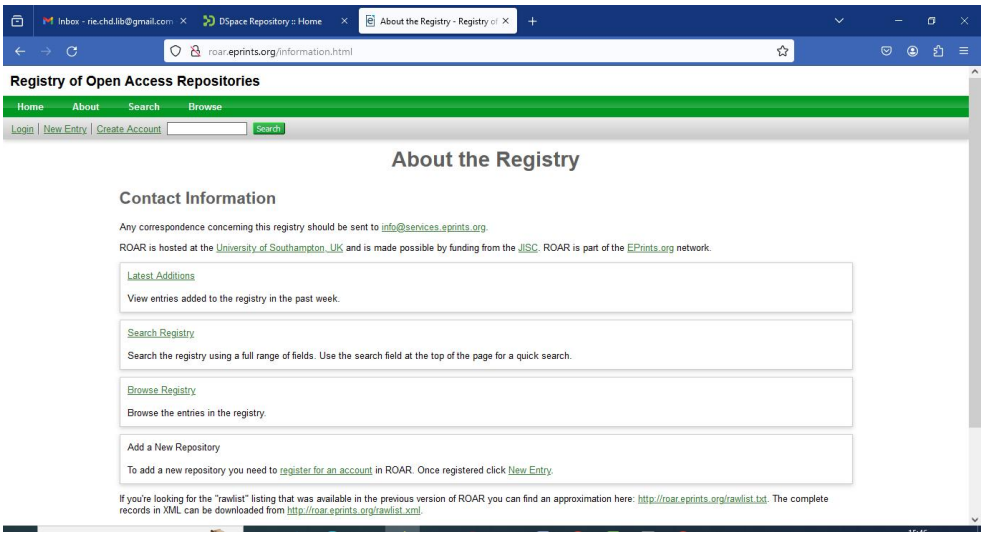

Figure 2: Homepage of ROAR available at https://roar.eprints.org/

6.1. Open Digital repositories in India:

The total number of digital repositories of the world were found to be 5603 according to ROAR and 5899 according to OpenDOAR. 137 (2.45%) repositories of the 5603 are present according to ROAR and 107 (1.81%) according to OpenDOAR in India. United States of America leads in the number of repositories in both OpenDOAR (818 or 13.87%) and ROAR (853 or 15.22%) followed by Japan, Germany and United Kingdom. The position of India in terms of number of repositories in the world in OpenDOAR is 15th and in ROAR is 11th well ahead of countries such as China, Australia, and Canada. Table 1 gives the number of repositories of a country mentioned in OpenDOAR and ROAR along with its percentage. Figure 3-4 represent the number of repositories of a country mentioned in OpenDOAR and ROAR.

Table 1: Digital Repositories by Country

Country	Repositories in Open DOAR	Repositories Percentage Open DOAR (%) *	Repositories in ROAR	Repositories Percentage ROAR (%)*
United States of America	818	13.87	853	15.22
Japan	655	11.10	196	3.50
Germany	304	5.15	247	4.41
United Kingdom	270	4.58	242	4.32
Peru	192	3.25	184	3.28
Spain	183	3.10	193	3.44
Turkey	183	3.10	169	3.02
Indonesia	182	3.09	183	3.27
Brazil	173	2.93	175	3.12
Croatia	173	2.93	7	0.12
France	161	2.73	98	1.75
Italy	146	2.47	82	1.46
Poland	145	2.46	102	1.82
Columbia	123	2.09	147	2.62
India	107	1.81	137	2.45
Canada	98	1.66	88	1.57
Ukraine	98	1.66	119	2.12
Australia	84	1.42	74	1.32
China	66	1.12	96	1.71

*(rounded to two decimal places)

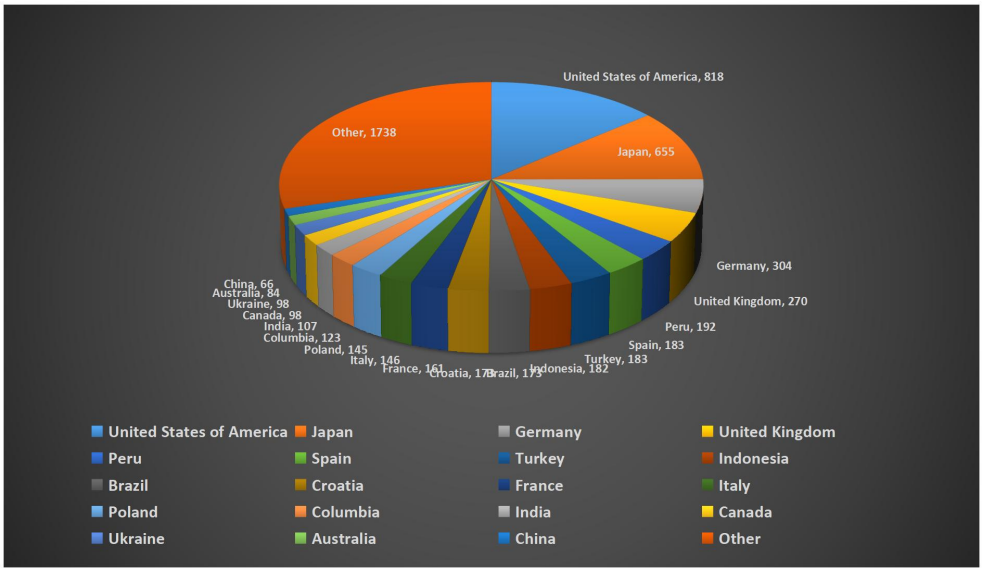

Figure 3: Digital Repositories by Country in OpenDOAR

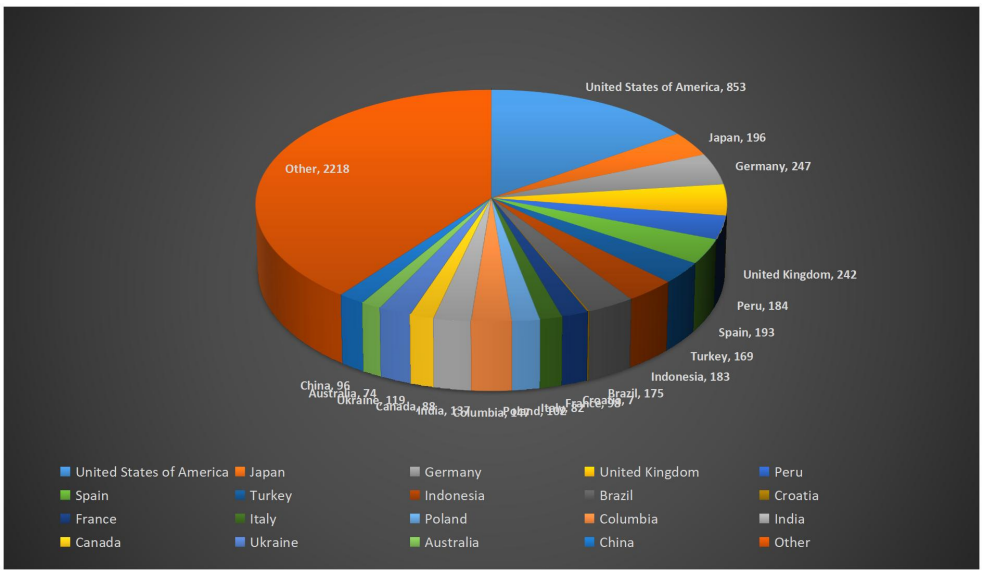

Figure 4: Digital Repositories by Country in OpenROAR

6.2. Common repositories in OpenDOAR and ROAR

OpenDOAR has a list of 107 repositories of India and ROAR has 137 repositories of India listed in the directory. The researcher found that both of them have 64 common repositories as given in table 2

Table 2: Common repositories of OpenDOAR and ROAR

S. No.	Repository Title	Organisation	Home Page Repository	Software	Type
1	AMU Repository (Knowledge	Aligarh Muslim	http://ir.amu.ac.in/cgi/oai2	Eprints	Theses

	Repository)	University			
2	BBAU Institutional Repository	Babasaheb Bhimrao Ambedkar University	http://14.139.228.238:8040/oai	Dspace	Theses
3	Bhogawati Mahavidyalaya Library	Bhogawati Mahavidyalaya, Kurukali , Kolhapur	http://61.1.85.128:8080/oai/request	Dspace	Institutional
4	CSIR- NCL Digital Repository	National chemical Laboratory - Pune	http://dspace.ncl.res.in/dspace-oai/request	Dspace	Theses
5	Digital Knowledge Repository of Central Drug Research Institute (DKR@CDRI)	Central Drug Research Institute	http://dkr.cdri.res.in:8080/dspace-oai/request	Dspace	Institutional
6	Digital Repository of National Institute of Technology Karnataka, Surathkal	National Institute of Technology Karnataka, Surathkal	http://idr.nitk.ac.in/oai	Dspace	Institutional
7	Dpace@Vidya Prasarak Mandal - Thane	Vidya Prasarak Mandal	http://dspace.vpmthane.org:8080/jspui/index.jsp	Dspace	Institutional
8	DRS @ National Institute Of Oceanography	National Institute Of Oceanography , India	http://drs.nio.org/oai/request	Dspace	Institutional
9	DSpace @ GGSIPU	Guru Gobind Singh Indraprastha University	http://14.139.60.216:8080/oai/request	Dspace	Institutional
10	DSpace @ INFLIBNET: Home	Inflibnet	http://dspace.inflibnet.ac.in/dspace-oai/request	Dspace	Institutional
11	DSpace @ Progressive Education Society's Modern College of Arts, Science and Commerce	Progressive Education Society's Modern College of Arts,Science and Commerce(Autonomous),Shivajinagar,Pune-5	http://125.99.47.158:8090/jspui/	Dspace	Institutional
12	dspace @ sdmcet	SDM College Of Engineering and Technology Dharwad	http://210.212.198.149:8080/jspui	Dspace	Institutional
13	DSpace at IUCAA	IUCAA	http://www.iucaa.ernet.in:8080/oai	Dspace	Institutional
14	DSpace at M S University	M S University	http://14.139.121.106:8080/jspui/	Dspace	Institutional
15	DSpace at Vidya Prasarak Mandal	Vidya Prasarak	https://dspace.vpmthane.org/	Dspace	Learning

	(Thane)	Mandal			
16	DSpace@ GIPE	Gokhale Institute of Politics and Economics (GIPE), Pune (India)	https://dspace.gipe.ac.in/xmlui/	Dspace	Institutional
17	Dspace@ IIA: Indian Institute of Astrophysics	Indian Institute of Astrophysics	http://prints.iiap.res.in/dspace-oai/request	Dspace	Institutional
18	DSpace@ IITB	Indian Institue of Technology, Bombay	http://dspace.library.iitb.ac.in/dspace-oai/request	Dspace	Institutional
19	DSpace@ IMSC	Institute of Mathematical Sciences	https://www.imsc.res.in/xmlui/	Dspace	Institutional
20	DSpace@ SFIT	St. Francis Institute of Technology (SFIT)	http://dspace.sfit.co.in:8004/oai	Dspace	Institutional
21	Dyuthi at CUSAT	Cochin University of Science & Technology	http://dyuthi.cusat.ac.in/dspace-oai/request	Dspace	Institutional
22	E-Knowledge Center	Foundation for Democratic Reforms	https://ekcenter.fdrindia.org/	Other	Opendata
23	ePrints @IISC	Indian Institute of Science, Bangalore, India	http://eprints.iisc.ernet.in/perl/oai2	Eprints	Institutional
24	ePrints@ATREE	Ashoka Trust for Research in Ecology and the Environment	http://eprints.atree.org/cgi/oai2	Eprints	Institutional
25	ePrints@Bangalore University	Bangalore University	http://eprints-bangaloreuniversity.in/cgi/oai2	Eprints	Institutional
26	Eprints@CMFRI	Central Marine Fisheries Research Institute	http://eprints.cmfri.org.in/cgi/oai2	Eprints	Institutional
27	Eprints@IARI	Indian Agricultural Research Institute	http://eprints.iari.res.in/perl/oai2	Eprints	Institutional
28	ePrints@IIMK: Indian Institute of Management Kozhikode Scholarship Repository	Indian Institute of Management Kozhikode	http://eprints.iimk.ac.in/perl/oai2	Eprints	Institutional
29	EPrints@IIT Delhi : Home	IIT Delhi	http://eprint.iitd.ac.in/dspace-oai/request	Dspace	Theses
30	Eprints@MDRF	Dr. Mohan's	http://mdrf-eprints.in/cgi/oai2	Eprints	Institution

		Diabetes Specialities Centre,Diabetes			al
31	eprints@mku	Madurai Kamaraj University	http://eprints.mkuniversity.in/	Eprints	Institutional
32	EPrints@NIRT Library	National Institute for Research in Tuberculosis (NIRTIR)	http://eprints.nirt.res.in/cgi/oai2	Eprints	Institutional
33	Eprints@NML	CSIR-National Metallurgical Laboratory	http://eprints.nmlindia.org	Eprints	Institutional
34	ETD@IISc Electronic Theses and Dissertations at Indian Institute of Science	Indian Institute of Science	http://etd.ncsi.iisc.ernet.in/dspace-oai/request	Dspace	Theses
35	E-theses A Saurashtra University Library Service	Saurashtra University	http://etheses.saurashtrauniversity.edu/cgi/oai2	Eprints	Theses
36	Ethesis@nitr - ethesis	National Institute of Technology Rourkela	http://ethesis.nitrkl.ac.in/cgi/oai2	Eprints	Theses
37	Gyan Pravah @ Central University of Haryana	Central University of Haryana	http://idr.cuh.ac.in:8080/oai	Dspace	Institutional
38	IIT Roorkee Repository-Shodhbhagirathi	Indian Institute of Technlogy Roorkee, India	http://shodhbhagirathi.iitr.ac.in:8081/jspui/	Dspace	Institutional
39	Indian Academy of Sciences: Publications of Fellows	Indian Academy of Sciences	http://repository.ias.ac.in/cgi/oa	Eprints	Institutional
40	Indian Institute of Petroleum Institutional Repository	Indian Institute of Petroleum, Dehradun	http://library.iip.res.in:8080/dspace	Dspace	Institutional
41	IR @ NIT Rourkela-Shodh Sangrah	National Institute of Technology, Rourkela, India	http://dspace.nitrkl.ac.in:8080/dspace-oai/request	Dspace	Institutional
42	IR@NEERI	CSIR-National Environmental Engineering Research Institute	http://eprints.neeri.res.in/cgi/oai2	Eprints	Institutional
43	IR@NPL	CSIR - National Physical Laboratory	http://npl.csircentral.net/cgi/oai2	Eprints	Institutional
44	Kautilya Digital Repository	Indira Gandhi Institute of	http://oii.igidr.ac.in:8080/dspace-oai/request	Dspace	Institutional

		Development Research			
45	KNooR(KNOWLEDGE REPOSITORY OPEN NETWORK)	University of Kashmir	http://dspaces.uok.edu.in:8080/dspace	Dspace	Multi
46	Knowledge Repository of Indian Institute of Horticultural Research	Indian Institute of Horticultural Research	http://www.erepo.iihr.ernet.in/	Dspace	Institutional
47	Krishikosh: Home	Indian Council of Agricultural Research Institutes	http://krishikosh.egranth.ac.in	Dspace	Subject
48	Librarians' Digital Library	Librarians' Digital Library	http://drtc.isibang.ac.in/oai/	Dspace	Subject
49	Mahatma Gandhi University - Online THESIS Search	Mahatma Gandhi University	http://mgutheses.org/	Other	Theses
50	NAL-IR	National Aerospace Laboratories	http://nal-ir.nal.res.in/perl/oai2	Eprints	Institutional
51	National Science Digital Library at NISCAIR, India: Home	National Institute of Science communication and Information Resources	http://nsdl.niscair.res.in/dspace-oai	Dspace	Learning
52	NIAS Repository	National Institute of Advanced Studies	http://eprints.nias.res.in	Eprints	Institutional
53	NISCAIR ONLINE PERIODICALS REPOSITORY (NOPR)	NISCAIR - National Institute of Science Communication and Information Resources	http://nopr.niscair.res.in/dspace-oai/request	Dspace	Institutional
54	OAR@ICRISAT	International Crops Research Institute for the Semi-Arid Tropics	http://oar.icrisat.org/cgi/oai2	Eprints	Institutional
55	Open Access Digital Repository of Ministry of Earth Sciences, Government of India	Ministry of Earth Sciences, Government of India	http://moeseprints.incois.gov.in/cgi/oai2	Eprints	Subject
56	Osmania University Digital Library [OUDL]	Osmania University	http://oudl.osmania.ac.in/oai	Dspace	Institutional
57	RAIITH	Indian Institute of Technology Hyderabad	http://raiith.iith.ac.in/cgi/oai2	Eprints	Institutional

58	Raman Research Institute Digital Repository	Raman Research Institute	http://dspace.rri.res.in:8080/oai/request	Dspace	Institutional
59	ScholarSphere: IITJ Research Insights Hub	Indian Institute of Technology Jodhpur	https://scholar.iitj.ac.in/home	Dspace	Researchdata
60	Shodhganga: A reservoir of Indian Theses @ INFLIBNET	INFLIBNET Centre	http://shodhganga.inflibnet.ac.in/oai/	Dspace	Aggregating
61	Social Science Cyber Library	Aligarh Muslim University, Aligarh, India	http://socsccybraryamu.ac.in/	Other	Other
62	VU Digital Repository : Dspace@VU	Vidyasagar University	http://inet.vidyasagar.ac.in:8080/oai	Dspace	Institutional
63	WeSchool Digital Repository	Welingkar Institute of Management Development and Research	http://dspace.welingkar.org:8080/jspui/	Dspace	Institutional
64	Zorotic Online Library	PKP (Public Knowledge Project) Open Archives Harvester	https://zorotic.com/	Ojs	Aggregating/ Database

6.3. Nature of Digital Repository

Digital repositories are categorized under significant heads of Governmental, Aggregating, Disciplinary and Institutional in OpenDOAR and under Subject, Open/Research data, Learning, Journal, Theses and Institutional in ROAR. Table 3 shows the maximum number of repositories are Institutional in both OpenDOAR (88) and ROAR (96).

Table 3: Types of Repositories

Type of Repository	Number in OpenDOAR	Percentage in OpenDOAR (%)	Number in ROAR	Percentage in ROAR (%)
Aggregating/ Multi	7	6.73	4	3.33
Disciplinary/ Subject	8	7.69	8	6.67
Governmental	1	0.97	-	-
Institutional/ Theses	88	84.61	96	80.00
Journal			6	5.00
Learning			4	3.33
Open/ Research data			2	1.67
Total	104	100.00	120	100.00

6.4. Inconsistencies about Indian Repositories available on OpenDOAR and ROAR

The researcher found a few inconsistencies on studying the two directories:

i) The researcher found that many IR's are mentioned more than once in the database as per the details mentioned on OpenDOAR and the csv file downloaded from ROAR. For example Cochin University of Science and Technology has three records according to ROAR: Cusat Digital Library, Dspace@CUSAT and Dhyuti. Similarly there are two entries for National Institute for Research in Tuberculosis in OpenDOAR. It was found that there are 104 digital repositories without repetition in OpenDOAR and 120 digital repositories in total from India without repetition in ROAR.

ii) The researcher observed that one of the repositories i.e repository of the Indian Institute of Management Kozhikode, showed that the software used by them is Eprints according to ROAR and DSpace according to OpenDOAR.
iii) The name of the repository mentioned in both the directories is not updated. For instance, Institutional repository of IIT Roorkee, Bhagirathi is now ShodhBhagirathi.
iv) It was also found that many of the repositories have not updated their URL and the researcher was not able to open a few repositories using the url provided.

6.5. Repository software used by Indian Repositories:

Data gathered was analysed to find popular software used by Indian repositories in creating IRs. In both OpenDOAR and ROAR, it was found that the most widely used software is DSpace 59(57%) in open DOAR or 57 % and 65(54%) in ROAR followed by Eprints with 31(30%) in OpenDOAR and 38 (31%) in ROAR. Other institutes used different software's. Table 4 and figure 5 represents the data about software used by Indian repositories. It is evident that more than 50 % of IR's registered with both OpenDOAR and ROAR use open source software.

Table 4: Number of Repositories as per Software Used

Software used	Number of Repositories in OpenDOAR	Percentage (%) of software used in OpenDOAR	Number of Repositories in ROAR	Percentage (%) of software used in ROAR
D Space	59	57	65	54
e-prints	31	30	38	31
Bepress	-	-	3	2
D-Space CRIS	2	2	-	-
Greenstone	1	1	3	2
Open Repository	1	1	-	-
Open Journal System	-	-	1	2
Others	10	9	11	9

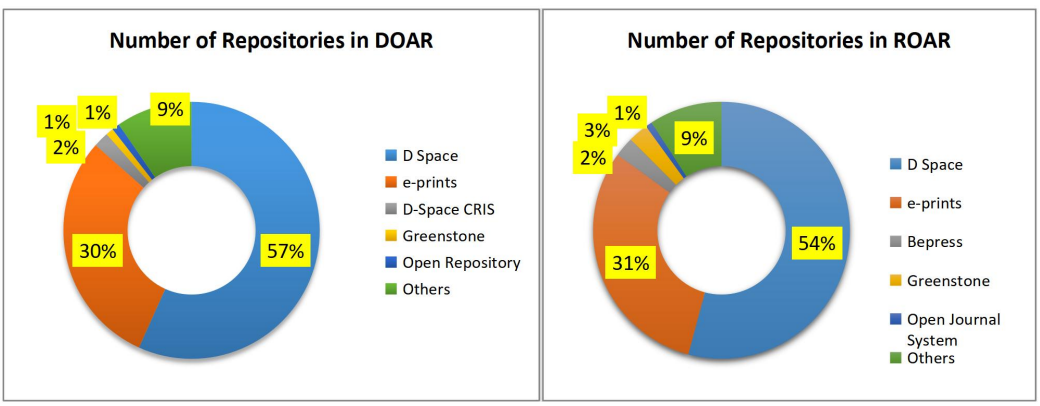

Figure 5: Number of Repositories on the basis of software in OpenDOAR and ROAR

7. MAJOR FINDINGS

- The position of India in terms of number of repositories in the world in OpenDOAR is 15th and in ROAR is 11th well ahead of countries such as China, Australia, and Canada.
- OpenDOAR and ROAR have 64 common repositories.
- It is observed that institutional repositories were found more in number (more than 80% in both OpenDOAR and ROAR) than other type of digital repositories.
- There are a few inconsistencies in the directories as they do not have the current version of the repository name and URL.

- Dspace and Eprints are most commonly used software for digital repositories in India. Dspace is used by more than 50 % institutes according to both OpenDOAR and ROAR.

8. CONCLUSION

Researchers have realized the importance of open access. Open access provides better visibility to other researchers, strengthens the research integrity of researcher by providing transparency, helps in interdisciplinary research due to better availability and provides opportunities in new collaborations. Digital repositories assist in scholarly communication and support open access goals at a global level. Countries like United States of America, United Kingdom and Germany are leading in creating and maintenance of digital repositories. There is a continuous growth in the number of organizations in India who have setup their repositories but at present all organizations have not given open access to their repositories on OpenDOAR or ROAR. However, many organizations in India keeping their repositories on LAN only, because of copyright policies and restrictions by authors. Open source softwares are preferred for creating repositories in India where DSpace and eprints have emerged as preferred digitization softwares as could be seen on both OpenDOAR and ROAR. The data on OpenDOAR and ROAR needs to be updated by the repository managers so that access to correct source is provided to researchers, students and teachers.

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Research Trends in Library And Information Science in Punjab During 2010-2020: A Study

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ABSTRACT

This study investigates the landscape of Library and Information Science (LIS) research in Punjab, focusing on the period from 2010 to 2020. The research delves into the extent of scholarly output in the field within the given timeframe and evaluates its significance in the broader context of academic research. The analysis reveals that out of a total of 993 universities of India out of only 99 Universities are running Ph.D Courses in the field of LIS . The study find that the average of 10.03% of Indian universities offering Doctoral programs in LIS. Among the 37 universities in Punjab, 9 offer Ph.D. programs in LIS, with an average of 24.32%. Panjab University, Chandigarh; Punjabi University, Patiala; and Guru Nanak Dev University, Amritsar are the primary institutions offering such programs. Panjab University, Chandigarh recorded 16 Ph.D. awards and 19 registrations during the study period. Punjabi University, Patiala saw 12 Ph.D. awards and 24 registrations, while Guru Nanak Dev University, Amritsar, recorded 17 Ph.D. awards. op trends in LIS research during the period include Information Seeking Behavior, E-resources, Collection Management, Digitization, Information Literacy, and Bibliometric analysis. Information Seeking Behavior emerged as the most occurring trend. Panjab University, Chandigarh led in research output with 16 Ph.D. awards, followed by Guru Nanak Dev University, Amritsar with 17 awards, and Punjabi University, Patiala with 12 awards. Ph.D. degrees were awarded three state universities in Punjab during the specified period, only 45 pertain to the LIS discipline, accounting for a mere 0.77%. University-wise distribution indicates that Panjab University, Chandigarh, recorded 16 Ph.D. awards, with 19 registrations during the study period. Punjabi University, Patiala, saw 12 Ph.D. awards and 24 registrations, while Guru Nanak Dev University, Amritsar, recorded 17 Ph.D. awards. Furthermore, the study identifies the top trends in LIS research during the period, highlighting areas such as Information Seeking Behavior, E-resources, Collection Management, Digitization, Information Literacy, and Bibliometric analysis. These trends provide valuable insights into the thematic focus and evolving interests Within the field of Library and Information Science research in Punjab.

Keywords : *Library and Information Science (LIS) research, Scholarly output, Academic research, Ph.D. awards, Ph.D. awards, E-resources, Collection Management, Digitization, Information Literacy, Bibliometric analysis*

1. INTRODUCTION: LIBRARY AND INFORMATION SCIENCE EDUCATION IN INDIA

The historical evolution of Library and Information Science (LIS) education in India is indeed fascinating and significant. The establishment of formal training courses in LIS in India dates back to 1911 with the initiation of a training course in the state of Baroda. However, the real impetus for systematic education in LIS came through the pioneering efforts of Dr. S.R. Ranganathan, often referred to as the "father of library science in India."

Dr. S.R. Ranganathan played a pivotal role in shaping LIS education in India during the period of 1926-1931. His seminal work and initiatives at the Madras University Library, in collaboration with the Madras Library Association, laid the foundation for formal education in the field of library and information science. Through his visionary leadership, Ranganathan introduced structured courses and curriculum in LIS, which were integrated into university programs.

Following Ranganathan's initiatives, LIS departments were established in various universities across India, offering courses at both bachelor's and master's levels. These programs aimed to equip students with the necessary knowledge and skills to manage information resources effectively and to serve the needs of diverse user communities.

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Over time, the scope of LIS education in India expanded to include formal research opportunities at different levels. Currently, formal research in LIS is conducted at six levels:

i) Diploma: Basic level of certification providing foundational knowledge in LIS.
ii) Bachelor of Library and Information Science (BLISc): Undergraduate degree program focusing on core principles and practices in LIS.
iii) Master of Library and Information Science (MLISc): Postgraduate degree program offering advanced study in LIS, including specialized areas.
iv) M.Phil (Master of Philosophy): Research-oriented program allowing students to explore specific research topics in depth
v) PhD (Doctor of Philosophy): Doctoral program enabling students to conduct original research and contribute to the advancement of knowledge in LIS
vi) D.Litt (Doctor of Literature): Highest academic degree awarded in recognition of significant contributions to the field of LIS through research and scholarship

2. LIBRARY SCIENCE RESEARCH IN INDIA

The research in LIS did not get impetus till the last quarter of 20th century. Though the first doctorate in the subject was awarded by Delhi University in 1957, the second Ph.D. in LIS was awarded after nearly two decades. The research at doctorate level got boost after 2009, when the UGC in its eligibility criteria for Assistant Professors and equivalent posts including Librarians, exempted the Ph.D. holders from passing National Eligibility Test for lectureship (University Grants Commission, 2010).

Library science Research in India was initiated by Dr. S.R. Ranganathan in 1931, with the formulation of Five Laws of Library science. He even graded them as Normative principles, Fundamental laws, Canons, Principles & postulates.•Ranganathan cut new grounds & blazed new trials in Library science initially by solo- research.

Dr. J.S. Sharma, was the 1st Indian & one of the 1st few to earn doctorate from USA. He was awarded PhD by Michigan University for his thesis 'Mahatma Gandhi: A Descriptive Bibliography.

The 2nd PhD in LIS in Pandey S.K. Sharma for his thesis 'Expansion and modification of Dewey Decimal Classification (18) for classifying books with special reference to Indian Philosophy, and Indian religion by Punjab university.

3. OBJECTIVE

The objective of this study is to investigate the landscape of Library and Information Science (LIS) research in Punjab, specifically focusing on the period from 2010 to 2020. The study aims to:

i) Assess the extent of scholarly output in the field of LIS within the specified timeframe.
ii) Evaluate the significance of LIS research in the broader context of academic scholarship in Punjab.
iii) Examine the distribution of LIS research across three state universities in Punjab.
iv) Identify and analyze the top trends in LIS research during the study period.
v) Provide insights into the thematic focus and evolving interests within the field of LIS research in Punjab.

Through these objectives, the study seeks to contribute to the understanding of the status and trends of LIS research in Punjab and to inform future research directions in the field.

4. SCOPE AND METHODOLOGY

The study specifically focuses on the state of Punjab in India, examining LIS research conducted within its boundaries. Three state universities, namely Panjab University, Chandigarh; Punjabi University, Patiala; and Guru Nanak Dev University, Amritsar, are the primary institutions of interest. The study delves into a decade-long timeframe, from 2010 to 2020, capturing the recent trends and developments in LIS research within Punjab. The study primarily revolves around research works pertinent to the field of Library and Information Science. It encompasses various aspects of LIS, including but not limited to Information Seeking Behavior, E-resources, Collection Management, Digitization, Information Literacy & bibliometric Analysis. The study quantifies the scholarly output in terms of the number of research works, Ph.D. awards, and registrations related to LIS within the specified universities and time frame. It qualitatively analyzes the content and themes of LIS research

works, providing insights into the thematic focus and evolving interests in the field. The study evaluates the significance of LIS research within the broader context of academic research in Punjab, shedding light on its relative importance and contribution. The study identifies and analyzes the top trends in LIS research during the study period, offering valuable insights into the thematic direction and emerging interests within the field in Punjab. Based on the findings, the study provides recommendations for policymakers, educators, and researchers to address gaps and inform future directions in LIS research within Punjab.

By delineating these scopes, the study aims to comprehensively explore the landscape of LIS research in Punjab from 2010 to 2020, providing valuable insights and recommendations for stakeholders in the field.

5. LITERATURE REVIEW

Thavamani and Pushparaj (2014) conducted a study focusing on the doctoral degrees awarded in Library and Information Science (LIS) in the North-Eastern region of India from 2007 to 2011. They found that Information sources and services were the primary thrust area of research in the region, with over 38% of doctoral degrees being awarded in Meghalaya alone. This study highlights the regional variations and thematic trends in doctoral research within India.

Pandita, Ramesh & Singh, Shivendra. (2017) Conducted a study also focusing on the popularity of the subject at the state level and in universities across the country. From data analysis, it emerged that 177 doctoral degrees were awarded in Library and Information Science in India during 2010-2014. Of the total doctoral theses awarded in Social Sciences in India during the period of study, a meager 3.05 per cent were awarded in the Library and Information Science. A total of 43 unique institutes and 17 states were identified which awarded doctoral degrees across India at an average of 4.11 and 10.41 degrees each, respectively. Gujarat emerged the most popular state by awarding the maximum 16.38 percent doctoral degrees and at the institutional level, Baba Bhim Rao Ambedkar University, Marathwada emerged the leading institute with 9.60 per cent of the total doctoral degrees. There is a steady decline in the award of doctoral degrees in India, besides the institutions also do not show any consistency in undertaking doctoral research in LIS in India.

Partap (2015) conducted a study titled "Current trends in Library and Information Science research in India 2008–2013" published in Library Progress(International). This research provides insights into the contemporary landscape of Library and Information Science (LIS) research in India, focusing on trends observed between 2008 and 2013

Singh and Babbar (2014) conducted a study titled "Doctoral Research in Library and Information Science in India: Trends and Issues," published in the DESIDOC Journal of Library & Information Technology. This research provides a comprehensive analysis of doctoral research trends and issues within the field of Library and Information Science (LIS) in India.

Ministry of Human Resource Development (2010-2011): This report offers statistics on school education in India for the academic year 2010-2011. While it primarily focuses on primary and secondary education, it provides a foundational understanding of the educational landscape, which forms the basis for higher education and specialized fields like LIS.

DrEducation: Global Higher Education Research and Consulting (2012-2013): This source presents statistics on Indian higher education for the academic year 2012-2013. It sheds light on enrollment trends, institutional data, and other relevant information crucial for understanding the context of higher education in India, including potential implications for LIS education and research.

University Grant Commission (2016): The consolidated list of universities in India offers insights into the institutional framework of higher education in the country. It serves as a reference point for understanding the distribution of universities across different regions and states, including Punjab, which is relevant for the context of LIS research in the region.

Downs (1966, 1969): These seminal works by Downs delve into doctoral programs and library resources, providing historical perspectives and insights into the evolution of research in library science. While dated, they offer valuable insights into the early stages of doctoral research in the field and its relationship with library resources.

Neelameghan (1974): Neelameghan's work focuses on education for librarians and documentalists, offering insights into the academic programs and curriculum development in LIS

education during the mid-20th century. This historical perspective provides context for understanding the evolution of LIS education in India.

Kumar & Sharma (2009), Patel & Kumar (2001), Kumar (2010), Kumar (1973), Krishan (1973): These works collectively offer a comprehensive overview of LIS education in India, spanning historical perspectives, curriculum development, and research trends. They provide insights into the growth and development of the field, highlighting key milestones and challenges faced in LIS education and research.

Panda and Hasan (2023) investigate the intersection of Electronic Theses and Dissertations (ETDs) with Open Science, revealing trends and patterns in ETD contributions in the 21st Century Library Science landscape, highlighting their role in knowledge dissemination and proposing strategies to enhance discoverability and use.

6. RESULT AND ANALYSIS

Table 1: Average number of Indian Universities which offers Ph.D. Programme

Total no. of University	Total no of Universities running LIS Ph.D	Average no. university offer Ph.D courses in LIS
993* appox.	**99**	**10.03%**

* Source: www.ugc.ac.in

Table 1 reveals that out of approximately 993 Indian universities included in the study, only 99 universities offer PhD courses in the field of Library and Information Science (LIS) Programme. This finding indicates a notable disparity between the total number of universities and those offering doctoral programs in LIS. The study find that the average of 10.03% of Indian Universities offers the Ph.D. courses in the field of LIS. The comparatively low percentage of universities offering LIS PhD programs underscores the selectivity and specific focus of these institutions within the broader landscape of Indian higher education. This insight suggests potential areas for further investigation, such as the factors influencing the distribution of doctoral programs across universities and the implications for the development and accessibility of advanced education in LIS within India.

Table 2: Universities wise which offers Ph.D. Programme of Punjab

SN	Type of University	Total no. of Universities	No. of universities offering Ph.D. programme in LIS	%
1	State university	15	03	20
2	Central University	01	01	100
3	Private Universities	18	05	27.77
4	Deemed to be Universities	03	00	00
	Total Universities	**37**	**09**	**24.32**

Table 2, reveals that out of the total 37 universities of Punjab, 8 offer Ph.D. programs in the field of LIS. The analysis shows that Central University has the highest percentage of offering Ph.D. programs (100%), followed by Private Universities (22.22%), and State Universities (20%). Deemed to be Universities do not offer Ph.D. programs in the field LIS.

Table 3: LIS Research Trends in Punjab during the year 2010-2020

SN	Name of university	Ph.D. completed during the year 2010-2020
1	Guru Nanak Dev University, Amritsar	17
2	Panjab University ,Chandigarh	16
3	Punjabi University ,Patiala	12
4	Central University of Punjab, Bathinda	00
5	Akal University, Talwandi Sabo, Bathinda	00
6	Desh Bhagat University, Fatehgarh Sahib	00
7	Guru Kashi University, Hoshiarpur	00
8	RIMT University, Mandi Gobindgarh	00
9	Lovely Professional University , Phagwara	00
	Total	**45**

The study reveals a notable concentration of PhD degrees in Library Science within three out of the nine universities offering such programs in Punjab during the period of 2010-2020, with a total of 48 PhDs awarded. This concentration suggests disparities in research activity among universities, potentially influenced by factors such as differing institutional priorities, resources, and faculty expertise. Understanding the reasons behind this concentration could inform strategies to promote research excellence and capacity-building across all universities offering PhD programs in Library Science in Punjab, ensuring equitable access to research opportunities and fostering a vibrant academic environment conducive to scholarly advancement in the field. Furthermore, it's pertinent to note that the remaining universities in the list, including Central University of Punjab, Akal University, Desh Bhagat University, Guru Kashi University, RIMT University, and Lovely Professional University, have not awarded a single PhD degree in Library Science as of 2020.

Table 4: Ranking on the basis of Ph.D. degree awarded

SN	University Name	Research Output	Ranking
1	Panjab University ,Chandigarh	19	1st
2	Guru Nanak Dev University, Amritsar	17	2nd
3	Punjabi University, Patiala	12	3rd

Table 4 showcases the three universities of Punjab based on their research output, with Panjab University in Chandigarh leading with 19 research outputs, followed by Guru Nanak Dev University in Amritsar with 17, and Punjabi University in Patiala with 12. The ranking column indicates their positions based on their respective research productivity.

Table 5: LIS Ph.D. degree in comparison with total Ph.D. degree awarded

SN	Name of university	Ph.D. awarded till 2020	Ph.D awarded during the year 2010-2020	Ph.D awarded in LIS till 2020	Ph.D awarded in LIS during the year 2010-2020
1	Guru Nanak Dev University, Amritsar	2015	995	32	17
2	Panjab University, Chandigarh	9260	1348	61	16
3	Punjabi University, Patiala	3130	2269	27	12
	Total	**14405**	**4612**	**120**	**45**

Table 5 reveals data on research output from three universities: Guru Nanak Dev University, Amritsar; Panjab University, Chandigarh; and Punjabi University, Patiala. This table provides a comprehensive overview of the research output of each university, with specific focus on research in the field of library science during the specified timeframe of 2010-2020. In Guru Nanak Dev University, Amritsar.

Table 6: Details of Ph.D. degree awarded in LIS in Guru Nanak Dev University, Amritsar during the year 2010-2020

SN	Name	Title of Ph.D thesis	Supervisor	Year of Award of Degree
1	Randhawa, Sarwan Singh	Electronic Databases And Their Impact On The Libraries With Special Reference To Canada	Amritpal Kaur	2011
2	Singh, Gurmeet	A Survey Of Resources And Services Of Polytechnic College Libraries Of Punjab And Chandigarh	Chopra, H S	2011
3	Chauhan, Surender	Digitization Of Resources In University Libraries In India	Chopra, H.S.	2012
4	Kulvir Kaur	Role Of University Libraries In Support Of Social Science Research	Amritpal Kaur	2012
5	Sarman	Information Literacy Among The Students Of Universities In Punjab And Chandigarh In The Electronic Environment	Amritpal Kaur	2013

6	Prabhjot Kaur	Information Seeking Behaviour Of Scientists In The Electronic Information Age	Amritpal Kaur	2014
7	Jatinder Singh	Information Seeking Behaviour Of The Sports Persons And Scientists Of Delhi And Punjab With Special Reference To The Use Of Information Technology	Satija,M.P.	2014
8	Sukhdev Singh	Preservation And Conservation Of Manuscripts And Rare Documents In National Archives Of India And National Mission For Manuscripts	Narang, Asha	2015
9	Sheela Devi	Service Quality In University Libraries In Haryana	Amritpal Kaur	2015
10	Navdeep Singh	Role Of Indest Consortium In Supporting Engineering Education And Research	Satija, M.P.	2016
11	Sangeeta	Research Productivity In Sciences In The Universities Of Punjab	Amritpal Kaur	2016
12	Jatinder Kumar	Bibliometric And Webometric Study Of Open Access Journals In Mathematics 2006 To 2010	Narang, Asha	2017
13	Satwinder Pal Kaur	Information Seeking Behaviour Of The Medical Professional In Electronic Era Medical Institutions Of Punjab	Amritpal Kaur	2017
14	Jagjit Singh	Role Of Cera In Supporting Agriculture Educational And Research. A Study Of Agricultural Universities Of Punjab, Haryana And Himachal	Amritpal Kaur	2017
15	Gurjeet Kaur	Citation Analysis Of Thesis In Social Sciences Submitted To Punjabi University In Patiala	Amritpal Kaur	2018
16	Surinder Singh	Reading Habits Of Post Graduate Students In The Electronic Era. A Survey Of Colleges Affiliated To Guru Nanak Dev University.	Amritpal Kaur	2018
17	Navneet Kaur	Use Of E-Resources By The Faculty Members And Pg Students. A Study Of Medical Colleges Of Punjab And Chandigarh	Amritpal Kaur	2019

Table 7: Details of Ph.D. degree awarded in LIS Punjabi University, Patiala during the year 2010-2020

SN	Name	Title of Ph.D thesis	Supervisor	Year of Degree awarded
1	Singh, Nirmal	A Study Of The Use Of Libraries Of Colleges Of Education In Punjab	Kaur, Trishanjit	2010
2	Jaspal Kaur	Information Technology Application And Level Of User Satisfaction In Degree College Libraries In Chandigarh: An Analytical Study	Singh, Jagtar	2012
3	Khushpreet Singh	Electronic Journals On Library And Information Science Available Via The Internet: A Critical Study	Dr. Jagtar Singh	2013
4	Nagi, Sukhjagneet Singh	Electronic Journals In Library And Information Science: A Bibliometric Study	Kalra, Harinderpal Singh	2014
5	Kaur, Navkiran	Role Of Medical College Libraries In Health Information Literacy In Punjab And Chandigarh An Analytical Study	Kaur, Trishanjit	2014
6	Gian Singh	Growth Development And Use Of Dr. Ganda Singh Punjabi Reference Library A Study	Kalra, Harinderpal Singh	2015
7	Sarbjot Kaur	Integration Of Learning Objects In Select Open Universities In South Asia A Comparative Study	Jagtar Singh	2016

8	Walia, Ritu	Collection Management In Select College Libraries In Delhi A Study	Kalra, Harinderpal Singh	2016
9	Kulveen Kaur Ahuja	Use Of E-Resources In Agricultural University Libraries Of Punjab, Haryana And Himachal Pradesh: An Analytical Study	Dr.Kiran Kathuria	2018
10	Monika Saini	Information Technology Application And User Satisfaction In Libraries Of Dav Colleges In Haryana: An Analytical Study	Dr. Baljinder Kaur	2019
11	Harvinder Kaur	Occupational Stress Among Library Professionals Working In Universities Of Punjab And Chandigarh	Dr. Kiran Kathuria	2019
12	Nirmal Chandra Uniyal	Media And Information Literacy In IITs In North India: An Analytical Study	Dr. Baljinder Kaur	2019

Table 8: Details of Ph.D. degree awarded in LIS Panjab University, Chandigarh during the year 2010-2020

SN	Name	Title of Ph.D thesis	Supervisor	Year of Award of Degree
1	Kumar, Shiv	Use Of Online Public Access Catalogue In University Libraries Of Chandigarh And Punjab A Study	Vohra, Ranjana	2010
2	Sharma, Neelam	Automation And Digitization Of University Libraries A Study Of University Libraries Of Northwest India	Vohra, Ranjana	2010
3	Chakravarty, Rupak	Developing Open Access Institutional Repositories For Scholarly Communications Role Of University Libraries In India	Mahajan, Preeti	2010
4	Sharma, Aarti	Conservation And Digitization Of Manuscripts In University Libraries In India	Vohra, Ranjana	2011
5	Kumar, Parveen	Management And Utilisation Of Newspaper Libraries In Chandigarh Delhi And Punjab	Mahajan, Preeti	2011
6	Bansal, Jivesh	Information Seeking Behaviour Of The Agricultural Scientists In The ICAR Establishments Of North Western India In The Electronic Environment A Study	Chopra, H.R.	2012
7	Gupta, Manisha	Information Seeking Behaviour Of Visual Artists In North Western India A Study	Mahajan, Preeti	2012
8	Sumi, Suman	Community Information Needs And The Informational Infrastructure Of A Highly Literate Himalyan Community Of District Hamirpur H P	Promila, Promila	2012
9	Kumar, Suresh	UGC Infonet Digital Library Consortium And The Social Science Research Output Among Select Indian Universities An Impact Study	Mahajan, Preeti	2013
10	Singh, Neeraj Kumar	Radio Frequency Identification Technology Applications In Library And Information Centres A Study Of Northern India	Mahajan, Preeti	2014
11	Chhatwal, Anita	Information Seeking Behaviour Of Social Science Faculty A Study Of Universities Of Punjab Haryana And Chandigarh	Mahajan, Preeti	2014
12	Kaur, Har	A Scientometric Analysis Of Medical	Mahajan, Preeti	2015

		Research Output In India		
13	Sharma, Jyoti	Research Output Of Library And Information Science Faculty A Bibliometric Study Of Select North Indian Universities	Chakravarty, Rupak	2016
14	Har Singh	Collection Development In University Libraries Problems And Prospects A Study Of The Universities Of Punjab Haryana And Chandigarh	Mahajan, Preeti	2016
15	Singh, Neeza	Information Seeking Behaviour Of Children In State Central Libraries Of North India	Vohra, Ranjana	2016
16	Kaushal, Shivani	Usage Of The N LIST E Resources An Evaluative Study Of Select Degree Colleges Affiliated To Panjab University Chandigarh	Chakravarty, Rupak	2017

Analytical Study

Table 9: Research Data Summary from 2010 to 2020

SN	Name of University	Ph.D. Awarded	Ph.D Registered
1	Panjab University, Chandigarh	16	19
2	Punjabi University, Patiala	12	24
3	Guru Nanak Dev University, Amritsar	17	0
	TOTAL	**45**	**43**

Table 10: Trends in LIS Research conducted in Universities for the year 2010 – 2020

SN	Keywords	Panjab University Chandigarh	Punjabi University Patiala	Guru Nanak Dev University, Amritsar	Trend
1	Information Seeking Behaviour	4		2	6
2	E-resources	1	2	2	5
3	Collection Management	2	1	1	4
4	Digitization	3		1	4
5	Information Literacy		2	1	3
6	Bibliometric	1	1	1	3
7	Information Technology		2		2
8	Citation			1	1
9	Consociam			1	1
10	Electronic Database			1	1
11	Information Sources	1			1
12	Learning Objects		1		1
13	Library Automation	1			1
14	Library Professional		1		1
15	OPAC	1			1
16	Reading Habits			1	1
17	Reference Library		1		1
18	Research Productivity			1	1
19	Resources			1	1
20	RFID	1			1
21	Sciencometric	1			1
22	Service Quality			1	1
23	Social Sciences			1	1
24	Use of Library		1		1

25	Webometric			1	1
	TOTAL	**16**	**12**	**17**	**45**

Table 10 reveals about the trends of research conducted in Library and Information Sciences in the three universities of Punjab i.e. Panjab University, Chandiagrh, Punjabi University, Patiala and Guru Nanak Dev University, Amritsar. After analyzing the data we found that in Panjab University, Chandigarh, research conducted in LIS on Information seeking behavior is 4 times and on Digitization is 3 times out of the 16 research conducted during 2010-2020.

In Punjabi University, Patiala, research conducted in LIS on E-resources, Information Literacy and Information Technology is 2 times each out of the 12 research conducted during 2010-2020.

In Guru Nanak Dev University, Amritsar, research conducted in LIS on Information Seeking Behaviour and E-resources is 2 times each out of the 17 research conducted during 2010-2020.

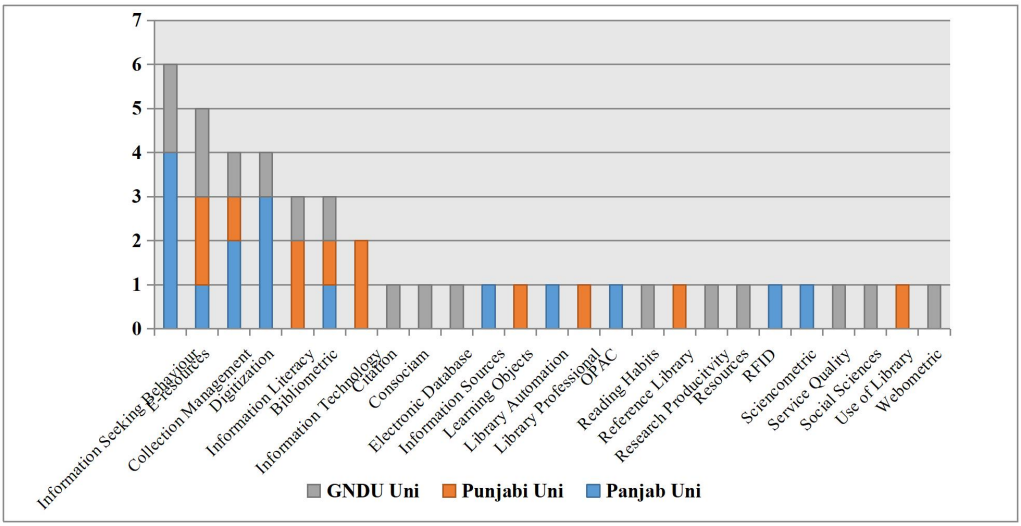

Figure 1: Topic-wise Distribution of PhD Thesis in Selected Three Universities

In overall analysis of data reveals about that Information seeking behavior is the most occurring trends in overall research conducted in all the three universities of Punjab. It appears 6 times. While research conducted on E-resources, Collection Management, Digitization, Information Literacy and Bibliometric appears to be 5, 4, 4, 3 and 3 times respectively.

Table 11: Top Trend

SN	Keywords	Trend	Rank
1	Information Seeking Behaviour	6	1st
2	E-resources	5	2nd
3	Collection Management	4	3rd
4	Digitization	4	3rd
5	Information Literacy	3	4th
6	Bibliometric	3	4th

7. CONCLUSION

The study has emphasized the perspective of the research activities in library and information science in three universities of Punjab. So far, 2219 Ph.D. these were produced in the LIS subject in all universities of India out of which 45 Ph.D. Degrees were awarded in Guru Nanak Dev university, Panjab University, Punjabi University and 43 no of research is going on in the same universities. These were produced in the field of Information Seeking Behaviour/E-resources/ Collection Management/ Digitization/ Information Literacy/ Bibliometric. To any research productivity the contributions of the researcher and their supervisor is highly significant.

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9. APPENDIX

Name of University	No. of Degree Awarded	Name of University	No. of Degree Awarded
Alagppa University	57	Manonmaniam sundaranar University	110
Aligarh Muslim University	70	Mewar University	1
AMET University	9	Mizoram University	1
Andhra University	4	Mohan Lal sukhadia University	4
Annamalai University	44	Monad University	1
Assam University	8	Mother Teresa Women University	12
Awadesh Pratap singh University	1	NIMS University	4
Babasaheb Bhim Ambedkar University	13	Madhav University	2
Banaras Hindu University	8	Madhaya University	1
Banasthali Vidyapith University	8	Madurai Kamraj University	49
Banglore University	6	Maharaja Krishnakumar Singh Bhavnagar University	9
Bharathiar University	85	Maharaja Sayairao University of Baroda	10
Bharathidasan University	60	North- Eastern Hill University	39
Bharati Vidyapeeth Deemed University	1	North Maharasthtra University	3
Bundelkhand University	24	Osmania University	5
C.U Shah University	1	Punjab University	53
Dr. Babasaheb Ambedkar Marathwada University	60	Periyar Maniammai	3
Dr.Babasaheb Ambedkar open University	14	Periyar University	21
Dr.Babasaheb Ambedkar Agra University	13	Pondicherry University	4
Dr.C.V Raman University	14	Pt.Ravishankar Shukla University	14
Dr. Hari Singh Gaur Vishwavidhyala	3	Punjabi University	11
Dr. Rammonohar Lohia Avadh University Faizabad	1	Rabindra Bharti University	7
Galgotias University	2	Rabindranath Tagore University	1
Ghauhati University	58	Rai University	10
Gondwana University	2	Sri chandrasekharendra Saraswati Viswa University	13
Gujrat University	4	Sri Krishnadevaraya University	31
Gujrat Vidyapith	16	Sri Venkateswara University	79
Gulbarga University	29	Swami Vivekanand University	2
Guru Ghasidas University	23	Swami Mahathwada University	13
Guru Nanak Dev University	15	Tamil University	1
Hemchandracharya North Gujrat University	2	Tata Institute of social science	5
Hindustan University	6	The Gandhigram Rural Institute	7
IIS Deemed to be University	1	The Universityof Burdan	37

Indra Gandhi National open University	11	Tilak Maharastra vidyapeeth	46
Integral University	6	University of alcutta	23
Javadpur University	26	University of Calicut	32
JECRE	1	University of Delhi	4
Jiwaji University	23	University of Jammu	12
Kalasalingam	1	University of Kalyani	22
Kannur University	1	Universityof Kasmir	11
Karnataka State women's University	14	University of Kerala	24
Karnataka University	106	University of Kota	1
Karunya University	11	University of Luckhnow	5
Krantiguru Shyamji Krishna Verma Kachchh University	3	University of Madras	31
Kuruksetra University	25	University of Mumbai	6
Kuvempur University	17	University of Mysore	69
Mandsaur University	4	Utkal University	29
Mangalayatan University	4	Veer Narmad South Gujrat University	8
Manglore University	36	Vidyasagar University	20
Manipur University	28		

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Braille Literacy and Skills Development in Modern Era

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ABSTRACT

In the digital era, the significance of Braille literacy and the provision of accessible library services for individuals with visual impairments are more crucial than ever. Libraries play a pivotal role in promoting Braille literacy by offering a wide range of technology services tailored to Braille users. These services include accessible digital formats, Braille printers, Braille displays, assistive technology tools, Braille transcription services, training, and collaborations with blind and visually impaired organizations. By embracing technology and incorporating digital solutions, libraries can enhance the accessibility and inclusivity of their services for Braille users. Digital formats and devices allow for the seamless conversion of materials into Braille, enabling individuals with visual impairments to access printed materials independently. Braille displays and assistive technology tools further empower Braille users to engage with digital content and navigate library resources efficiently. Moreover, the provision of Braille transcription services and training programs ensures that Braille users receive the support and guidance needed to utilize technology effectively. Collaborations with blind and visually impaired organizations help libraries stay informed about the latest advancements in assistive technology and best practices in serving the Braille community. In this digital era, the commitment of libraries to promoting Braille literacy through innovative technology services is vital for fostering accessibility and inclusion. By embracing digital solutions and enhancing their offerings for Braille users, libraries can create a more inclusive and equitable environment that ensures individuals with visual impairments have equal access to information and resources. Through these efforts, libraries can play a pivotal role in advancing Braille literacy and empowering individuals with visual impairments to thrive in the digital age.

Keywords: *Braille Literacy, Braille Education, Disability rights, visually impaired*

1. INTRODUCTION

Visually impaired people have the same information needs as sighted people. As the sighted people have the curiosity to gain information and news from all over the world via newspapers, books, radio, television and Internet etc. therefore, things are not easy for print disabled and visually impaired people in comparison to sighted people. Hence invention of Braille comes into existence. Louis Braille invented the Braille tactile writing system for people who are visually impaired and is typically written on embossed paper. For visually impaired people, reading refers to Braille reading through touch. Reading is the most important form of learning. According to Varao Sous, reading reduces mind wandering and increases understanding. In the digital age where everything is done online, the visually impaired have a hard time trying to access digital content or read electronics, here the Braille literacy plays a crucial role for promoting visually impaired individuals to access the information. Hence, Libraries have a moral duty to make knowledge accessible to people by offering Braille literacy services typically by having specialized equipment and trained staff to facilitate the Braille production and distribution of Braille materials, educational programs, enhancing accessibility and inclusivity for all patrons and advocating for the needs of people who are blind and visually impaired. Information is essential and every library aims to provide right information at the right time and in the right format regardless of races, religion, age sex, nationality and language. According to the World Health Organization, (WHO) there are about 314 million visually impaired people globally with 45 million blinds. India is home to 26,810,557(26.8 million) disabled persons which constitutes 2.21% of the total population of the country. 5 million persons are visually impaired (disability in seeing) sharing 18.8% of total disabled persons in the country. (Census of India, 2011). At present with the help of Information Technology (IT) it is possible to provide user friendly & adequate services for these people who were neglected for a long time. International Federation of Library Association (IFLA) and United Nations Educational, Scientific and Cultural Organisation (UNESCO)

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in the Public Library Manifesto (1994) emphasizes that every library must provide proper services for those who do not have access to them, such as the mentally and physically disabled, the ill and the imprisoned. Moreover in the higher education sector, the University Grants Commission (UGC) is supporting universities and colleges in the country to involve in special education activities to empower differently-abled persons. The UGC had started the scheme of assistance to universities/colleges for Higher Education for Persons with Special Needs (Differently-abled Persons) (HEPSN).

Developed nations such as the United States, Canada, the United Kingdom, and other European countries began their efforts to support people with disabilities (PWD) a long time ago. By Enacting laws, creating national policies, and giving financing for libraries and information centers are some of the ways that the majority of colleges and institutes in these nations help disabled people access information. To help with information access, they have cutting-edge technologies. Such institutes are equipped with skilled personnel, infrastructure that is accessible to people with disabilities, information and communication tools, and facilities. Disability-friendly websites and portals can be found on the websites of government agencies, institutions, libraries, businesses, foundations, and NGOs. India isn't far behind in empowering its challenged citizens. It has provided all possible assistance to people with disabilities, whether through the enactment of a special Act, the implementation of a 'National Policy for Persons with Disabilities', the provision of accommodations in education, employment, government schemes and programs, the establishment of institutes and organizations, and so on. In addition to the legal framework, considerable infrastructure has been constructed, notably the 'National Institute of Visually Handicapped, Dehradun'. The Government of India has enacted three legislation for persons with disabilities viz.

i) Persons with Disability (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995, which provides for education, employment, creation of barrier free environment, social security, etc.
ii) National Trust for Welfare of Persons with Autism, Cerebral Palsy, Mental Retardation and Multiple Disability Act, 1999 has provisions for legal guardianship of the four categories and creation of enabling environment for as much independent living as possible.
iii) Rehabilitation Council of India Act, 1992 deals with the development of manpower for providing rehabilitation services (MSJE 2009).

In 2005, 'Action Plan for Inclusive Education of children and Youth with Disabilities,' the Government of India's Ministry of Human Resource Development, Department of Education stated its objective as "Recognizing Education for All Children as a Fundamental Right, to ensure the inclusion of children and youth with disabilities in all available mainstream educational settings, by providing them with the learning environment ."

2. OBJECTIVE OF THE STUDY:

i) To study the present scenario of the Braille Library system (resources, services and Infrastructure) provided to the visually challenged learners.
ii) Investigate existing library and information services for the visually-impaired Individual.
iii) The features of the various technologies that the visually impaired use in their daily lives or to access library services are covered.
iv) It describes the services offered to disabled individuals by various libraries in India.

3. LIBRARY SERVICES AVAILABLE TO THE VISUALLY IMPPAIRED PEOPLE:

In 21st century, libraries have been changed in a revolutionary way due to use of various information and communication technologies and its application in libraries, library services and products as well as library activities. Any reader can read information in any format and access it from anywhere using the ICT platform.

Libraries and information centers throughout the world have established specific information services to fulfill the library and information demands of their visually impaired members. The following section address some of the library's information center's most common resources for visually impaired people

i) **Braille Book:** It is a system of writing and reading books for Braille users in which it uses raised dots arranged in specific patterns representing letters, numbers, punctuation marks, and even

whole words. These dots can be felt with the fingertips, allowing blind individuals to read by touch.

ii) **Talking Books:** These are books in audio format that can be downloaded as e-books from the Internet or recorded for cassette, CD-ROM, DVD, or CD player. Most visually handicapped people prefer talking books.

iii) **Talking Newspaper:** similar to talking books, with the exception that daily news is now recorded in electronic format on cassettes, CD-ROMs, and DVDs that are accessed over a network.

iv) Electronic Texts: These are computer text-files. Visually impaired user can load an electronic text in computer and can read the text from computer using screen magnifying software, can print the text in large print and read it from paper, can read the text using Braille bar that is attached to the computer and can have the text read out loud by the computer, using a screen reader.

v) **Large printed materials :** In order to enable visually challenged users to effectively read papers, this service prints documents in a larger size.

vi) **Screen Magnifier:** It enlarges the content displayed on a computer or mobile device screen. It is primarily designed to assist people with visual impairments by making text, images, and other graphical elements easier to see. Key features of screen magnifiers may include:

- **Magnification level control:** Users can adjust the degree of magnification to suit their preferences and needs.
- **Pan and zoom:** Users can move the magnified view around the screen and zoom in or out to focus on specific content.
- **Color and contrast customization:** Users can often customize the colors and contrast of the magnified view to enhance readability and reduce eye strain.
- **Focus tracking:** Some screen magnifiers automatically track the mouse cursor or keyboard focus to keep important content in view.
- **Full-screen mode:** Users may have the option to magnify the entire screen for tasks that require a broader view, such as web browsing or document editing.

vii) **Screen Reader:** Screen reader software is a vital accessibility tool designed to assist individuals who are blind or visually impaired in accessing and interacting with digital content on computers, smartphones, and other electronic devices. Instead of relying on visual cues, screen reader software converts text and graphical elements into speech or Braille output, allowing users to navigate user interfaces, read text, and interact with applications through audio or tactile feedback.

- **JAWS (Job Access With Speech): Job Access with Speech (JAWS)-** JAWS is the most widely used and affordable program design that enables visually impaired people to access digital resources and function independently. These features, which were visible on displays compatible with Windows 7, 8, and 10, helped users who were blind understand the text displayed on the screen. This technology allows visually challenged people to read and print digital text in libraries and information centers. Making use of the chance to read a variety of books, journal articles, reports, etc. in libraries is highly beneficial for those in low-income situations. All visually impaired individuals can function freely with JAWS placed on their monitors.
- **NVDA (Non-Visual Desktop Access):** . NVDA is a free and open-source screen reader for Windows. A visually challenged individual can use this technology to read the text aloud in a digital voice. With a maximum of 48 languages, information may be easily accessed by anyone. It is really lightweight, requires only an easy Windows installation, and operates flawlessly. It is useful for keeping up with document preparation tasks including writing, creating excel sheets, getting mail, and surfing the web in addition to accessing web pages, offering features similar to commercial alternatives.
- **Voice Over:** It allows visually impaired readers and students to access written documents on the screen in an audible format that talks loudly. It can also display other information like message, calling, and battery level, and is connected to the Wi-Fi network much like a smartwatch.
- **Talk Back:** Developed by Google, Talk Back is a screen reader for Android devices, providing access to apps, navigation, and other features.

- **ORCA:** This software is a free and open-source scriptable screen reader which gives access to many application tools. It has main extensible, flexible technology and supports AT-SPI for Linux operating systems. It enables access to a graphical desktop through speech and braille.

viii) **Plex Talk Device:** Plex device is a lightweight device with the help of which a visual impaired can read. It is a digital DAISY book player, Mp3 music player and voice recorder, which one can take anytime, anywhere and it eliminates the difficulties in the education of the low vision peoples.

ix) **Index Braille Basic D V4 Printer:** Index Braille Basic D V4 Printer is combination with JAWS. It needs to install Duxbury Braille Translating software. The text typed in MS-Word can be translated into Braille by Duxbury. Then, Braille print can be taken with the help of Index Braille Basic D V4 Printer. It is a small and portable device facilitating two-side print on paper which is mostly used in Braille embossers with high quality print resolution.

x) **Kibo XS Device**: It is a device useful for converting textbooks in accessible from for visually impaired students. The Kibo Access Device can read any printed and handwritten document in audio format. With kibo access device, they can download any translated/original documents in editable Unicode format like .doc, .docx, .txt, .zip and can also translate documents in 11 different languages i.e. Hindi, Punjabi, Gujarati, Marathi, Telugu, Tamil, Malyalam, Sanskrit, English, kannada.It is a portable device with the weight less than 400g to carry it anywhere, anytime.

xi) **Accessible Google:** Google Labs just launched a beta version of Accessible Google, a resource for the visually handicapped. T.V. Raman, a Google researcher who has been blind since infancy owing to glaucoma, designed it. Basic Google makes an effort to assist users in finding the most relevant results while conducting searches. When a visually impaired person uses a screen reader to conduct a typical Google search or any other type of search, including online catalogs, the device may take a long time to interpret the results. The searcher then tries to view the sites, but they are inaccessible. Accessible Google, on the other hand, is intended to assist visually impaired people in discovering the most accessible pages. Google claims to have collaborated with a variety of groups to assess many characteristics that make a Web page more accessible, including its simplicity, amount of visual imagery, and ability to be read using keyboard navigation and shortcuts. Librarians might include a link to Accessible Google on their websites and promote its availability through newsletters and press releases.

4. CONCLUSION

Technology has advanced in the twenty-first century, therefore visually impaired pupils can now explore their ideas and thoughts in the modern world with more direction, versatility and adaptability. Among those who wish to access information and assistive technology resources, proprietary and non-proprietary, many libraries and information centers offer a free forum. This enables individuals who are visually impaired to independently retain their knowledge at their fingertips. Individuals with visual impairments who face financial hardships can conveniently take use of library services and maintain management services like free access to electronic resources, commonly referred to as Braille books, Braille software and devices. Prior to this, the management librarian assisted students who are blind or visually impaired in developing their communication skills, which are also based on technology and support for screen reader audio-video low vision devices.

The purpose of libraries is to provide visually impaired students, teachers, and readers with a variety of assistive technologies so they can learn, teach, and read. With these technologies, they can use all the resources, products, and library amenities just like a regular reader would by creating a virtual learning environment. All libraries and information centers must abide by specific legal requirements on the use of assistive technologies to provide students with disabilities with improved library services. All reading materials must be made available by using user-friendly equipment, qualified personnel, and standard accessibility requirements. For this reason, using assistive technologies in libraries to help visually impaired readers would undoubtedly make it easier for them to integrate into the educational process and eliminate any gaps or challenges. Because of this, using assistive technologies in libraries to help visually impaired readers will undoubtedly make it easier for them to integrate into the educational process and eliminate any gaps or challenges.

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Libraries: New Cultural Identity for Global Community

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ABSTRACT

The role of libraries is continuously changing as a centre of social and cultural hub. Libraries are once regarded as luxurious privilege, and in present time it is a public necessity. This article highlights the transformation of library space from preserving knowledge to disseminating knowledge. A library as a social and cultural hub opens the gate of immense possibilities for its user and society. Libraries as an institute are fulfilling curiosity of variety of information seekers from different backgrounds. The present paper highlights responsibility of traditional libraries and digital libraries in shaping the society. The libraries at various levels have taken remarkable steps to contribute in development of society and culture. The technology and library professionals are twin pillars and pivotal in strengthening the influence of library in modern world. The libraries are emerging as a global institute with help of technology, and are integrating diverse culture around the world. The gap between "rural and urban community" and "national and international community" is blurred as libraries mobilised people for recreation, learning and research. Public libraries due to diverse outreach programs now becoming synonymous to social and cultural hub.

Keywords: *Digital Libraries, Public Libraries, Library professionals, Research.*

1. INTRODUCTION

Libraries are institution with responsibility to preserve and conserve knowledge for the user. In addition of this, libraries also have social responsibilities and functions. Library users are part of society and libraries are meant to serve society. The level of development of society depends upon access and use of knowledge. The basic function of library is to disseminate knowledge at a large scale. Library plays an integral role in formation of human resource and social capital. Knowledge democratization is a reality in modern information age. Public Library as a social and cultural centre working with vision of up to date, reliable, sustainable, and inclusive source of information to make a well informed society. A library as a social and cultural hub has a power to change the world in a constructive way. In modern era, libraries take various social and cultural initiatives to bring the peoples of diverse background at common platform and contributing in integration of society. It adopted technological innovation and visionary steps for delivery of high quality services.

2. RESEARCH OBJECTIVE

This paper focus on the following objectives:-

i) The objective paper primarily investigates the connection between library and society.
ii) What role is played by library professional and technology in delivering library services?
iii) To understand the importance of library as a global institute
iv) To evaluate the various libraries initiative for well being of society.

3. LITERATURE REVIEW

Kebede Gessesse (1986) studied the function of various types of libraries emphasizing on national development. Libraries play a major role in holistic progress of a country. Library through the various services always saves the time of reader and while doing so it also faces various problems.

UN Public Library Manifesto (1994) highlighted that well informed society and their constructive participation is determined by public libraries. It designated public libraries as living for force acting for development of human beings. The library services are equally available to all

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persons living in society. It also declared that a public library should be organised effectively to meet local community needs.

Jones & Delahanty (2011) did the study to assess how library professionals providing service to youth. Library works as a nodal centre for community activity. Libraries are nursery for shaping the youths future by providing them required services and knowledge. It also helps in developing leadership skills through activities involving community participation.

Sasi, PK (2015): studied the importance of public library in empowerment of women and discussed the significance of public library in changing lives of women of kerala Women use public library to update knowledge and skills. The purpose of visiting public library is different for different woman, and it can be considered as major finding of the study. One can notice a clear difference among women who visits public library and who does not visits public library.

Talawar Anil B, (2022) studied in detail about Importance of Public Libraries in a Multicultural Society. At a same time also highlighted Public library role in promotion of social consensus and peace with Special Reference to state of Karnataka.

4. RESEARCH METHODOLOGY

In present paper, author did exploratory research on libraries and their evolving role in social development. People from diverse background are active users of libraries. To meet research objective author did constant study of existing literature around related to library and better practices of library services. Some ideas are also taken from the policies and manifesto of major institutions like IFLA and UNESCO. The websites of Public libraries and globally recognized institutes dedicated for growth of library and mankind have been scanned thoroughly to find out the possibility of library becoming global institute. The libraries have immense potential for becoming a global centre of learning and knowledge dissemination.

5. CHANGING ROLE OF LIBARY

Information is the basis of development of human society. Humans evolved and learned to interact with surrounding and collected information. In Palaeolithic age to Neolithic age, humans generated limited information that were orally shared and can be easily remembered. As the interaction of humans with nature increased, it produced more information. It was challenging to task to share and remembering information over a long period of time. They developed art of painting, pictographic symbols and later the art of writing. As the creation of information and knowledge increased, people started collecting written information for future use or to use whenever needed. Thus the concept of library emerged. Library as institute of knowledge changed it's a role from being a information collector to information creator. Once library regarded as private luxury with limited reach but now is a public necessity. Public Libraries can be termed as backbone of social development. In individual life, information is required for development of moral, social, political character and meeting economical need. Libraries are of different types and perform different functions. The basic essence of all library services remains same "development of individual and Society." Academic library fulfils the academic need of learner. Special libraries are for special user requiring specific information. Public library is for public and fulfils the need of general user of community. Public Library supports lifelong learning.

P.N Kaula, raman Nair and OP Sharma traced the existence of public library in different time frames ranging from Indus Valley Civilization to British India. Libraries associated with various universities like Taxila, Nalanda and Vikramshila including temples are more public in nature. Libraries also acted as a culture centre was people come to hone their skills and potentials.

UNESCO published a document known as UNESCO Public Library manifesto in 1949 and updated in year 1994 at Paris. Recently it UNESCO along with IFLA updated the Public Library Manifesto in July 2022. The IFLA clearly mentions "new IFLA-UNESCO Public Library Manifesto proclaims UNESCO's belief in the public library as a living force for education, culture and

information, and as an essential agent for the fostering of peace and welfare through the minds of all people."

IFLA/UNESCO Public Library Manifesto 1994, highlighted following key task that are related to information, literacy, education and culture should be at the mainstay of public library services:

i) Creating and strengthening reading habits in children from an early age.
ii) Supporting both individual and self conducted education as well as formal education at all levels.
iii) Providing opportunities for personal creative development;
iv) Stimulating the imagination and creativity of children and young people.
v) Promoting awareness of cultural heritage, appreciation of the arts, scientific achievements and innovations.
vi) Providing access to cultural expressions of all performing arts.
vii) Fostering inter-cultural dialogue and favouring cultural diversity.
viii) Supporting the oral tradition.
ix) Ensuring access for citizens to all sorts of community information.
x) Providing adequate information services to local enterprises, associations and interest groups.
xi) Facilitating the development of information and computer literacy skills.
xii) Supporting and participating in literacy activities and programmes for all age groups, and initiating such activities if necessary.

6. LIB RARY PROFESSIONALS AND TECHNOLOGY

ALA Glossary of Library and Information Science identified librarianship as "the profession concerned with the application of knowledge of media and those principles, theories, techniques and technologies which contribute to the establishment, preservation, organisation, and utilization of collections of library materials and to the dissemination of information media" (Young H, 1983).

S.R Ranganthan had identified trinity of library as a "book' reader 'and staff." This trinity is perfect for the traditional library where for availing the service of library physical presence is essential. The physical presence of trinity is prerequisite condition in traditional library. This required a good library buildings, well trained library professionals, book collection and study facilities. In spite of all the efforts, physical accessibility of library was limited to few users or community. Previously, library extension services are only way to provide library services at remote areas. In 20th Century due to emergence of modern Information and Communication Technology, with help of relevant technologies library services are now delivered without physical presence of Rangnathan's trinity. The library collections are now available in both electronic and physical from. In present time library user are shifting towards electronic resources and also demanding printed documents at a large scale. . The library resources are digitized and library professionals are well trained to meet the expectations of modern users and traditional users at same time.

The aim of librarianship is so serve the society through its collection and technology is the perfect vehicle to serve the purpose of librarianship. Jones and Delahanty mentioned the role of library professionals in providing community services. A proper training of library professionals and right technology can solve the space and information resources shortage of library. Information and Communication Technology is the medium to make library available at every door step.

The traditional libraries are in the era of transformation and are moving ahead to become a digital library. Clifford Lynch (1995) elucidated digital library as "a system providing a community of users with coherent access to a large, organized repository of digital information and knowledge. The digital library is not just one entity, but multiple sources seamlessly integrated." Paperless service and service to all are twin long terms objective of digital library. Modern technologies automated the traditional library functions enabling high quality and quick delivery of services. Library automation means the use computer technologies for traditional library functions like acquisition, classification, cataloguing, references, circulation and serial control. The digital library extends facilitate to manual

libraries activities to get automated with existing resources. The digital libraries create a huge possibility for information storage and information retrieval with progress in technology.

7. LIBRARY AS A GLOBAL CENTRE OF CULTURE

Globalisation is often seen as a dynamic phenomenon aiming to integrate the world socially, culturally, economically and politically. Global society is a certainty. The technological advancement connected the all corners of world together leading to standardization of academic knowledge and information. Globalisation leads to the formation of global society. In the era of blurred international boundaries, public libraries are recognised as a global institute. Libraries are promoting global exchange of information for benefit of mankind leading to economic prosperity and self-reliance of global community. The idea of IFLA is "a strong and united library powering literate, informed and participative societies**."** UNESCO established in 1946, with the concrete aim of working 'to promote peace, and social and spiritual welfare by working through the minds of men'.

Both institutions have acknowledged the role of library for international community. In the year 1947, UNESCO acknowledged that Public library ought to 'open the doors and distribute the stored-up knowledge.' Robert L. Hansen, a Scavendinavian librarian identified that libraries are playing an important role in convalescing the inhabitants. Libraries exist at a junction of culture, civilization, education, and society, and by this, they become a centre for nurturing cross-cultural exchange of ideas and active citizenship.

Functions of Libraries are dynamic. Along with the academic learner and researcher, libraries also provide opportunities to integrate diverse user coming from different backgrounds. It is also platform for cultural and social exchange and gathering. Information leads to economic development and prosperity of a nation. Better practices and ideas around the world can be found at one place and that place is library. IFLA and UNESCO are working together to promote and harness the capability of libraries a global institute and culture capital.

Libraries are a cornerstone of global progress, empowering communities through knowledge and inclusivity. Some remarkable aspects of libraries as a global institution include: universal access to information, a vast network of international partnerships, and a commitment to diversity and inclusivity. Libraries also preserve cultural heritage, embrace digital transformation, and serve as community hubs. Additionally, they collaborate on various global initiatives, contribute to UN Sustainable Development Goals, prioritize professional development, and celebrate international literacy events. By fostering literacy, education, and community development, libraries have become an indispensable part of our global village.

8. LIRARY INTIATIVES FOR SOCIETY

Libraries have transformed into dynamic catalysts for social change, cultivating inclusive environments that empower individuals and bridge societal divides. By offering diverse resources and welcoming spaces, libraries foster literacy, education, and access to information, thereby enhancing employability and economic scenario. They also serve as effervescent community hubs, hosting cultural events, workshops, and thought-provoking discussions that promote social cohesion and address pressing issues like mental wellbeing, diversity, and environmental stewardship. Through outreach initiatives and strategic partnerships, libraries extend their reach to marginalized populations, advancing social equity and inclusion. By harnessing technology and collaborative spirit, libraries drive social progress, nurturing informed, connected, and resilient communities that are well-equipped to thrive in the 21st century.

According to UNESCO, libraries are essential for fostering inclusive and knowledgeable communities. They provide safe spaces for social connection and community engagement, bridging gaps between diverse populations. Libraries address pressing social issues like literacy, education, and economic inequality through innovative programming and outreach initiatives. Leveraging technology and digital resources, libraries connect marginalized communities with vital information and opportunities. For example, the Rural Library Project in Africa provides access to information and

education for rural communities, while the Library for All initiative in Australia promotes literacy and education for Indigenous peoples. Through their commitment to social progress, libraries drive positive change and shape a more just and equitable society for all. Libraries are acting as a champion of community development; emancipating individuals and communities to flourish.

Rural libraries with help of funding and guidance also upgraded themselves. Rural libraries equipped with advanced technology acting as a catalyst for development of rural community. Public library played major role in development of backward regions throughout the world. It also helped to combat the problem of gender discrimination by empowering females. PK Sasi (2015) discussed the role of public libraries on women empowerment in Kerala. A society where individual and group can utilise their capabilities and opportunities for beginning a new life of higher standard, and contributing in society with novel responsibilities is possible with global use of Information and telecommunication technologies.

The library has exceeded its traditional role as a mere repository of books to emerge as active social and cultural hub. It now serves as a dynamic gathering space and platform where individuals from varied backgrounds assemble to engage in intellectual discussions, cultural events, and community activities. The library's walls have become a canvas for local artists, showcasing their work and fostering a sense of community pride. Moreover, it has become a haven for marginalized voices, providing a platform for underrepresented groups to share their best practices and experiences. Through its innovative programming and inclusive environment, the library has evolved into a beacon of social connection, creativity, and cultural exchange, empowering individuals to build meaningful relationships and a stronger sense of community.

9. CONCLUSION

Library enables and gives opportunities to people for social and cultural engagement. A library doesn't discriminate between its users but offers a common platform for social improvement and lifelong learning. McColvin believes that .public library must give children, young people, men and women the opportunity to keep in touch with their times, in every sphere. It introduces its user with variety of idea and key concept and nurtures them to create their own opinion and understanding. Libraries offers platform for positive criticism and sharing of innovative ideas. They are supposed to be free from biasness, prejudices and censorship. Since their inception they promote inclusive and cooperative environment in community with equal opportunity for growth and development of everyone. A 1956 IFLA memorandum on the importance of public libraries states, public library "should promote and sustain freedom of thought and action, individual development, and the good of the individual and the community. It is essential that nothing should be done to deny the principles of free choice and liberty of thought; and that due regard should be paid to the differing needs and abilities of potential reader."

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Librarianship and Role of Professional Ethics in ICT Era

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ABSTRACT

This paper highlights the role of modern librarianship with special emphasis on ethical values involved in library profession. In modern library, the role of Library professionals revolves around the technology. A modern librarianship requires the command over current technological practices to deliver library services to user. Professional ethics are core value that sustains modern librarianship. The ethical values urge Library professionals to keep high quality and quick service as top priority. Ethics is important at both personal and professional level to maintain the spirit of librarianship. Rangnathan's five laws of library science give an explicit code of conduct for library professional to serve library user and improve library services. Ethics for modern librarianship is the centre of discussion across the world. Information and communication technology poses a variety of challenge like copyright, authenticity, accountability, privacy, equality of access of information, etc. to libraries and librarianship. Librarianship is a service to humanity and professional ethics is vessel to distribute library services with integrity.

Keywords: *Librarianship, professional, professional ethics, library user, Information and communication technology.*

1. INTRODUCTION

Librarianship is a dedicated bridge to connect library services to its user. Library professional requires multi dimensional skills like better communication ability and technological proficiency. Librarianship plays a crucial role in determining what service and will meet information meet the need of user. In modern era, information is key for generating wealth and development. Thus modern librarianship is dynamic activity fostering equitable dissemination of information and knowledge content. Librarianship is as a profession involves a daily routine associated with identification, acquisition, classification, conservation, preservation and dissemination of knowledge in community. Information society heavily depends upon information sources but finding correct source of information is a challenging task due to information explosion. The expertise of modern librarians comes in handy to filter out the unnecessary information. Librarianship also concerned with ethical issues like privacy and identity of their users. Ethical values and code of conduct guides modern librarianship. The beauty lies in the fact that modern librarianship and library services needs to get improved on a regular basis. Librarianship is a team activity that requires active participation of their library professional staffs. Providing their user, irrespective of their identity and background, along with the liberty and right to access information and essential participation in development process is fundamental to modern librarianship.

2. RESEARCH OBJECTIVE

i) The central purpose of the paper is to emphasize the role and function of "Library Professionals" in providing library services.
ii) This article tries to find out the ethical issues involved in modern librarianship.
iii) This study analyses role of librarianship keeping Rangnathans's five laws of library science in centre.
iv) The objective of study is to discuss the emerging challenges faced by library professionals due to utilization of Information and Communication Technology (ICT) in library field.

3. LITERATURE REVIEW

Ranganathan, S. R. (1931) discussed the librarianship with his famous "five laws of library science." He found that the purpose of library is to serve humanity and in each law is direction to library professionals to serve humanity. The first law is first step of librarianship to ensure proper

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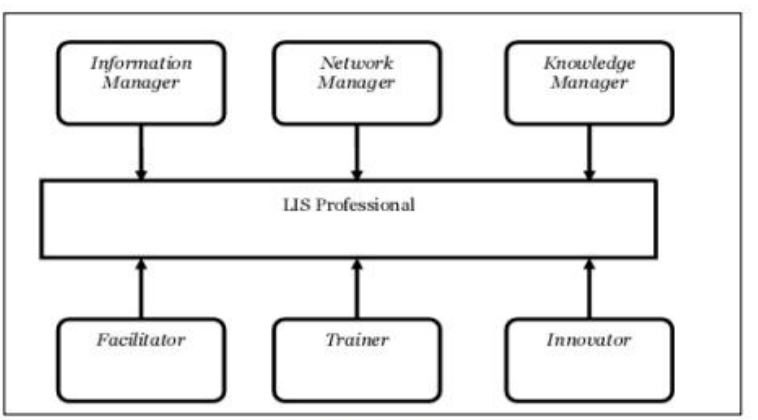
utilization of library materials. The modern librarianship follows the fifth laws and keeps their role evolving as per technology and expectations of user. This process of technological advancement and changing need of user makes library professionals dynamic. IFLA Code of Ethics identifies that a Librarians and other information workers focus on development of access of information for all of individual and collective development. Librarianship shouldn't create any barrier for accessing information for the user. In fact librarianship connects all user to accurate and reliable source of information. Maganand (1962) argued that like other professions, library profession must have own professional ethics. Ethics should also be the party of library curriculum to develop a sense of morality and responsibility among librarians. This (Kumar & Singh, 2019) is a case study on role of ICT in library and information science education. A lot of challenges coming in LIS and for library professionals due to development in ICT like automation, digitalization, e-learning, digital resource sharing etc Library professionals are also updating themselves to meet this challenges in future. Authors (Kumar P.S.G, 2003) in book discussed the intent of professional ethics in field of library science. Dedicated library services to user and neutrality of library professionals are two important aspects of professional ethics of librarians.

4. RESEARCH METHODOLOGY

This study follows exploratory literature review. The information is collected from the various books, Google Scholar, Sodhganga, nation and international journals and from official websites of recognised national and international institutes. Through cautious investigation and personal observation, study seeks to explore the ethical issues involved in librarianship and challenged faced by library professionals appear due to ICT.

5. LIBRARIANSHIP

A library is collection of book and non-book material and centre of knowledge for lifelong learning while librarianship is caretaker and protector of library collection and material. Like other professions librarians also need expertise for acquiring, classifying, cataloguing and preserving knowledge. Library professionals work to achieve the objectives of Rangnathan's five law of library science. It involves planning, directing, leading and delivery of library services to serve the library users actively. Library professionals are salesman of library services. They are not associated with performance of single task but it is a collective team work. A library is known for variety of activities and librarianship is multifaceted profession. Better communication skills and knowledge of ICT are integral part of librarianship.



Multifaceted LIS Professional
(adopted from Soudararajan, E. and Oth. 2007.)

Figure 1

Dr. S. R. Ranganathan, put a greater emphasis on librarianship in India, and declared, "The library profession is a noble profession. It can do no harm to anybody."The field of librarianship has

revolutionized recently, guided by technological advancements and changing user expectations and need. As information professionals, librarians often face ethical dilemmas associated to privacy, intellectual property rights and equitable access to information. The fundamental objective of librarianship is to connect the knowledge with user and user with knowledge. It empowers society and equips with updated knowledge.

6. PROFESSIONAL ETHICS AND LIBRARIANSHIP

The Random House Dictionary of English Language (RHD) defines, "a Professional is one who is engaged in an activity as a means of livelihood or for a gain or pertaining to or connected with a profession."

Webster's International Dictionary defines Ethics as:

- The discipline dealing with what is good and bad or right and wrong with moral duty and obligation;
- A group of moral principles or set of values; a particular theory or system or moral values; the principles of conduct governing an individual or a profession; standards of behaviour.
- The adjective 'Ethical' connotes conformity to professionally endorsed principles and practice or a system/philosophy of conduct and principles practiced by a person or group.

Simply, ethics is a set of moral principles that a one has to consider in daily while performing their daily activity and decision making. Professional ethics is also collection of moral principles that are required to follow in particular occupation. In words of IFLA, professional ethics means "a collection of professional guidelines for librarians and other library employees adopted by national library or librarians associations or implemented by government agencies"

IFLA is a pioneer global institute working for library, librarianship and library services. It prepared a standard code of ethics for librarians. This code of ethics acts as a model ethical code for librarians around the world. It inspires nations and library organisation to draft their own code of ethics for library professionals. IFLA's Code of "Ethics for Librarians and other Information workers" core principles for the work of library and information professionals include:

- Ensuring access to information for all for personal development, education, cultural enrichment, leisure, economic activity and informed participation in and enhancement of democracy.
- Rejecting censorship in all its forms.
- Ensuring that the right of accessing information is not denied to anyone, regardless of their age, citizenship, political belief, physical or mental ability, gender identity, heritage, education, income, immigration and asylum-seeking status, marital status, origin, race, religion or sexual orientation.

Like other professions, ethics plays an important role in librarianship. Library professionals are custodian of knowledge and information. Ethics is important for performing routine activities of library. Library professionals are involved in book acquisition, classification, cataloguing conservation and preservation of subject knowledge. Ethical values guide librarianship to perform duty with utmost sincerity and ensure active participation in the process of dissemination of knowledge.

In 1986 the Joint Council of Library Association (JOCLAI) in India accepted a set of professional ethics for Indian Library and Information Professional. It presented Library and Information profession as a dedicated service-oriented profession that follows democratic attitude.

7. RANGANATHAN'S FIVE LAWS OF LIBRARY SCIENCE AND LIBRARIANSHIP

Late Dr. S.R Ranganathan wanted to form some basic principles for the field of library science. Then he came with idea of "The Five Laws of Library Science." Ranganathan discussed his five laws of library science initially in 1928 in a conference of teachers held in the Meenakshi College, Annamalainagar. The five laws of library science published in the book form in 1931. The Rangnathan's five laws of library science is revised and presented in different forms by various author in various time frame. However, this paper discusses the five laws of Library Science as visualized by Ranganathan.

i) **Books are for use:** The first law library science leads to the basic foundation of library profession. This law implies that a library professional should adopt methods that promote regular use of library collection. It gives emphasis on library location, library hours, library

infrastructure, and behaviour of staff. The combination of library trinity that is book, reader and staff are integral part of first law.

ii) **Every person his or her book:** This law gives a responsibility to authorities to develop a library to meet requirement of reader. It expects that a library professional performs duty with honesty by maintaining the quality in collection of information material and also in delivery of services. This advocates the equitable access of information to all.

iii) **Every book its reader:** This law gives books immense importance. Books have also right to get used by user. This explicitly mentions that a librarian professionals work in providing open access in library. The success of librarianship is directly related with constant use of library materials. Cataloguing, reference service, and extension services makes library science profession multidimensional.

iv) **Save the time of the reader:** Time is the new currency in modern world. Timely accessibility of information can make a huge impact on individual development and social development. Fourth law is a clear direction to library professional to design library services in such way that it doesn't waste a single second of user.

v) A library is a growing organism: The fifth law of library science is a limitless. Library profession is organised in last few decades to information explosion. Librarianship dealt with only physical collection of resources and delivery of services in previous century. Due to advent of ICT, library evolved and library services diversified. ICT enabled transformation traditional library and their collections into digital library and digital resources. It gives opportunity to librarianship to learn new techniques and practices of ICT to enhance professional skills.

8. ICT AND CHALLENGES TO LIBRARIANSHIP

ICT is wing for librarianship that makes them to fly. Use of ICT in library field is innovative approach that is welcomed by all. Computer and internet impacted every activity of library and library profession. The motto of library is service to humanity and information to all. ICT is way to accomplish the motto of library. ICT has huge potential to make information available on finger tips of user. Space and infrastructure is major issue in expansion of library. Digitalization of library resources can overcome these problems. Digital libraries provide service to large number of user in limited time.

Arrival of ICT in library field creates newer challenges to librarianship. Some of the major issues are

- No well defined standard for information available on internet.
- Copyright and license often hampers free flow of information
- Digital divides creates inequality among user.
- Lack of expertise in modern technologies restricts the online growth of libraries.
- Maintaining the privacy of user
- Online Censorship is imposed by undemocratic governments.
- Creating safe learning environment

9. ROLE OF LIBARINSHIP IN SOCIETY

Librarians throughout the world have realized the importance of professional ethics. Around 60 countries of various continents formed and got approval for a national code of ethics for library professionals. Librarianship in modern era is having more responsibility for meeting the user expectations. Both professional integrity and neutrality are important characteristics of modern librarianship. They are crucial in for inclusive growth and equitable accessibility of information by eradicating prejudices. Lifelong service with smile is need of time. Library is a public resources and librarians helps marginal sections of society to access information. A little effort made by library professionals has potential to create a major difference in future. Library basically helps people to know their rights and creates a sense of civic awareness. In democratic era, library has potential to transform the society by correct and timely access of information. It provides a platform to society for social and cultural dialogue. Modern librarianship take care of libraries and by various initiatives develops reading habits and vocational skills among different user. It also helps in providing reliable and authentic information to the local community. Information professionals encourage people to be

the active part of information society. Library is modern information centres of knowledge and information and librarianship way to access desire information and knowledge.

10. CONCLUSION

"Information is for use" is basic principle that librarianship justifies. Modern librarianship requires a profound understanding of ethical principles and a pledge to ongoing education and professional development. As information professionals, librarians must navigate complex ethical dilemmas related to privacy, intellectual freedom, and access to information. By staying up-to-date with technological advancements and ethical considerations, librarians can continue to play a vital role in promoting literacy, lifelong learning, and social justice. R. L Mittal's 'Seven Lamps of Conduct' for library professionals also seeks to bring excellence in librarianship. Ethical values create a sense of responsibilities in any profession. Librarianship is the gatekeeper of knowledge. It is pious responsibility of library professionals to serve all who seeks information and make information available at doors of all marginalised people. Librarianship is a profession that requires continuous enhancement of skills and knowledge. The Rangnathan's five laws are still relevant and are source of ethical values of librarianship.

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The Influence of Artificial Intelligence on Library Services: Enhancing Access, Discovery, and User Engagement

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ABSTRACT

The evolving landscape of artificial intelligence (AI) holds the potential to reshape library services, offering novel avenues to enhance user engagement, accessibility, and information discovery. This study delves into the transformative impact of AI on libraries, examining how these technologies revolutionize user interactions and utilization of available resources. Specifically, the research explores the applications of AI in library services, with a focus on data analytics, virtual assistants, intelligent search and discovery systems, content curation, and accessibility enhancements. It investigates how AI can bolster security measures, streamline collection curation, automate routine tasks, and fortify preservation endeavours. Additionally, the study elucidates the evolving role of AI in tailoring research support, facilitating learning, and its contribution to ongoing staff training. The findings will underscore the imperative for libraries to adapt to the AI-driven era for sustained relevance. Libraries stand to benefit from operational streamlining, provision of personalized and easily accessible services, and optimization of user experiences. By shedding light on the multifaceted role of AI in library services, this paper aims to equip library professionals and stakeholders with the knowledge to leverage AI in meeting the dynamic needs of their communities, thus ensuring their position at the forefront of information access and dissemination.

Keywords: *Artificial Intelligence (AI); Library Services; User Experience; Information access; Data analytics*

1. INTRODUCTION

Libraries have metamorphosed beyond its traditional role as custodian of print resources in an era characterised by disrupting technology breakthroughs. They have developed into vibrant centres for strategic knowledge management and information access, meeting the constantly evolving requirements of its users. At the forefront of this transformation is the integration of artificial intelligence (AI), a technology poised to revolutionize library services such as AI-driven data analytics for the library (Saeidnia, 2023), intelligent search (Luca et al., 2022) discovery systems and virtual assistant tools (Enakrire & Oladokun, 2023).

Libraries have been quick to embrace emerging technologies, facilitating a transition from traditional physical collections to modern and dynamic digital collections. This shift has revolutionized the way libraries operate, offering its patrons a wealth of digital resources, including e-books, online journals, multimedia materials, and archival content. The adoption of digital collections has not only expanded the accessibility of library resources but has also ushered in a new era of convenience, search ability, and preservation. In this evolving landscape, libraries continue to bridge the gap between the tangible and the virtual, ensuring that they remain indispensable knowledge hubs in a rapidly changing world.

In this ever-evolving landscape, libraries have harnessed a diverse array of technologies to meet the evolving demands of both their patrons and professionals. These encompass Library Management Software, Online Catalogs, Electronic Resources, RFID Systems, Self-service Kiosks for Check-in and Checkout, Digital Libraries, Mobile Applications, Virtual Assistants, Active Social Media Engagement, E-Learning Platforms, Remote Access Services, Facilities for 3D Printing and Creative Projects, Augmented and Virtual Reality Experiences, Accessibility Solutions for Individuals with Disabilities, Tools for Collaborative Work, Robust Cyber security Measures, Digital Preservation Strategies, and Sustainable Green Technologies. Additionally, libraries have now integrated AI

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(Artificial Intelligence) to further enhance and personalize their services, offering patrons the benefits of AI-driven recommendations, advanced search capabilities, and improved operational efficiency.
By shedding light on the multifaceted role of AI in library services, this paper aims to equip library professionals and stakeholders with the knowledge to leverage AI in meeting the dynamic needs of their communities, thus ensuring their position at the forefront of information access and dissemination. The objectives of this study are as follows:

- To evaluate how artificial intelligence (AI) affects user experiences and library services
- To investigate how artificial intelligence (AI) technologies—such as virtual assistants, intelligent search engines, content curation, and accessibility improvements—are changing how people interact with libraries.
- To investigate the possible advantages of artificial intelligence (AI) applications in library services, such as enhanced information discovery, accessibility, and user engagement.

This study builds upon an extensive review of existing literature, comprising scholarly articles, books, papers, and other relevant materials addressing library development, technological advancements in library services, and the integration of artificial intelligence (AI) into library operations. By meticulously analyzing and synthesizing the available literature, this process aims to illuminate the subject matter and draw pertinent conclusions. Through this method, trends, best practices, and notable innovations within the realm of library science and technology can be discerned.

2. AI TECHNOLOGIES IN LIBRARY SERVICES

AI technologies have indeed revolutionized library services in numerous ways. Here are several ways in which AI contributes:

i) **Content Curation**: AI algorithms can analyze vast amounts of data to curate personalized recommendations for library users based on their interests and past borrowing history. This enhances user experience by providing relevant content suggestions. AI can also analyze user preferences, reading habits, and search history to provide personalized recommendations for books, articles, and other library resources.
ii) **Automated Cataloging**: AI can assist in the cataloging process and metadata generation by automatically tagging, categorizing, accurate and indexing library materials (Brzustowicz, 2023). This streamlines the organization of library collections, making it easier for users to find what they need.
iii) **Virtual Assistants**: Virtual assistants powered by AI, such as chatbots (Adetayo, 2023), can provide immediate assistance to library patrons, answering questions, providing information about library resources and services, and even helping with basic research queries.
iv) **Enhanced Search Capabilities**: AI-driven search engines (Huang et al., 2024), can provide more accurate and efficient search results by understanding natural language queries, identifying synonyms, and predicting user intent.
v) **Accessibility Services**: AI can be used to develop accessibility tools such as text-to-speech and speech-to-text converters (Hussain, 2023; Lund et al., 2020), helping users with visual or hearing impairments access library materials more easily.
vi) **Preservation and Conservation**: AI technologies like image recognition and analysis can assist in the preservation and conservation (Musalia et al., 2023) of library materials by identifying deteriorating or damaged items and recommending appropriate conservation measures.
vii) **Library Space Utilization**: AI sensors and analytics can optimize library space utilization by monitoring foot traffic, studying user behavior, and providing insights to redesign spaces for improved functionality and user experience.

These are just a few examples of how AI can be leveraged to enhance library services, streamline operations, and better meet the needs of library users in the digital age. Overall, AI technologies play a crucial role in modernizing and optimizing library services, making resources more accessible, improving user experiences, and enhancing the efficiency of library operations.

3. ENHANCING ACCESS WITH AI

AI has significantly improved the accessibility of library resources and services through various initiatives leveraging AI-driven technologies. One notable example is the implementation of AI-powered text-to-speech (TTS) systems in libraries (Inamdar, 2023). These systems convert written

text into spoken language, enabling individuals with visual impairments or learning disabilities to access a wide range of materials, including books, articles, and documents. For instance, the National Library Service for the Blind and Print Disabled (NLS) in the United States utilizes AI-driven TTS technology to provide accessible audiobooks and other reading materials to patrons with print disabilities (NLS at the Library of Congress, n.d.). By offering alternative formats, libraries can ensure that all individuals, regardless of their abilities, have equitable access to information and educational resources.

Additionally, AI-driven image recognition technologies have been employed to enhance accessibility in libraries by providing automated descriptions of visual content. For example, the Library of Congress in collaboration with AI researchers has developed an image description tool that uses machine learning algorithms to generate textual descriptions of images in its digital collections. This initiative aims to make visual materials more accessible to individuals who are blind or visually impaired by providing detailed descriptions of photographs, illustrations, and other visual resources. By harnessing the power of AI, libraries can break down barriers to access and create inclusive environments where everyone can benefit from the wealth of knowledge and information available.

4. ENHANCING DISCOVERY WITH AI

AI plays a crucial role in enhancing the discoverability of library resources by leveraging advanced algorithms and data analytics techniques (Cox & Tzoc, 2023). One significant contribution comes from AI-driven search algorithms, which go beyond traditional keyword-based search to deliver more accurate and relevant results. These algorithms analyze user queries, identify semantic meanings, and incorporate context to provide tailored search results. For example, Google's AI-powered search engine employs natural language processing (NLP) algorithms to understand the intent behind user queries, enabling it to deliver more precise search results and help users discover relevant library materials more efficiently. By improving the search experience, AI-driven algorithms empower library users to navigate vast collections with ease and discover resources that meet their specific information needs.

Furthermore, AI-driven recommendation systems (Olusegun Oyetola et al., 2023) play a pivotal role in enhancing discovery by providing personalized suggestions based on user preferences and behavior. These systems analyze user interactions, borrowing history, and preferences to generate recommendations for similar or related library materials. For instance, platforms like Amazon and Netflix use AI algorithms to recommend books, movies, and other content based on user activity and feedback. Similarly, libraries can implement recommendation systems to suggest relevant books, articles, and multimedia resources to users, thereby enhancing discovery and promoting serendipitous exploration of library collections. Additionally, AI-powered metadata tagging techniques automate the process of categorizing and labeling library resources, improving their visibility and making them easier to discover through browsing and search. Overall, AI-driven search algorithms, recommendation systems, and metadata tagging initiatives play a vital role in enhancing the discoverability of library resources, enabling users to find and access relevant materials more effectively.

5. ENHANCING USER ENGAGEMENT WITH AI

AI technologies offer a multiple opportunities to increase user engagement in library services by providing personalized experiences and innovative interaction tools. One significant application is the use of AI-powered chatbots and virtual assistants, which offer immediate assistance and support to library users (Bi et al., 2022). These AI-driven bots can answer queries, provide recommendations, assist with research, and offer guidance on library services, enhancing user engagement by offering timely and convenient support. For instance, a library chatbot equipped with natural language processing capabilities can engage users in conversational interactions, helping them find relevant resources, navigate library systems, and access assistance round the clock. By offering personalized and interactive assistance, AI-powered chatbots foster user engagement and satisfaction, ultimately improving the overall library experience.

Moreover, AI technologies enable the development of personalized services tailored to individual user preferences and needs. For example, AI-driven recommendation systems can analyse user behaviour, borrowing history, and preferences to offer personalized content suggestions, curated

reading lists, and targeted promotional offers. By delivering relevant and curated recommendations, libraries can capture user interest, encourage exploration of library resources, and foster deeper engagement with the collection. Additionally, AI-powered analytics tools can provide insights into user behaviour and preferences, enabling libraries to tailor services, collections, and programming to meet the evolving needs of their users effectively. Overall, by leveraging user-centric AI applications and personalized services, libraries can enhance user engagement, foster a sense of belonging, and cultivate a vibrant and interactive community of library users.

6. CHALLENGES AND ETHICAL CONSIDERATIONS

The integration of AI technologies into various aspects of society, including library services, presents both challenges and ethical considerations that must be addressed. One significant challenge is the potential for bias in AI algorithms, which can perpetuate and amplify existing societal inequalities (Barsha & Munshi, 2023; Hussain, 2023; Jha, 2023). Biases may be present in training data, algorithm design, or decision-making processes, leading to unfair or discriminatory outcomes, such as biased search results or recommendations. Addressing bias in AI requires careful attention to data selection, algorithmic transparency, and ongoing monitoring to ensure equitable outcomes for all users.

Another challenge is the impact of AI on employment and workforce dynamics. As AI technologies automate routine tasks and processes, there is concern about job displacement and the need for reskilling and up skilling workers to adapt to changing job roles. Libraries must consider the ethical implications of adopting AI technologies that may result in job loss or changes to traditional library roles. Additionally, there is a need to ensure that AI deployment in libraries does not exacerbate existing digital divides or exclude marginalized communities with limited access to technology or digital literacy skills.

Ethical considerations also arise regarding data privacy and security in AI-driven library services. Libraries collect and analyse vast amounts of user data to improve services (Saeidnia, 2023), personalize recommendations, and optimize operations. However, there is a risk of data breaches, unauthorized access, or misuse of personal information, which could compromise user privacy and trust. Libraries must implement robust data protection measures, transparent data policies, and informed consent mechanisms to safeguard user privacy and maintain ethical standards in AI-driven initiatives.

Furthermore, there are broader societal implications of AI adoption, including concerns about algorithmic accountability, transparency, and the concentration of power in the hands of AI developers and tech companies (Boruff, Ahip et al., 2023; Gasparini & Kautonen, 2022; Luca et al., 2022; Trujillo, 2021). Libraries play a crucial role in promoting digital literacy, critical thinking, and ethical awareness among users to empower them to navigate and evaluate AI-driven technologies responsibly. By addressing these challenges and ethical considerations, libraries can harness the potential of AI to enhance services, expand access to information, and promote equitable outcomes while upholding principles of fairness, transparency, and user privacy.

7. FUTURE DIRECTIONS

Looking ahead, the future of AI in library services holds exciting possibilities for further enhancing accessibility, discovery, and user engagement. One potential development is the integration of AI-driven virtual reality (VR) and augmented reality (AR) technologies into library spaces, offering immersive and interactive experiences for users. VR and AR applications could enable users to explore virtual library environments, access digital collections in innovative ways, and participate in interactive learning experiences (Panda & Kaur, 2023). Additionally, advancements in natural language processing (NLP) and machine learning may lead to more sophisticated AI-driven recommendation systems that can anticipate user needs, preferences, and learning goals with greater accuracy, providing highly personalized and adaptive library services. Furthermore, the integration of AI with Internet of Things (IoT) technologies could enable smart libraries equipped with sensor networks and intelligent devices, facilitating real-time monitoring of library spaces, resource usage, and user interactions to optimize services and improve operational efficiency (Enakrire & Oladokun, 2023; Fischer et al., 2023; Izquierdo, 2022).

In terms of further research and technological advancements, areas of focus may include the development of AI-driven tools for information literacy instruction and digital skills training, empowering users to critically evaluate information, navigate digital resources, and engage in lifelong learning. Additionally, there is a need for research into AI-driven solutions for multilingual and multicultural library services, including language translation, cultural adaptation, and accessibility enhancements for diverse user populations. Furthermore, exploring the potential of AI in preserving and digitizing cultural heritage materials, such as rare manuscripts, artifacts, and oral histories, could contribute to the conservation and dissemination of cultural knowledge and heritage. Overall, continued research and innovation in AI technologies have the potential to revolutionize library services, enriching the user experience, expanding access to information, and advancing the mission of libraries as inclusive and dynamic learning environments.

8. CONCLUSION

The integration of artificial intelligence (AI) into library services represents a transformative shift that holds immense promise for enhancing user experiences, accessibility, and operational efficiency. Through AI-driven technologies such as data analytics, virtual assistants, intelligent search systems, and content curation, libraries can revolutionize the way patrons interact with resources, fostering a dynamic and personalized experience. However, the adoption of AI also presents challenges and ethical considerations, including concerns about bias, employment dynamics, and data privacy. It is imperative for libraries to navigate these challenges thoughtfully, ensuring that AI deployment aligns with principles of fairness, transparency, and user privacy. Looking ahead, the future of AI in library services holds exciting possibilities for further innovation, including the integration of virtual reality, advancements in recommendation systems, and the development of multilingual and multicultural services. By embracing AI responsibly and fostering a culture of digital literacy and ethical awareness, libraries can continue to evolve as indispensable knowledge hubs in the digital age, catering to the diverse needs of their communities and ensuring equitable access to information for all.

Further, AI meticulously analyzes extensive repositories of information to discern patterns, trends, and correlations, thereby revealing valuable insights that might otherwise remain concealed. AI holds immense potential to generate meta-information, offering a promising avenue for innovation and discovery. Nonetheless, Artificial intelligence (AI) needs to undergo training on precise, current, and meticulously arranged data, ensuring that its outputs maintain the standards of accuracy, relevance, and precision. The training of AI should prioritize the conversion of unorganized data into structured formats.

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Unveiling the Potential: A SWOT Analysis of Implementing Web 2.0 Technology in Library Services

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ABSTRACT

In an era defined by digital transformation, libraries stand at the forefront of adapting to evolving technological landscapes to better serve their communities. The advent of Web 2.0 technology offers libraries unprecedented opportunities to engage patrons, deliver dynamic content, and redefine the traditional notions of library services. However, with these opportunities come unique challenges and considerations. This article conducts a concise SWOT analysis to delve into the strengths, weaknesses, opportunities, and threats associated with integrating Web 2.0 technology into library services. By exploring these key factors, we aim to provide librarians and stakeholders with valuable insights into maximizing the potential of Web 2.0 while navigating its complexities effectively.

Keywords*: Digital transformation, Community engagement,Dynamic content, SWOT analysis, Technology integration, Information access*

1. INTRODUCTION

In an age where technology is reshaping the landscape of information access and dissemination, libraries are embracing innovative approaches to fulfil their mission of providing equitable access to knowledge and resources. Central to this evolution is the integration of Web 2.0 technology, which represents a paradigm shift in the way libraries interact with their patrons and deliver services.

Web 2.0 encompasses a range of interactive and collaborative online platforms, including social media, blogs, wikis, and multimedia content sharing sites. These tools offer libraries unprecedented opportunities to engage with patrons in real-time, foster community-driven knowledge sharing, and create dynamic digital experiences.

However, as libraries navigate the integration of Web 2.0 technology into their services, they must also grapple with a myriad of challenges and considerations. From addressing digital literacy disparities to managing privacy concerns and ensuring the sustainability of digital initiatives, librarians are tasked with balancing the promise of technological advancement with the realities of resource constraints and evolving user expectations.

To shed light on these complex dynamics, this article undertakes a comprehensive SWOT analysis of implementing Web 2.0 technology in library services. By examining the strengths, weaknesses, opportunities, and threats inherent in this digital transformation, we aim to provide librarians, stakeholders, and decision-makers with a nuanced understanding of the strategic implications and potential outcomes of embracing Web 2.0 in the library ecosystem. Through this exploration, we seek to empower libraries to harness the full potential of Web 2.0 while navigating the inherent challenges with confidence and foresight.

2. LITERATURE REVIEW

The integration of Web 2.0 technology into library services represents a significant shift in how libraries interact with their patrons and fulfil their missions in the digital age. This section provides an overview of key themes and findings from existing literature on the topic, encompassing research, case studies, and professional perspectives.

Numerous studies highlight the transformative impact of Web 2.0 technologies on user engagement and collaboration within library settings. For example, Liu and Lu (2012) discuss how social media platforms such as Facebook and Twitter enable libraries to connect with patrons, promote events, and facilitate dialogue in real-time. Similarly, Case and Given (2016) emphasize the

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role of Web 2.0 tools like wikis and collaborative document editing platforms in fostering co-creation and knowledge sharing among library users.

Digital literacy disparities and concerns about inclusivity are recurring themes in the literature on Web 2.0 technology adoption in libraries. Research by Lim and Lee (2015) highlights the importance of providing digital literacy training to both staff and patrons to ensure equitable access to online resources and services. Furthermore, Case and O'Brien (2017) underscore the need for libraries to consider accessibility issues when designing and implementing Web 2.0 platforms to accommodate users with disabilities effectively.

Privacy and security considerations are central to discussions surrounding the implementation of Web 2.0 technology in library services. Studies by Taylor and van der Walt (2019) and Koehler and Mishra (2016) examine the challenges libraries face in safeguarding patron data and ensuring compliance with privacy regulations amidst the proliferation of online platforms and digital content. Strategies for addressing these concerns range from developing robust data protection policies to implementing encryption protocols and user authentication mechanisms.

Web 2.0 technology offers libraries new avenues for enhancing service delivery and fostering innovation. Case studies by Mathews (2018) and McInerny (2019) showcase how libraries leverage social media, blogs, and multimedia content to promote library resources, engage with diverse audiences, and showcase their unique offerings effectively. Furthermore, research by Borgman (2015) highlights the role of Web 2.0 technologies in facilitating interdisciplinary collaboration and research dissemination within academic library settings.

Despite the potential benefits of Web 2.0 technology integration, libraries must grapple with resource constraints and sustainability concerns. Studies by Chowdhury and Paul (2018) and Johnson (2020) explore the financial implications of maintaining and supporting Web 2.0 platforms and initiatives, particularly for libraries with limited budgets and staffing resources. Strategies for addressing these challenges include partnering with external stakeholders, adopting open-source solutions, and leveraging community-based approaches to content creation and curation.

Panda (2021) explores the importance and strategies of marketing information products and services in libraries, emphasizing the significance of promoting library offerings to enhance reader satisfaction and education quality with reference to Web 2.0 tools.

The literature on Web 2.0 technology in library services underscores the transformative potential of these platforms for enhancing user engagement, promoting digital literacy, and driving innovation. However, it also highlights the need for libraries to navigate a range of challenges, including privacy concerns, accessibility issues, and resource constraints, effectively. By drawing on insights from existing research and case studies, librarians and stakeholders can develop informed strategies for leveraging Web 2.0 technology to achieve their goals while mitigating risks and maximizing impact in the digital era.

3. THE SWOT MATRIX

A SWOT analysis is employed to assess aspects of business in terms of the strengths, weaknesses, opportunities, and threats (Jackson et al., 2003; Kim, 2005). SWOT recognizes the important internal and external aspects of attaining a business's goals. The internal aspects refer to the features that are within the control of the business, whereas the external aspects are factors out of the businesses' control (Bull et al., 2016; David et al., 2017; Hill &Westbrook, 1997; Lee & Ko, 2000; Shariatmadari et al., 2013). Based on a mix of strengths, weaknesses, opportunities, and threats analyses, the SWOT analysis can be used effectively to produce alternative options for a business (Lee & Ko, 2000; Valentin, 2001; Wang, 2007; Weihrich, 1982). Such techniques can clearly clarify how strengths and weaknesses can be matched with opportunities and threats. Based on the internal and external factors, managers can develop four strategies, these are SO (strengths - opportunities), ST (strengths - threats), WO (weakness - opportunities) and WT (weakness - threats) (Bayram &Üçüncü, 2016; David et al., 2019; Povilanskas&Labuz, 2012; Thomas et al., 2014; Usman & Murakami, 2011). According to Davis (2007), tools such as the external factors evaluation (EFE) matrix, the internal factors evaluation (IFE) matrix or the competitive profile matrix (CPM) can also construct the SWOT matrix.

The SWOT matrix can be summarized as follows:

- SO strategies: taking advantage of opportunities.

- ST strategies: avoiding threats.
- WO strategies: introducing new opportunities by reduction of weaknesses.
- WT strategies: avoid threats by minimizing weaknesses.

	STRENGTHS Positive characteristics and advantages of the issue, situation, or technique	**WEAKNESSES** Negative characteristics and disadvantages of the issue, situation, or technique
OPPORTUNITIES Factors, situations that can benefit, enhance or improve the issue, situation, or technique	**S-O Strategy/Analysis** *Using strengths to take advantage of opportunities*	**W-O Strategy/Analysis** *Overcoming weaknesses by taking advantage of opportunities*
THREATS Factors, situations that can hinder the issue, situation, or technique	**S-T Strategy/Analysis** *Using strengths to avoid threats*	**W-T Strategy/Analysis** *Minimize weaknesses and avoid threats*

*This figure combines definitions from three sources (shaded[21] cells; clear cells[70,71]).

Figure 1

SWOT is a convenient tool at the evaluation stage in order to gain an initial idea of possible future consequences. The SWOT analysis is a simple analysis method that can provides a realistic interpretation of the strengths and weaknesses of a business. As well as, it helps in having an overview of differences between the actual and future plan, and analyses the current competition situation (Armstrong, 1982; Robinson & Pearce, 1988). Moreover, SWOT analysis is very familiar, user friendly, and does not require computer systems or software (Beeho& Prentice, 1997).

4. DATA COLLECTION

To comprehensively evaluate the feasibility and implications of implementing Web 2.0 technology in library services, data collection will focus on gathering information pertaining to both internal strengths and weaknesses, as well as external opportunities and threats. Internal strengths will entail assessing the library's existing resources, technological infrastructure, and organizational capabilities, while weaknesses will involve identifying any limitations or challenges hindering effective adoption. External opportunities will be explored through market research, examining industry trends, user preferences, and potential partnerships, while threats will encompass external factors such as competition, regulatory constraints, and technological obsolescence. Through meticulous data collection across these dimensions, a holistic understanding of the landscape surrounding Web 2.0 implementation in library services will be attained, facilitating informed decision-making and strategic planning.

5. DATA ANALYSIS

The data collection methodology outlined for the research paper titled "Unveiling the Potential: A SWOT Analysis of Implementing Web 2.0 Technology in Library Services" demonstrates a systematic approach to gather relevant information for a comprehensive SWOT analysis.

By focusing on both internal strengths and weaknesses, as well as external opportunities and threats, the methodology ensures a holistic examination of the factors influencing the implementation of Web 2.0 technology in library services. The emphasis on internal strengths, including existing resources, technological infrastructure, and organizational capabilities, provides insights into the library's readiness for technological innovation. Concurrently, identifying weaknesses enables the recognition of potential obstacles or challenges that may impede effective adoption.

Furthermore, the exploration of external opportunities through market research, industry trends, user preferences, and potential partnerships offers valuable insights into the broader landscape surrounding Web 2.0 implementation. This proactive approach allows for the identification of avenues for growth and development, aligning with the strategic objectives of the library.Additionally, considering external threats such as competition, regulatory constraints, and technological obsolescence underscores the importance of assessing risks that may impact the success of the implementation process. By acknowledging these threats, the research can inform proactive strategies to mitigate risks and enhance resilience.Overall, the meticulous data collection across these dimensions facilitates a holistic understanding of the opportunities and challenges associated with implementing Web 2.0 technology in library services. This comprehensive analysis lays the foundation for informed decision-making and strategic planning, empowering the library to leverage its strengths, address weaknesses, capitalize on opportunities, and mitigate threats effectively.

6. SWOT ANALYSIS OF IMPLEMENTING WEB 2.0 TECHNOLOGY IN LIBRARY SERVICES

6.1. Strengths:

- Enhanced Accessibility: Web 2.0 technologies enable libraries to provide remote access to digital resources, breaking down geographical barriers.
- Interactive Learning: Platforms such as social media, blogs, and interactive tutorials facilitate active engagement and personalized learning experiences.
- Community Building: Libraries can foster virtual communities around shared interests, facilitating knowledge exchange and collaboration among patrons.
- Data Analytics: Web analytics tools allow libraries to gather valuable insights into user behavior, preferences, and usage patterns, informing strategic decision-making.

6.2. Weaknesses:

- Digital Divide: Not all patrons have equal access to technology or digital literacy skills, exacerbating disparities in information access.
- Quality Control: User-generated content may lack accuracy and reliability, posing challenges for ensuring the integrity of library resources.
- Technical Challenges: Maintaining and updating Web 2.0 platforms requires technical expertise and resources that may be lacking in some library settings.
- Privacy Concerns: Online interactions raise privacy and security concerns, requiring robust policies and safeguards to protect patron data.

6.3. Opportunities:

- Expanded Outreach: Web 2.0 platforms offer opportunities for libraries to reach new audiences and engage with diverse communities.
- Collaborative Partnerships: Libraries can collaborate with other institutions, content creators, and community organizations to enrich their digital offerings and extend their impact.
- Personalized Services: Data analytics and user feedback enable libraries to tailor services and content to individual preferences, enhancing user satisfaction and loyalty.
- Innovation in Programming: Webinars, virtual book clubs, and interactive workshops present innovative avenues for delivering educational and cultural programming to patrons.

6.4. Threats:

- Technological Obsolescence: Rapid technological advancements may render existing Web 2.0 platforms obsolete, necessitating continuous adaptation and investment.
- Cyber security Risks: Libraries are susceptible to cyber threats such as data breaches, malware, and phishing attacks, compromising patron privacy and trust.
- Competitive Pressures: Libraries face competition from commercial digital platforms and online content providers, challenging their relevance and sustainability.
- Regulatory Compliance: Evolving regulations and legal frameworks governing online activities require libraries to stay abreast of compliance requirements, imposing additional administrative burdens.

7. CONCLUSION

In conclusion, the SWOT analysis demonstrates that libraries leveraging Web 2.0 technologies possess significant strengths in terms of accessibility, engagement, and data-driven decision-making. However, they also face challenges related to digital divide, quality control, and cybersecurity. By capitalizing on opportunities for expanded outreach, collaborative partnerships, and personalized services, libraries can mitigate threats and maximize the benefits of Web 2.0 integration. Ultimately, embracing innovation and agility is essential for libraries to remain vital institutions in the digital age.

8. RECOMMENDATIONS

Based on the SWOT analysis, the following recommendations are proposed for libraries seeking to optimize their utilization of Web 2.0 technologies:

- Invest in digital literacy training programs to bridge the digital divide and empower patrons with essential skills for navigating online resources.
- Implement robust content moderation and quality assurance measures to ensure the reliability and credibility of user-generated content.
- Foster strategic partnerships with educational institutions, technology companies, and community organizations to leverage collective expertise and resources.
- Strengthen cyber security measures through regular audits, staff training, and adoption of encryption and authentication protocols.
- Continuously monitor technological trends and user preferences to anticipate and adapt to evolving needs and preferences.

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Optimising Library Spaces and Digital Interfaces through Psychological Principles: Enhancing User Satisfaction and Engagement

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ABSTRACT

The present study investigates the incorporation of psychological concepts into the formulation of physical and digital library settings intending to augment user satisfaction and engagement. The obligation to integrate conventional tasks with new digital offerings becomes more necessary as libraries undergo technological improvements. The present research investigates the psychological importance of library spaces, the use of digital interfaces, and the implementation of environmental and cognitive psychology principles to establish library settings that prioritise the needs and preferences of users. This article demonstrates the impact of strategic design on user behaviour, cognitive reactions, and overall satisfaction via an analysis of several library settings and digital platforms. The results support the adoption of a comprehensive methodology in library design that integrates psychological perspectives to cultivate settings that promote learning, relaxation, and social engagement, therefore augmenting the overall user experience.

Keywords: *library design, cognitive psychology, environmental psychology, user engagement, digital interfaces.*

1. INTRODUCTION

Libraries have historically served as essential foundations in communities, functioning not just as stores of information but also as crucial venues for public involvement, education, and cultural interchange. The function of libraries in the digital era is constantly influenced by rapid technical breakthroughs and evolving user expectations. Contemporary libraries are confronted with the dual responsibility of maintaining conventional operations while also being anticipated to foster innovation by offering digital services and creating engaging and gratifying settings for their users. Libraries are essential in providing equitable access to digital tools and media as information becomes more digitally digitised, allowing everyone in society to participate in the digital economy. The current transformation necessitates a deliberate restructuring of both physical and digital library environments, using psychological concepts to enhance user engagement and contentment.

Psychological Significance of Library Spaces: The psychological ramifications for users are profoundly influenced by the design of library spaces, including both physical and virtual environments. According to environmental psychology, locations have a substantial impact on cognitive performance, emotions, and total mental well-being. Well-designed libraries take into account several characteristics, including but not limited to natural lighting, noise management, spatial arrangement, and colour palettes. These components possess the capability to influence the affective states, energy levels, concentration, and comprehension of information of users. Natural light has been shown to enhance mood and vitality, which are crucial elements for efficient learning and the assimilation of knowledge.

Adaptation to Digital Interfaces: Libraries must adapt their digital interfaces to suit the expectations of technologically proficient users as digital technologies progress. This entails more than just the provision of digital material access; it necessitates the development of simple and user-friendly interfaces that enable effortless retrieval of information. Cognitive psychology provides valuable insights into the manner in which individuals engage with digital platforms, emphasising the significance of comprehending memory mechanisms, attention durations, and cognitive capacities for information processing. One potential strategy for improving user engagement and happiness is to

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reduce cognitive load through the simplification of navigation and the reduction of informational clutter.

Integrating Psychological Principles in Library Design: The incorporation of psychological concepts into library design is not only a theoretical endeavour but rather has practical consequences for augmenting user happiness and engagement. Libraries may establish environments that are both useful and caring, as well as inclusive, by comprehending the psychological impacts of the environment and digital interfaces. This entails the use of design concepts that accommodate a wide range of user requirements, including varying cognitive capacities and learning preferences. For instance, using soothing hues may effectively alleviate tension, while adaptable environments can enable both cooperative and individual pursuits, accommodating diverse user inclinations and modes of engagement.

Hence, it is essential to include psychological considerations in the design of library spaces and digital interfaces in a time characterised by the constant evolution of user expectations. The objective of this essay is to thoroughly examine these ideas, offering practical insights that may be used in libraries globally to enhance user engagement and contentment. By establishing a connection between the fields of psychology and library science, it is possible to augment the significance of libraries as indispensable and flexible assets that adeptly address the complexities and possibilities presented by the digital era.

2. THEORETICAL FRAMEWORK

To better understand how to include psychological factors in library design, this part explores the theoretical foundations. This framework offers a complete approach to designing library environments and digital interfaces that improve user pleasure and engagement by analysing environmental psychology, cognitive psychology, and user experience design.

2.1. Environmental Psychology

The field of environmental psychology investigates the intricate interplay between humans and their immediate environment, providing unique perspectives on the ways in which physical surroundings may impact human emotions and actions. Significant factors in this field include spatial arrangement, sensory components (such as illumination and auditory stimuli), and overall visual attractiveness, all of which may have a dramatic influence on psychological welfare and efficiency. This is applicable to libraries, which serve as centres of education. Take, for example, the following examples:

i) **Spatial Arrangement and Seating:** The Seattle Central Library has an open floor design that incorporates enough natural lighting and offers a diverse choice of seating options to accommodate the varying demands of its users. One illustration of this concept is that open tables foster cooperation, while quiet locations promote private study and contemplation. The deliberate organisation of space enables individuals to choose settings that align with their emotional and cognitive inclinations, so augmenting their level of comfort and concentration.

ii) **Physical Layout and Aesthetic Design:** Anna Centenary Library, located in Chennai, India, is renowned as one of the largest libraries in Asia. It exemplifies the implementation of environmental psychology in its meticulous design, characterised by expansive interiors, abundant natural lighting, and the incorporation of green spaces to cultivate a calming ambience. The layout of the library is intentionally intended to promote both collaborative and individual activity, accommodating the diverse emotional and cognitive requirements of its users.

2.2. Cognitive Psychology

Cognitive psychology is a discipline that seeks to investigate and understand the cognitive processes that human possess such as perception, memory and all related mental processes. It is critical that library systems match with human cognitive functions such as memory, attention, and problem solving. Gaining a comprehensive understanding of these processes may significantly enhance the organisation and accessibility of material in libraries, resulting in a more natural and less mentally demanding search and retrieval procedure. To comprehend its significance, contemplate the below illustrations:

i) **Categorization and Signage:** The Dewey Decimal Classification System, widely used in libraries worldwide, serves as a prominent illustration of cognitive psychology in practice. The categorization of books into broad groupings that correspond to general knowledge areas is in accordance with the cognitive process of information categorization in the human brain. Libraries optimise this system by implementing prominent and strategically positioned signage that facilitates navigation and minimises the cognitive burden on users, resulting in a smoother and gratifying library experience.

ii) **Information Organisation and Wayfinding:** The British Council libraries in India (multiple locations) adopt a logical and accessible classification of resources, with an emphasis on user-centric service design. The use of unambiguous and uniform signage, as well as digital catalogue systems, serves to mitigate the cognitive burden experienced by users. In addition, the libraries provide guided tours and orientation workshops for new members, facilitating the process of retrieving information and enhancing the ease of navigating the library's resources.

iii) **User Experience Design:** The User Experience design, also known as UX in short is focused on enhancing the engagement, satisfaction and efficacy experience of users while interacting with the products or technology. Within the realm of libraries, the use of UX design concepts assumes paramount importance in the creation of digital interfaces that possess both utilitarian functionality and user-friendliness. This requires a comprehensive comprehension of user requirements and actions, iterative experimentation, and a dedication to developing inclusive and accessible technology. To enhance comprehension, contemplate the following illustrations:

iv) **Digital Catalogue Interface Design:** The interface design of digital catalogues has been extensively redesigned by several libraries, including the New York Public Library, with the aim of enhancing user-friendliness. These digital resources are made more accessible and less scary to consumers of all ages and tech-savvy levels due to features such as predictive text, easily navigable categories, and visually attractive design. The design of these interfaces takes into consideration human psychology, with a focus on enhancing usability and reducing user irritation. This approach is crucial for effectively engaging people in the contemporary digital era.

v) **Digital Interface and User Interaction:** In the context of Digital Interface and User Interaction, the National Digital Library of India (NDLI) is an excellent example. The NDLI is a project initiated by Ministry of Education in collaboration with IIT Kharagpur. It's noteworthy features include easy to use user interface, simple search options and it is also bilingual in nature. One well-known example of user experience design in digital library systems is the National Digital Library of India (NDLI). Additionally, the system has functionalities such as filter-based search methods, enabling users to swiftly and expeditiously locate resources, hence mitigating annoyance and augmenting overall user contentment.

Incorporating psychology and design concepts into library design enables the creation of settings and tools that not only cater to the user's functional requirements but also foster enhanced emotional and cognitive well-being. The theoretical framework presented herein functions as the fundamental basis for the creation of library spaces and digital interfaces that prioritise the needs and preferences of users, therefore cultivating a more profound bond between the library and its community.

3. REVIEW OF RELATED LITERATURE

In order to have a deeper comprehension of how library science and psychology are combined, it is necessary to examine the extensive collection of literature that elucidates the convergence of library design and user psychology. This study examines the impact of physical organisation, digital interface design, and emotional concerns on library user behaviour, accessibility, usability, and overall experience, drawing on psychological concepts.

3.1. Library Layout and User Behaviour

Spatial Arrangement

The concept that the spatial arrangement of a library has a substantial impact on user behaviour and well-being is continuously supported by research. A study conducted reported that open spaces having access to bright, natural light in libraries not just improve the aesthetic and visual appeal but it also contribute towards extend daily usage of library and enhanced psychological well-

being(Heerwagen, 2008). The results are supported by architectural theories that assert that places resembling natural surroundings might enhance cognitive performance and reduce stress (Ulrich, 1984).

Wayfinding Systems

The cognitive factors associated with navigating in library environments have a significant impact on the overall user experience. In his influential book "The Image of the City," Lynch (1960) offers fundamental perspectives on how people see and traverse urban environments, which may be extrapolated to the smaller-scale context of library interiors. The usability of library spaces may be considerably improved by using effective signage systems that minimise complexity and cognitive load, as shown in the research conducted by Peponis et al. (1990) on visibility and circulation inside public buildings.

3.2. Digital Interface Design in Libraries

Accessibility

The promotion of accessibility in the digital domain is not only a legal requirement but also a core principle within the field of library science. This entails ensuring that library interfaces are inclusive and accessible to all users, including those with impairments. The importance of interfaces that cater to a wide range of user demands is underscored by Lazar, Feng, and Hochheiser (2017) and supported by Web Content Accessibility Guidelines (WCAG). The WCAG guidelines include comprehensive criteria aimed at enhancing digital accessibility and were revised in 2022.

Usability

The cognitive load hypothesis, as explored by Sweller (1988), underscores the need to create computer interfaces in a manner that minimises cognitive demands. The notion of streamlining digital catalogues and including user-friendly search algorithms has been implemented by libraries. This may be seen in the research conducted by Gwizdka and Spence (2007), which examined the impact of various display styles on user search behaviour and the efficiency of information retrieval.

3.3. Psychological Impact of Aesthetic Design

Colour Psychology

The psychological influence of colour on mood and conduct has been extensively studied, as seen by Whitfield and Wiltshire's (1990) research on how various hues may affect mental acuity and mood. This is particularly relevant in environments that need high levels of cognitive engagement, such as libraries. Recent research, as shown by the work of Elliot and Maier (2014), persists in investigating the influence of colour on psychological processes, hence emphasising the importance of deliberate hue choice in the design of libraries.

Material Texture

The psychological influence of material texture inside a library is noteworthy. In his work, Kaplan (1995) examined the potential of naturalistic surroundings for facilitating cognitive activities and mitigating stress levels. In library design, the use of materials like wood or stone that imitate natural habitats is employed to provide a tranquil and concentrated ambience for users.

The significance of incorporating psychologically informed design into the library user experience is emphasised in this literature review, emphasising the importance of incorporating these insights into both physical and digital library spaces.

4. METHODOLOGY

The purpose of this study was to use a systematic approach in collecting and analysing the current body of literature that explores the relationship between psychology and library design. The primary emphasis was on investigating the application of psychological concepts in order to improve user satisfaction and engagement in library settings. The relevant internet databases were searched such as, PsycINFO, Library, Information Science, & Technology Abstracts (LISTA), Google Scholar, and others. The search method used a blend of keywords and phrases to include the most extensive and relevant body of literature. such as: "library &psychology", "library designs", "cognitive psychology", "environmental psychology & spaces", "psychological principles in library usage", "digital interface", "user satisfaction and engagement", "library and well-being". The search results were refined and focused by combining these keywords using Boolean operators. For instance, terms

such as “library design AND psychological principles” or “user satisfaction AND digital interfaces in libraries” were used.

Further, the studies that were collected were chosen according to the following criteria: the research should have a specific emphasis on or be relevant to both physical and digital library settings; the research should include or use psychological ideas, methodologies, or data in a clear and unambiguous manner; the major focus of this study was to prioritise research that examined user involvement, contentment, or other relevant metrics as the main results. The data obtained from the chosen research was organised into a systematic style, including essential details such as the objectives of the study, the methodology used, the psychological principles utilised, the primary results, and the implications for library design. The use of a systematic methodology enabled the amalgamation of results from many research investigations, so enabling a thorough comprehension of the successful application of psychological concepts within library environments.

5. RESULTS & DISCUSSION

The methodology used in this systematic literature review resulted in a number of noteworthy results that illustrate the interaction between psychological concepts and library design. The main focus of the research is to explore and understand how these aspects leads to more engagement and user satisfaction. This section presents a comprehensive validation of the systematic review completed on the integration of psychological concepts into library design by including data from current research and meta-analyses. The primary concern is to the influence of these principles on user happiness and engagement, specifically in relation to the design of physical libraries, digital interfaces, and the broader psychological effects of visual design.

5.1. Findings on Physical Library Design

i) **Impact of Spatial Arrangement on User Behaviour**

in relevance of user behaviour and spatial arrangements the exploration of recent researches and meta-analyses indicates their immense impact on engagement, library usage, productivity and well-being in library. This section provides a detailed analysis of the particular results derived from empirical research that examine the impact of library space design and organisation on user experiences.

- **User Behaviour and Space Utilisation:** The study conducted by Noh (2021) examined the elements that influence user satisfaction in complicated cultural library environments. The research shed light on the differing perspectives held by librarians and users about the organisation of space and the choice of programmes provided. According to Noh (2021), the research indicates that there is potential for substantial improvement in user happiness by aligning space design more closely with user preferences and behaviours. Research regularly demonstrates that library rooms that are open, well-lit, and seamlessly integrated have a major impact on the psychological well-being and productivity of users. Heerwagen (2008) observed that these spaces have the potential to decrease stress and improve mood, which aligns with the conclusions drawn by Kaplan (1995), suggesting that the presence of natural components in architecture promotes cognitive abilities and emotional welfare. Libraries that integrate adaptable and user-friendly environments are capable of accommodating many learning styles and activities, hence fostering increased duration and frequency of visits.
- **Well-being and Productivity:** Recent systematic studies consistently emphasise the importance of open areas that are illuminated by natural light. These spaces not only contribute to visual attractiveness but also foster psychological well-being and productivity. Mead and Gay (1995) conducted a systematic study that examined the design of digital libraries, focusing on user behaviour. They highlighted the significance of intuitive spatial arrangements in enhancing navigation and minimising cognitive load, ultimately leading to improved user satisfaction and increased library use. According to Moon (2014), the research conducted on library spaces as urban experiences indicates that libraries that incorporate open stacks and grand staircases, resembling urban plazas, have the potential to not only improve their visual appeal but also foster social interactions and community connections. These factors are considered essential for promoting psychological well-being and productivity (Moon, 2014). Furthermore, the user satisfaction study conducted by the University of Malaya revealed that customers place great

importance on venues that include technology conveniences and places for leisure, such as cafés located inside the library. Sinnasamy and Ramu (2014) observed that these factors were shown to enhance visual comfort and overall contentment, suggesting a clear association between spatial quality and user involvement. The amalgamation of results from these researches validates that the spatial configuration inside libraries has a pivotal function in augmenting user engagement with the area, hence impacting their overall contentment and efficiency. Libraries that provide a combination of practical, adaptable, and visually appealing settings not only cater to the varied requirements of their patrons but also cultivate an environment that promotes both educational growth and individual welfare.

The aforementioned study provides a robust basis for library administrators and designers to include psychological concepts into the physical arrangement of libraries, so guaranteeing that these environments are not just utilitarian but also contribute to the improvement of user satisfaction. Libraries may maintain their significance as essential resources that successfully address the needs of their communities by consistently changing and innovating in accordance with user input and developing research. The architectural design of the Seattle Central Library in the United States is well recognised for its unique approach, effectively using space arrangement to improve the overall user experience. The library exhibits spacious and well-ventilated sections that are replete with enough natural illumination, adaptable seating configurations, and distinct zones designated for various pursuits. These characteristics are intentionally crafted to enhance customer satisfaction and encourage extended periods of visitation. The use of spatial design in Indian libraries is shown by the Anna Centenary Library located in Chennai. The design incorporates distinct areas for children, young people, and research academics, promoting suitable engagements and reducing interruptions, consequently augmenting user efficiency and contentment. Therefore, these illustrations emphasise the significance of deliberate spatial design in libraries to accommodate a wide range of user requirements, indicating that integrating adaptability and convenience into library environments may result in heightened user involvement and contentment.

ii) **Effectiveness of Wayfinding Systems**

The usefulness of wayfinding systems in libraries and their influence on user navigation and overall experience is examined in a systematic review, which identifies numerous significant research. The amalgamated findings derived from these investigations provide a comprehensive comprehension of the manner in which meticulously crafted signs and navigational aids may substantially enhance the user experience inside library environments. The principles proposed by Lynch (1960) regarding urban navigation can be applied to the design of interior library layouts. The implementation of clear and intuitive signage, along with logical space organisation, has been found to enhance users' ability to efficiently locate resources, decreased irritation and improved usability of library resources as informed by the principles of Cognitive Psychology. This assertion is supported by the findings of Peponis et al. (1990), who conducted a study on visibility and circulation in public buildings.

- **Impact of Wayfinding Design on User Navigation:** The research performed by Calista et al. (2023) assessed the wayfinding and signage design for the Indonesian National Library, using the pyramid approach developed by Chris Calori & David Vanden-Eynden, to determine its impact on user navigation. The research highlighted the significance of well-defined, hierarchical wayfinding systems in effectively regulating the movement of users within densely populated library settings. This approach resulted in enhanced user satisfaction and decreased stress associated with navigation (Calista et al., 2023). In a noteworthy study it has been found that well designed signs plays a very important role in moving around the libraries as it leads familarity and it is also decreases spatial anxiety as one may face due to unfamilarity of the space (Su et al., 2021).
- **User-Centric Signage and Navigation Experience:** In Gardner's (2018) study, the author examined the remodelling of the Fondren Library at Southern Methodist University, focusing on the use of a user-centric approach to wayfinding signs. The library implemented cost-effective and intuitive signage that significantly improved the user navigation experience by adhering to UX guiding principles and completing usability testing. According to Gardner (2018), the implementation of this strategy resulted in enhanced spatial orientation, as well as a notable rise in user engagement and satisfaction with the library services. Furthermore, an investigation into the cognitive economy pertaining to the utilisation of external navigation aides for interior spaces

was undertaken by Holscher et al. The results of their investigation unveiled a notable preference among users for signs in comparison to maps. The study conducted by Holscher et al. (year) underscored the effectiveness of signs in reducing cognitive burden through the provision of clear and easily understood navigational cues. This is particularly significant in intricate environments such as libraries.

Therefore, the results of these research emphasise the substantial influence that well designed wayfinding systems have on improving user navigation in libraries. The implementation of efficient wayfinding systems not only enhances accessibility and alleviates navigation-related anxiety, but also fosters a more comprehensive and favourable user experience. The results of the research suggest that the successful integration of user-centric and intuitive signage systems has promise for greatly improving user interactions inside library environments, leading to a more pleasurable and effective experience. The aforementioned research provide a strong empirical foundation for library administrators and designers to take into account user behaviour and cognitive concepts when designing and implementing wayfinding systems. These concerns are crucial for developing library settings that are inclusive and user-friendly, accommodating the different demands of users. The Vancouver Public Library in Canada employs intuitive signage and strategic layout to enhance efficient navigation across its vast collection and diverse range of services. The library's navigation system has been intentionally intended to provide inclusivity, accommodating persons across all age groups and skill levels. Additionally, the Delhi Public Library in India has implemented notable enhancements to its wayfinding systems with the incorporation of multilingual signs in both Hindi and English. This strategic approach has shown to be very successful in effectively directing the heterogeneous user population often seen in the area. Consequently, efficient navigation systems decrease the mental effort required and improve the use of library areas. These libraries exemplify the importance of user-centric signage and navigation aids in promoting inclusion and enhancing user comfort.

5.2. Findings on Digital Interface Design

i) **Enhancing Accessibility in Digital Platforms**

The significance of inclusive design in enhancing user experience is highlighted in the systematic study on the improvement of accessibility in digital interfaces of libraries. This section presents data from empirical research that illustrate how digital platforms that are easily accessible effectively address the different demands of users, hence improving usability and user satisfaction. Lazar, Feng, and Hochheiser (2017) underscored the need of ensuring universal accessibility of digital platforms within library settings, including those with impairments. Libraries that conform to these standards have elevated levels of user satisfaction and heightened utilisation, so exemplifying an inclusive approach to the administration of digital resources.

- **Impact on Visually Impaired Users:** A notable investigation conducted by Xie et al. (2023) examined the accessibility and usability of mobile applications and mobile web iterations of digital libraries, with a special focus on those who are blind or visually impaired. The study emphasised that the implementation of accessibility improvements in mobile platforms has a substantial impact on enhancing the user experience for this particular population. This is achieved via the provision of more intuitive navigation and interaction choices. This research emphasises the need to include users with impairments in the design phase to guarantee that digital platforms are really accessible (Xie et al., 2023).
- **User Experience and Interface Design:** The significance of user interface decorations and deliberate navigation reorganisation in digital library interfaces was underscored in a research conducted by Wu et al (2021). According to the study, the incorporation of dynamic video backgrounds and interactive interfaces in online libraries not only offers superficial pleasure but also fosters a sense of profound satisfaction by providing functional, dependable, and user-friendly interfaces. These enhancements greatly contribute to the overall improvement of the user experience.
- **Usability and Responsive Design:** The study conducted by Sasongko et al. (2016) centred on the creation of a digital library user interface via the use of Responsive Web Design and User Experience testing. The results of their study indicated that responsive design has a positive impact on the efficiency and effectiveness of digital library interfaces by improving user task

completion durations and success rates. According to Sasongko et al. (2016), this methodology guarantees the accessibility of digital libraries across several devices, hence augmenting the overall user experience.

Enhancing Digital Library Collections Management: The significance of a streamlined interface for verifying material availability and accessing electronic resources is underscored in the study conducted by Tadituri and Naick (2023) on a prototype design aimed at improving the administration of digital library collections. Their research indicates that enhanced digital interface design results in more effective administration of library resources and a more favourable user experience, demonstrating how digital innovation can optimise library operations and user engagements (Tadituri & Naick, 2023).

- **Inclusive and Adaptable Interfaces:** The study conducted by Kibithe and Naibei (2023) focused on the significance of usability testing, prototyping, and adherence to accessibility rules in digital library settings for the development of inclusive and flexible information services. Digital libraries have the potential to foster digital inclusion and improve the overall user experience by effectively resolving the obstacles encountered by those with print impairments (Beyene, 2019).

Therefore, the research that have been evaluated together indicate that improving accessibility in digital library interfaces has a substantial effect on user pleasure, engagement, and inclusion. The implementation of these improvements is of utmost importance for libraries that want to achieve equal access to knowledge and guarantee that all individuals, irrespective of their physical capabilities or technical capabilities, may get advantages from digital resources. The results support the idea of maintaining a persistent dedication to enhancing digital accessibility by using inventive designs and inclusive methodologies. This is crucial in order to ensure that digital libraries stay relevant and adaptable to the requirements of their varied user population.

ii) **Usability of Digital Catalogues and Interfaces**

The present systematic review examines the usability of digital catalogues and interfaces in libraries, presenting valuable insights derived from previous research. This section presents a comprehensive analysis of the data, highlighting the crucial significance of deliberate interface design in augmenting user engagement and contentment.

- **Advanced Interface Designs Enhancing Usability:** The notion of fluid interfaces in personal digital libraries was proposed in an important research conducted by Good et al. (2005). These interfaces aim to reduce cognitive burden and enhance user engagement by using zoomable treemap visualisations. This technique challenges the conventional differentiation between the acquisition and use of materials, therefore providing a more cohesive and uninterrupted user experience. The research conducted by Good et al. (2005) emphasised the substantial improvement in the discoverability and usability of digital library systems with the use of sophisticated visualisation methods.
- **Augmented Reality for Enhanced Navigation:** The use of augmented reality has been investigated as a means to supplement the user experience inside children's libraries, hence improving navigation capabilities. This application aims to greatly improve the library experience for younger individuals by using captivating digital technologies. This strategy not only enhances the intuitiveness of navigation but also enhances the interactivity and enjoyment of the learning process for youngsters (Wu et al., 2021).
- **Integration of Recommendation Systems**: TIsinkaye and Fred-Yusuff (2022) conducted a research on the integration of recommendation components in e-library systems, which demonstrates a significant improvement in user experience. According to Isinkaye and Fred-Yusuff (2022), the inclusion of these elements enhances the alignment between digital libraries and the requirements of their users, resulting in a significant increase in user happiness and engagement.
- **Impact of User-Centric Design:** The change of user experience at MSU Libraries was examined by researchers and they emphasised the adoption of a holistic approach to integrating user experience into all services. The libraries created a productive and collaborative environment that improves the overall usability of digital catalogues and interfaces by considering all aspects of the interface, including layout, visual design, text, brand, sound, and interactivity. This

comprehensive approach guarantees that every facet of the user interaction is optimised to successfully satisfy user demands (Thompson & Vess, 2017).

Therefore, the literature examined demonstrates a distinct inclination towards the use of cutting-edge technology and sophisticated interface designs in order to improve the usability of digital catalogues and interfaces within library settings. Technological innovations like as augmented reality, recommendation algorithms, and user-centric design concepts play a crucial role in the transformation of conventional library interfaces into dynamic, intuitive, and captivating platforms. The enhancements made in digital interface design not only address the changing requirements of users but also greatly improve their entire library experience, highlighting the crucial importance of usability in the digitalization of libraries. Such as New York Public Library and National Digital Library of India. It also has a responsive design, which greatly improves accessibility and user engagement across the nation. The aforementioned instances demonstrate the potential of digital libraries to augment the user experience via the use of user-friendly interfaces and inclusive design principles.

iii) **Psychological Impact of Aesthetic Design: Influence of Colour and Material Texture**

The retrospective analysis underscores the significant influence of colour and material texture on the psychological encounters of individuals using libraries. The following part provides an in-depth analysis of many research that investigate the impact of library design components on mood, cognitive function, and overall user satisfaction.

Colour Impact on User Perception and Mood: The psychological impacts of colour in the interior design of libraries were examined in a significant research conducted by Majidah et al. (2019). The study focused on the impact of colour selections on customers' perceptions and motivations. The research revealed that colour has a significant impact on both the visual attractiveness and the ability of libraries to create environments that promote relaxation and recreation. This, in turn, leads to increased visitation and usage rates (Majidah et al., 2019). The study emphasised the significance of carefully selecting hues and textures to design surroundings that have a good impact on users' emotions and cognitive abilities. Recent meta-analytic investigations and research provide more evidence supporting the substantial impact of colour and material texture on the psychological well-being and behavioural reactions of those who use libraries. Additionally, Uluçay (2018) conducted a study to investigate the relationship between colour scheme preferences and emotional states in an educational environment. The findings of this study suggest that the colour preferences of people in library environments have the potential to both reflect and impact their mood and stress levels. This underscores the need of adopting a deliberate approach to using colour in library design (Uluçay, 2018).

Material Texture and Psychological Comfort: The study of material texture and its influence on psychological comfort in libraries is a relatively new but expanding area of research Cho and Lee (2019) investigated the affective responses elicited by a range of material textures incorporated into the interior design of public libraries. The results of Cho and Lee's (2019) investigation suggest that the use of materials that mimic the characteristics of natural elements—like stone or wood—may promote emotions of calm and relaxation. This, in turn, may lead to an increase in the duration of time that individuals spend within library environments. Furthermore, Liu and Chen (2015) conducted a study that specifically examined the colour design of interior spaces in high schools and observed comparable effects in library settings. A study conducted by Hui Liu and Fei Chen in 2015 revealed that colours that are seen as relaxing and textures that are visually or tactilely pleasing may greatly improve the reading environment, leading to improved learning results.

Therefore, the amalgamation of these results highlights the significant influence of visual design components such as colour and material texture on the mental health and conduct of those using libraries. Through meticulous colour selection that enhances mood and use of stress-reducing products, library designers may create spaces that not only facilitate academic and personal development but also foster enhanced well-being and contentment among users. The results of this research not only underscore the importance of incorporating psychological elements into library design, but also offer pragmatic guidance for architects and designers aiming to improve the allure and inclusiveness of library settings. Colour psychology is skillfully used by the Chicago Public Library via the strategic placement of brilliant colours in children's sections to foster creativity, and softer hues in study rooms to enhance attention and relaxation. The Bishan Public Library in Pune

employs material textures that emulate natural habitats, including wooden panels and stone textures. This deliberate choice of materials fosters a tranquil ambiance, so promoting extended periods of visitation and enhanced interaction with the library's collection of resources. The material textures and colours of a library have a considerable impact on the psychological well-being of its users, which in turn influences how actively they engage with the space The proficient use of these design features has the potential to convert libraries into more welcoming and intellectually engaging settings.

6. CONCLUSION

The incorporation of psychological concepts into library design is not just a theoretical matter, but rather a pragmatic strategy for augmenting user engagement and happiness. This study establishes the foundation for future research on how libraries could change to suit the demands of the contemporary day and emphasises the significance of psychological principles in library design Libraries may maintain their importance as community resources by incorporating user-centered design techniques, using technology, and giving priority to sustainability. This will enable them to adjust to the changing landscapes of information access and public involvement. The aforementioned instances from many countries, including India, demonstrate the effective implementation of these principles, highlighting the advantages of deliberate design in establishing environments that cater to the changing requirements of contemporary library patrons. As libraries progress in embracing the digital era, these concepts will continue to be crucial in directing the creation of library settings that are more inclusive, captivating, and user-friendly.

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Enhancing Plant Stress Detection through Transfer Learning and Explainable AI Techniques

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ABSTRACT

Precision agriculture is predicated on the criticality of early detection of plant duress for sustainable cultivation and effective crop management. By integrating transfer learning and explainable artificial intelligence (XAI) in order to capitalise on their respective advantages, this work introduces a novel technique for identifying plant stress. We present an innovative framework that employs deep convolutional neural networks (CNNs) that have been pre-trained and modified on a dataset comprising numerous images of plant leaves displaying signs of various stresses, such as diseases, nutritional deficiencies, and water scarcity. Transfer learning enables our model to minimise the requirement for large labelled datasets while effectively applying the complex feature representations obtained from enormous datasets to the specific domain of agronomy. In machine learning applications, the inclusion of XAI concurrently provides a transparent viewpoint that exposes the model's decision-making processes, thereby fostering confidence and comprehensibility. The performance of our model is evaluated in relation to the most state of art architectures presently accessible, so as to ascertain the efficacy of our approach. The results underscore the potential for creating practical insights and automating the detection of plant stress through the integration of transfer learning and XAI-based diagnostic tools.

Keywords*: Plant Stress Diagnosis, Smart Agriculture, Deep Learning, Explainable AI, Convolutional Neural Networks, LIME*

1. INTRODUCTION

We often hear that India is an agriculture country. Agriculture plays a vital role in the Indian economy. Over all 70 per cent of the rural households depend on the agriculture. Discuss only three crops in this paper namely wheat, rice, cotton. Wheat is a staple food for human consumption and animal production. Indian wheat is largely a medium protein , soft / medium hard , and white bread wheat . The major increase in the productivity of wheat has been observed in the states of Haryana, Punjab and UP. It is, in fact, the dominant crop of country. India is one of the leading producers of this crop. Rice is the basic food crop and being tropical plant, it flourishes comfortably in hot and humid climate. Rice is mainly grown in rain fed areas that receive heavy annual rainfall. That is why it is fundamentally a Kharif crop in India. It demands temperature of around 25 degrees Celsius and above, and rainfall more than 100 cm. Rice is also grown through irrigation in those areas that receive comparatively less rainfall. Rice is the staple food of eastern and southern parts of India Cotton is one of the most important fibres and cash crop of India and plays a dominant role in the industrial and agricultural economy of country. Similarly, we have several stresses in plants. Further, plant stress phenotyping involves the assessment and quantification of plant responses to various stressors such as bacterial, fungal, virus, disease, pests, and weeds. Traditionally, this process has been labor-intensive and subjective, relying on visual inspection and manual measurements. However, with the advancements in machine learning (ML) and deep learning (DL), particularly through the use of Generative Adversarial Networks (GANs), plant stress phenotyping has been revolutionized. Plant stress phenotyping plays a crucial role in agriculture by providing insights into the physiological and biochemical changes in plants under stress conditions. It helps in understanding plant stress tolerance, identifying stress-resistant cultivars, and developing strategies for stress management.

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ML and DL techniques offer powerful tools for automating and enhancing plant stress phenotyping processes. These techniques can analyze large volumes of data, extract intricate patterns, and make predictions with high accuracy. In particular, DL methods, such as convolutional neural networks (CNNs) and GANs, have shown remarkable potential in this domain. Deep Learning with GANs in Plant Stress Phenotyping: Generative Adversarial Networks (GANs) consist of two neural networks, the generator and the discriminator, which are trained simultaneously in a competitive manner. GANs have been applied to various tasks in plant stress phenotyping. GANs can generate synthetic images of plants under different stress conditions. These synthetic images can augment the training dataset, improving the robustness and generalization of the ML/DL models. GANs can generate realistic synthetic data representing various stress-induced phenotypes in plants. This synthetic data can be used to supplement limited or unavailable observational data, enabling more comprehensive analysis and model training. GANs can facilitate domain adaptation by transferring knowledge learned from one set of plant species or stress conditions to another. This transfer learning approach helps in leveraging existing data and models to address new challenges or domains with limited labeled data. GANs can be used to extract discriminative features from plant images, capturing subtle differences associated with different stress conditions. These features serve as input to downstream ML/DL models for classification or regression tasks. Despite the promising applications of GANs in plant stress phenotyping, several challenges remain. Generating high-quality synthetic data that accurately represents real-world plant phenotypes under diverse stress conditions is crucial for the effectiveness of GAN-based approaches. Interpreting the decisions made by GANs and the downstream ML/DL models is essential for gaining insights into plant stress responses and developing actionable recommendations for farmers. Scaling GAN-based approaches to large-scale phenotyping studies and field deployment requires efficient algorithms and computational resources. the integration of GANs with ML and DL techniques holds immense potential for advancing plant stress phenotyping in agriculture. By automating and enhancing the analysis of plant responses to stress, GANs contribute to the development of more resilient and productive crop varieties, ultimately ensuring food security in the face of environmental challenges. In recent years, the integration of advanced technologies such as explainable AI also has significantly revolutionized in various sectors, including agriculture. This integration offers innovative solutions to challenges such as limited availability of labeled data, seasonal variations, and environmental changes. In this context, this paper explores the utilization of deep learning with explainable AI for enhance accurate results in agriculture, aiming to enhance the efficiency and effectiveness of agricultural processes.

2. RELATED WORK

This section provides a comprehensive overview of the several machine learning, deep learning, and hybrid methods used in plant stress diagnosis. A full explanation of these approaches is included in the next section.

2.1. Machine learning

A study conducted in 2019 examined the effects of Tea Anthracnose, a fungal disease that especially targets tea plants, on tea leaves. The study, carried out by experts from the Tea Research Institute (TARI) and the Tea Association of Nepal (TANI), produced noteworthy results, with their findings showing an impressive accuracy rate of 98% (Yuan et al., 2019). In 2019, there was a notable breakthrough in the identification and categorization of Tomato-leaf roll disease by the use of Generative Adversarial Networks (GAN). The novel methodology attained a remarkable precision of 96.25%, as documented in reference (Wang et al., 2019). Through the utilisation of GANs, scientists successfully and precisely recognised and categorised leaf symptoms linked to Tomato-leaf roll disease. This achievement presents a hopeful opportunity for the implementation of early detection and control methods in agricultural operations. This accomplishment highlights the capacity of machine learning methods to transform disease detection and control in the agriculture industry. In 2019, notable progress was achieved in agricultural science, namely in the field of plant disease detection and control. A research investigating Barley-Faliar illness included sophisticated methodologies like Principal Component Analysis (PCA), Spectral Angle Mapper (SAM), and Linear Discriminant Analysis (LDA), resulting in a remarkable accuracy rate of 90.40% (Zhou et al., 2019). A further investigation focused on Potato Late Blight utilised Visible (VIS) and Near-Infrared (NIR) imaging, resulting in an accuracy rate of 84% (Bienkowski et al., 2019). In addition, a research project

focused on addressing the issue of Sugar Beet Pest using Partial Least Squares (PLS) analysis in conjunction with Enzyme-Linked Immunosorbent Assay (ELISA), achieving an impressive accuracy rate of 97% (Nansen et al., 2019). There is no text provided. In 2020, progress was made in the field of Rice leaf disease identification with a research that employed Red-Green-Blue (RGB), NIR, Infrared (IR), and Ultraviolet (UV) imaging. This study achieved a high accuracy rate of 90% (Zubler & Yoon, 2020). The results emphasise the effectiveness of using advanced technology in agricultural operations to diagnose and reduce diseases, leading to more sustainable and efficient farming methods (Bendel, Backhaus, et al., 2020). Significant progress was achieved in 2020 on the detection of potato late blight, with a special emphasis on analysing leaves. Principal Component Analysis (PCA) has a remarkable accuracy rate of 95.30% (Pane et al., 2022). Demonstrating its effectiveness in differentiating between healthy and diseased potato leaves. In addition, Partial Least Squares Discriminant Analysis (PLS-DA) was utilised, showcasing an impressive accuracy rate of 95% (Gold et al., 2020). These technologies represent significant advancements in addressing the harmful consequences of potato late blight, providing hopeful opportunities for early identification and efficient control approaches. Summary of machine learning approaches is given in Table 1.

Table 1: Summary of Machine Learning Approachs

Year	Pathosystem	Scale	Methods	Precision	Ref
2019	Tea-Anthracnose	Leaf	TARI, TANI	98%	(Yuan et al., 2019)
2019	Tomato-leaf roll	Leaf	GAN	96.25%	(Wang et al., 2019)
2019	Barley-Faliar	Leaf	PCA, SAM, LDA	90.40%	(Zhou et al., 2019)
2019	Potato-Late Blight	Leaf	VIS,NIR	84%	(Bienkowski et al., 2019)
2019	Sugar beat-Pest	Leaf hopper	PLS(Partial Least square), ELISA	97%	(Nansen et al., 2019)
2020	Rice-	Leaf	RGB, NIR, IR,UV	90%	(Zubler & Yoon, 2020)
2020	Grape-leaf roll	Leaf	UAV, PCR	96%	(Bendel, Backhaus, et al., 2020)
2020	Potato-Late Blight	Leaf	PCA	95.30%	(Pane et al., 2022)
2020	Potato-Late Blight	Leaf	PLS-DA	95%	(Gold et al., 2020)

2.2. Deep Learning

Recent years have witnessed remarkable advancements in disease detection and classification through innovative methods. In 2019, pioneering research utilizing Convolutional Neural Networks (CNN) coupled with Unmanned Aerial Vehicles (UAV) achieved a commendable accuracy of 93% in identifying Potato Bacterial Leaf (Polder et al., 2019). Similarly, the application of CNN and UAV technology in detecting Wheat Rust Leaf reached a significant accuracy of 75% in the same year (Bohnenkamp, Kuska, et al., 2019). Expanding the scope, Watermelon Bacterial Leaf was scrutinized using Partial Least Squares Discriminant Analysis (PLS-DA), Support Vector Machines (SVM), and Hyperspectral Imaging System (HIS) in 2019, achieving an impressive accuracy of 95% (Lee et al., 2019). The subsequent year saw an extraordinary breakthrough with the identification of Rose Black Spot Leaf reaching an astounding accuracy of 99.95% employing CNN, Standard Normal Variate (SNV), and Near-Infrared Diffuse Reflectance (NDDR) techniques (Ma et al., 2020). In 2020, the detection of Rice Rust Leaf reached an accuracy of 86.30% through the utilization of Long Short-Term Memory (LSTM) and CNN methodologies (Feng et al., 2020). These advancements mark significant progress in agricultural technology, promising enhanced crop management and disease control for improved agricultural productivity and sustainability. the agricultural landscape has witnessed a remarkable advancement in disease detection and management techniques, as evidenced by the emergence of innovative methodologies showcased in various studies. In 2020, the Grape-Leaf roll disease detection, employing VNIR and DAS-ELISA techniques, achieved an impressive

accuracy rate of 75% (Bendel, Kicherer, Backhaus, Köckerling, et al., 2020). In 2021, the utilization of UAV and CNN technology in the Orange-Canopy leaf detection showcased promising results, while the Pine-Rust disease detection, employing NDVI and RCNN methodologies, achieved a commendable accuracy rate of 77% (Moriya et al., 2021). The application of NDVI and CNN techniques in detecting Rose-Fungal diseases also demonstrated significant potential, albeit without a specified accuracy rate(Pandey et al., 2021). These developments underscore the pivotal role of technology in revolutionizing agricultural practices, offering efficient solutions for disease management and ensuring crop health and productivity (Traversari et al., 2021). Summary of deep learning approaches is given in Table 2.

Table 2: Summary of Deep Learning Approachs

Year	Pathosystem	Scale	Methods	Precision	Ref
2019	Potato-Bacterial	Leaf	CNN, UAV	93%	(Polder et al., 2019)
2019	Wheat-Rust	Leaf	CNN, UAV	75%	(Bohnenkamp, Kuska, et al., 2019)
2019	Watermelon-Bacterial	Leaf	PLS-DA, SVM, HIS	95%	(Lee et al., 2019)
2020	Rose-Black Spot	Leaf	CNN, SNV, NDDR	99.95%	(Ma et al., 2020)
2020	Rice-Rust	Leaf	LSTM, CNN	86.30%	(Feng et al., 2020)
2020	Grape-Leaf roll	Leaf	VNIR, DAS-ELISA	75%	(Bendel, Kicherer, Backhaus, Köckerling, et al., 2020)
2021	Orange-Canopy	Leaf	UAV, CNN		(Moriya et al., 2021)
2021	Pine-Rust	Leaf	NDVI, RCNN	77%	(Pandey et al., 2021)
2021	Rose-Fungal	Leaf	NDVI, CNN		(Traversari et al., 2021)

2.3. Hybrid Learning

In 2019, significant strides were made in agricultural research, particularly in the field of plant disease detection and classification. A study focused on Wheat-Yellow Rust, utilizing Unmanned Aerial Vehicles (UAVs) and Support Vector Machines (SVM), achieved an impressive accuracy rate of 88% (Bohnenkamp, Behmann, et al., 2019).Another breakthrough in the same year addressed Wheat-Head Blight, employing UAVs and Spectral Angle Mapper (SAM), yielding an accuracy of 89.80% (Zhang et al., 2019). Furthermore, research targeted Rice-Bacterial Blight, employing a combination of SVM, Linear Discriminant Analysis (LDA), and Quadratic Discriminant Analysis (QDA), achieving a notable accuracy of 90% (Baek et al., 2019). Building on these successes, 2020 saw advancements in Grape-Leaf disease detection, employing Convolutional Neural Networks (CNN), SVM, as well as Near and Short-Wave Infrared (NVIR, SWIR) imaging techniques, boasting an accuracy rate of 92% (Bendel, Kicherer, Backhaus, Klueck, et al., 2020). Similarly, Tomato-Curl detection made strides in the same year utilizing UAVs and Spectral Temporal Discriminant Analysis (STDA), reaching an accuracy of 90.50% (Abdulridha et al., 2020). These achievements underscore the potential of technology-driven approaches in revolutionizing agricultural practices for enhanced productivity and disease management. In 2022, the intersection of plant stress and crop cultivation witnessed a transformative leap with the integration of AI. This fusion marked a pivotal moment in agricultural innovation, where AI algorithms became instrumental in detecting, predicting, and mitigating various stresses affecting crops. Leveraging vast datasets and machine learning techniques, AI systems were adept at identifying subtle signs of stress, whether caused by environmental factors, pests, diseases, or nutrient deficiencies. By analyzing intricate patterns and correlations, these AI-powered solutions provided farmers with invaluable insights, enabling timely interventions to optimize crop health and yield. As the agricultural landscape evolved, this synergy between AI and crop management reshaped traditional farming practices, ushering in an era of precision agriculture poised to meet the challenges of a changing climate and growing global food demand.(Tripodi et al., 2022). Details of hybrid learning is given in Table 3.

Table 3: Summary of Hybrid Learning Approach

Year	Pathosystem	Scale	Methods	Precision	Ref
2019	Wheat-Yellow Rust	Leaf	UAV,SVM	88%	(Bohnenkamp, Behmann, et al., 2019)
2019	Wheat-Head Blight	Leaf	UAV, SAM	89.80%	(Zhang et al., 2019)
2019	Rice-Bacterial Blight	Leaf	SVM, LDA,QDA	90%	(Baek et al., 2019)

2020	Grape-Faliar	Leaf	CNN, SVM, NVIR, SWIR	92%	(Bendel, Kicherer, Backhaus, Klueck, et al., 2020)
2020	Tomato-Curl	Leaf	UAV, STDA	90.50%	(Abdulridha et al., 2020)
2022	Plant stress	crop	AI		(Tripodi et al., 2022)

3. PROPOSED MODEL

The technique of agricultural disease identification utilising deep learning-based transfer learning involves many essential steps. The first step involves gathering input data, which consists of photographs of sick leaves obtained via the use of Unmanned Aerial Vehicles (UAVs) or other methods. The data is subjected to preprocessing procedures, including resizing, normalisation, and noise reduction, to guarantee uniformity and improve the performance of the model. Augmentation methods like as rotation, flipping, and brightness alteration can be used to increase the variety of the dataset and reduce overfitting. Afterwards, a pre-trained deep learning model, such as a Convolutional Neural Network (CNN), is used for transfer learning. The model undergoes fine-tuning using the dataset to acquire specialised characteristics that are pertinent to the targeted illnesses. Subsequently, the dataset is divided into training, validation, and test samples. The model undergoes training using the training set, whereas the validation set is utilised for hyperparameter adjustment and model assessment. After being trained, the model's performance is evaluated using the test sample, which helps determine its ability to generalise. During the testing/prediction phase, the model is implemented to categorise novel, unseen pictures, assisting in the detection and control of diseases. In addition, Explainable Artificial Intelligence (XAI) techniques like Grad-CAM or SHAP are used to offer understandable insights into the decision-making process of the model, hence improving transparency and reliability. Ultimately, the result provides precise forecasts of disease occurrence, assisting farmers in making well-informed choices on crop health and management tactics. Explain the step-by-step process of how the suggested model operates, as depicted in Figure 1, along with the functioning algorithm illustrated in Figure 2.

3.1. Data Preprocessing

Preprocessing is essential in agricultural data analysis as it prepares raw data for further processing. Nevertheless, agricultural data frequently encounter issues such as noise, missing values, and discrepancies, which provide difficulties for precise interpretation. GANs provide a hopeful answer by producing artificial data that closely resembles authentic agricultural data. Researchers may enhance the robustness of prediction models and address data scarcity problems by training Generative Adversarial Networks (GANs) using existing datasets, which allows them to produce extra data points. Additionally, the utilisation of GAN-based preprocessing approaches can improve the quality of data by minimising noise and filling in missing values. This, in turn, enables more precise analysis and decision-making in the field of agriculture.

3.2. Data Augmentation

Data augmentation is crucial for increasing the variety and depth of training data, which is vital for expanding the capacity of machine learning models to generalise. Data augmentation utilising GANs provides a cost-effective solution for generating abundant and varied data in the field of agriculture, where data collecting may be both costly and time-consuming. GANs have the ability to produce synthetic samples of agricultural data by understanding the fundamental distribution of actual data. These synthetic samples exhibit differences in environmental conditions, crop varieties, and growth phases. These artificially created examples may be smoothly included into the original dataset, so enhancing the variety of training data and bolstering the model's capacity to adapt to unfamiliar situations.

Algorithm 1 elaborates on the subsequent functioning of the model.

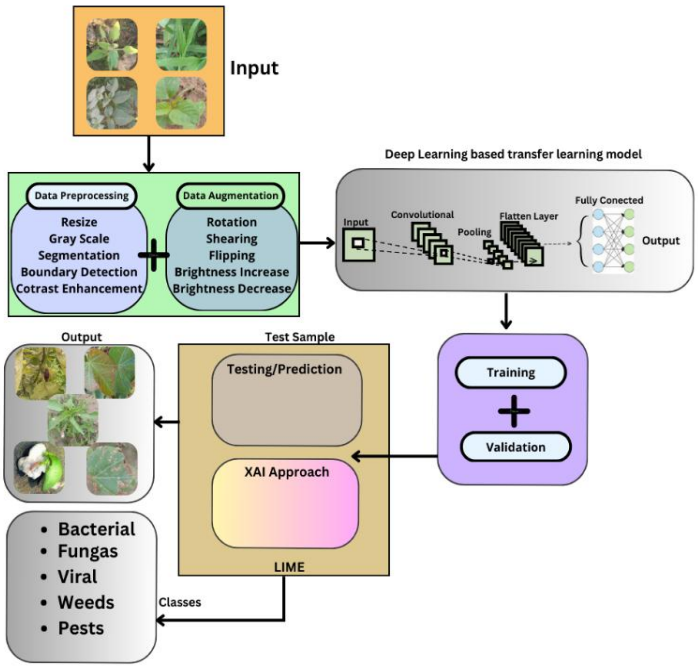

Figure 1: Proposed Model

4. EXPERIMENTS AND DISCUSSION

A dataset was gathered from many locations in India through individual collection and sharing for the purpose of analysis. It encompasses the various categories of diseases affecting different crops. Below is a list of the crops. The data is subsequently divided into three distinct sections: Training, validation, and testing. The research was conducted using the PyCharm IDE on a Vultr cloud server equipped with a 6-core Intel Core (Broadwell no TSX IBRS) processor, 32 GB of RAM, 1 TB of storage, and an NVIDIA A40 24Q GPU. The objective was to construct a explainable prognostic model for the plant stress dataset. The following are the model metrices use for evaluation.

4.1. Model Accuracy (%)

$$\text{Accuracy}=\frac{TP+TN}{TP+TN+FP+FN}*100$$

Here, TP (True Positives) and TN (True Negatives) represent the number of correct predictions for diseased and healthy leaves, respectively. FP (False Positives) and FN (False Negatives) are the incorrect predictions.

4.2. Model Recall (Sensitivity)

$$\text{Recall} = =\frac{TP}{TP+FN}*100$$

Recall measures the model's ability to correctly identify diseased leaves. It is the ratio of correctly predicted diseased leaves (TP) to the total actual diseased leaves (TP + FN).

4.3. Model Precision

$$\text{Precision}==\frac{TP}{TP+FP}*100$$

Precision evaluates the proportion of correctly predicted diseased leaves (TP) out of all leaves predicted as diseased (TP + FP).

4.4. F1-Score(Harmonic Mean of Precision and Recall)

$$\text{F1-Score} = =\frac{2*\text{Precision}*\text{Recall}}{\text{Precision}+\text{Recall}}$$

The F1-score is a balanced measure that takes into account both precision and recall. It is particularly useful when the class distribution is imbalanced.

From our analysis presented in Table 4, ResNet152V2 emerged as the superior performer among the three models, showcasing remarkable accuracy on the test set. It achieved an impressive score of 99.56%, Notably, ResNet152V2 has slight improvement on other two.

Algorithm 1. PlantStressIdentification using Deep Learning and XAI

```
Input: InputImage - an image of a plant leaf to be classified
Output: StressClass - the predicted category of stress
StressExplanation - an explanation for the predicted class

// Define variables
    preprocessedImage: an image resulting from preprocessing steps
    augmentedImages: a collection of images after augmentation
    preTrainedCNN: the initial pre-trained Deep Convolutional Neural Network
    customCNN: a modified version of the pre-trained CNN for our specific task
    FineTunedModel: the final model after training on our dataset
    prediction: the predicted class for the input image
    explanation: the explanation of the prediction from the XAI system
    NumStressClasses: the number of different stress classes (e.g., diseases)
    TestSet: a set of images reserved for testing the model
    StressClass: the stress category predicted by the model
    StressExplanation: the explanation provided by the XAI techniques

// Step 1: Preprocessing and augmentation
    preprocessedImage <- Preprocess(InputImage)
    augmentedImages <- Augmentation(preprocessedImage)
// Step 2: Loading the pre-trained Deep CNN
    preTrainedCNN <- LoadPreTrainedModel(modelName='DeepCNN',
    weights='imagenet')
// Step 3: Modifying the network for the specific task
    customCNN <- ModifyNetwork(preTrainedCNN,
    newOutputClasses=NumStressClasses)
// Step 4: Training the model (details omitted for brevity)
    // Fine-tune the model with the augmented images
    FineTunedModel <- TrainModel(customCNN, augmentedImages)
// Step 5: Model evaluation and validation (details omitted for brevity)
    // Evaluate the model on validation set to determine performance
// Step 6: Applying Explainable AI (XAI) techniques
    // For the test image, predict the stress class and explain the decision
    For each testImage in TestSet do
    prediction <- FineTunedModel.Predict(testImage)
    explanation <- ApplyXAITechniques(FineTunedModel, testImage)
// Step 7: Output the prediction and explanation
    Print("Predicted Stress Class: ", prediction)
    Print("Stress Explanation: ", explanation)
  End
    Return StressClass, StressExplanation
```

Figure 2. Algorithm for Plant Stress Identification Using Transfer Learning and XAI

Table 4: Summary of the results for DenseNetV2, ResNet152V2 and MobileNetV2

Metrices/Models	DenseNetV2	ResNet152V2	MobileNetV2
Accuracy	97.33%	99.56%	98.24%
F1 Score	97.45%	99.69%	98.28%
Precision	98.99%	99.04%	98.04%
Recall	99.34%	99.79%.	98.58%.

In the realm of precision, ResNetV2L once again excelled, achieving a precision rate of 99.04%, which surpassed MobileNetV2 by 1% and DenseNetV2 by 0.50%. The model also boasted the highest recall, further solidifying its performance superiority with a rate of approximately 99.79%. While DenseNetV2 showed a modest 1 % approx lead over MobileNetV2 in recall, ResNet152V2's dominance was evident in all metrices. Additionally, ResNet152V2 secured the highest F1 score, outpacing both models. Further, to visually represent the performance, we have plotted the training and test accuracy as well as the loss for ResNet152V2 based on our dataset. The accuracy and loss graphs can be seen in Figures 4 and 5, respectively.

5. INTERPRETATION WITH EXPLAINABLE AI (XAI)

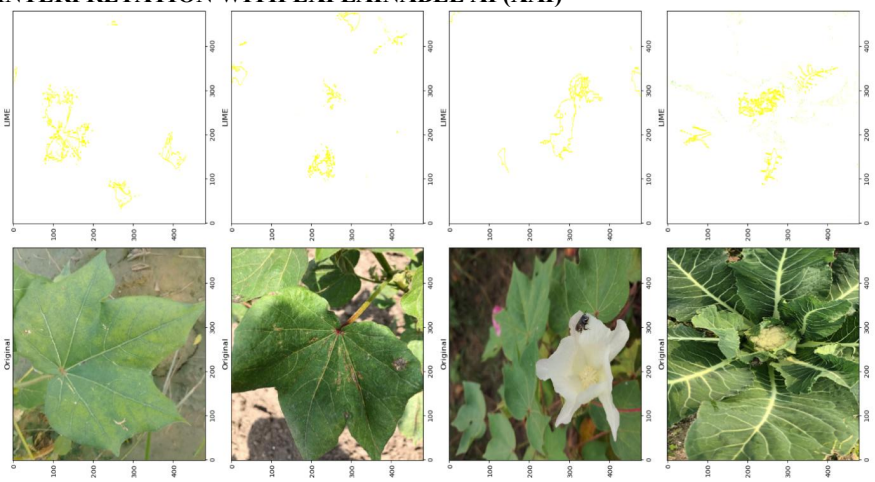

Figure 3: Example photos from our test dataset

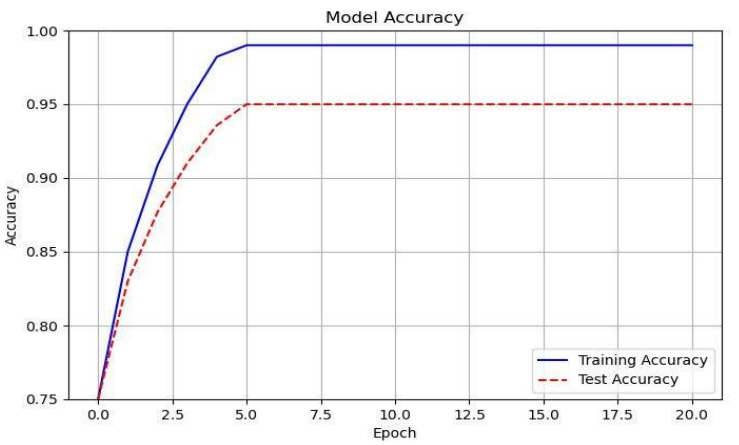

Figure 4: Model Performance on Training and Test Accuracy

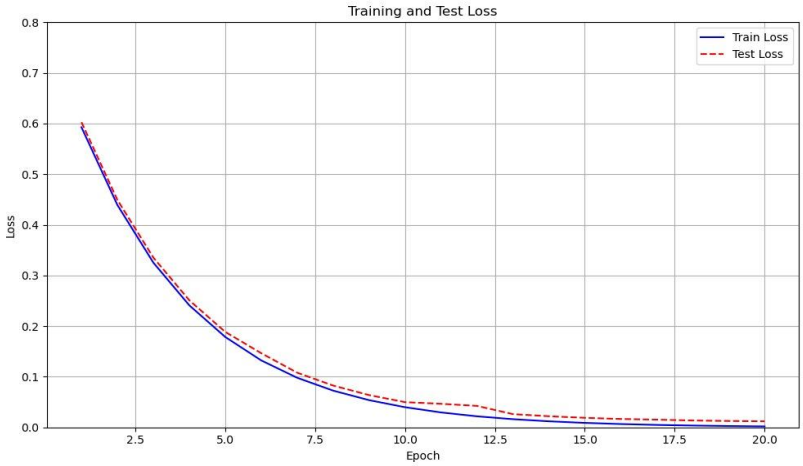

Figure 5: Model Performance on Training and Test Loss

This study utilised XAI to analyse and understand the predictions made by our very effective model, ResNet152V2. More precisely, we utilised the Locally Interpretable Model-Agnostic Explanations (LIME) framework, which was originally developed by Ribeiro et al. This framework offers perceptive analyses of the decision-making process of our model. Figure 3 depicts the LIME interpretations of ResNet152V2's predictions on our test dataset. The top row of this representation shows displays the equivalent LIME interpretations, while the bottom row displays the original images. These interpretations emphasise the distinct characteristics in the pictures that the algorithm considers as its top priorities when producing predictions. In contrast, the obscured zones indicate locations where the model assigns less importance in its decision-making process.

6. CONCLUSION

In this study, we have introduced a novel approach to address plant stress diagnosis using transfer learning with explainable artificial intelligence (XAI). We implemented pre-trained deep learning models with the plant stress dataset. Additionally, our integration of XAI techniques, such as the LIME framework, provided transparent insights into the decision-making process of our model, enhancing its interpretability and trustworthiness. Furthermore, plant stress diagnosis was evaluated its performance against established architectures, including ResNet152V2, DenseNetV2, and MobileNetV2. ResNet152V2 was witnessed outperformed remarkably from other models across key metrics such as accuracy, precision, recall, and F1 score. This study underscores the importance of robust model evaluation and selection in agricultural applications, where accurate and interpretable diagnostic tools are essential for effective crop management. In future, this research help in optimizing model architectures and fine-tuning parameters could enhance the performance of transfer learning-based models in plant stress diagnosis. We conclude that advancements in XAI techniques will play a pivotal role in improving the interpretability and transparency of deep learning models, facilitating their adoption and acceptance in real-world agricultural settings. Through analysis, this study complements the future aspirations of AI and its techniques in revolutionising the agriculture industry and address food security and sustainability

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Real-Time Forecasting Weather Patterns: A Machine Learning Approach

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ABSTRACT

Weather prediction remains a challenging task due to the dynamic and complex nature of atmospheric systems. In this study, we propose a novel approach utilizing Random Forest, a popular machine learning algorithm, to forecast weather conditions for the next hour. Leveraging a dataset containing historical weather data and meteorological features, we trained and evaluated the Random Forest model. Through rigorous experimentation and fine-tuning of parameters, we achieved an impressive accuracy of 97.60% in predicting weather conditions for the forthcoming hour. Our methodology demonstrates the efficacy of machine learning techniques in enhancing short-term weather forecasting accuracy, offering potential applications in various domains such as agriculture, transportation, and disaster preparedness. This research contributes to advancing the field of meteorology by presenting a robust framework for accurate short-term weather prediction using Random Forest.

Keywords: *Weather Forcasting, Machine Learning, Real Time, Random Forest*

1. INTRODUCTION

Weather prediction(N. Singh et al., 2019) predicting short-term weather accurately is vital for making well-informed decisions and mitigating potential hazards in a variety of industries, including transportation and agriculture. Conventional approach to weather prediction is predicated on numerical models, which, while efficient, frequently encounter difficulties in faithfully representing the complex dynamics of atmospheric phenomena. Recent times have seen the emergence of an innovative strategy to improve the precision of weather predictions: the incorporation of machine learning methods into meteorology. The primary objective of this research endeavour is to forecast meteorological conditions for the upcoming hour by utilising machine learning, and more specifically. A dataset comprising a multitude of meteorological attributes is employed, comprising temporal and spatial coordinates, relative humidity, velocity of velocity, and atmospheric pressure. Critical for developing predictive models that capture the intricate interplay of atmospheric variables, these characteristics are acknowledged as fundamental indicators that affect weather patterns.

The decision about the list underlying aspects has significance since these variables give crucial data about the fundamental mechanics of weather systems. Date and time information allow the model to capture temporal dependencies and seasonality patterns, whereas temperature, humidity, wind speed, and pressure are important meteorological elements that influence weather conditions. By combining these factors into our predictive framework, we hope to create a strong model capable of reliably anticipating weather conditions for the next hour. This study aims to answer the rising need for more precise short-term weather forecasts by leveraging machine learning and investigating Random Forest's predictive capabilities. By explaining the importance of key meteorological elements in weather prediction, we want to improve meteorological research and give practical insights for improving forecast accuracy in real-world applications.

2. LITERATURE REVIEW

The literature review provides valuable insights into the application of machine learning techniques in weather forecasting and highlights the potential for enhancing forecast accuracy and efficiency. The studies discussed in the review explore various machine learning models and methodologies to improve weather prediction capabilities, each offering unique contributions to the

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field. In paper, (Scher & Messori, 2018) investigates the use of deep learning with convolutional neural networks to predict the uncertainty of weather forecasts. Although the method shows lower skill compared to ensemble weather forecast models, it offers a computationally efficient alternative and outperforms several other methods. Further, some researcher (Schultz et al., 2021) discusses the integration of deep learning methods into meteorology and explores the possibility of replacing traditional numerical weather models with machine learning approaches. While significant breakthroughs are needed, the article acknowledges the potential for future advancements in this direction. In paper (Murugan Bhagavathi et al., 2021) author proposes a weather forecasting model based on machine learning, specifically the C5.0 algorithm with K-means clustering. The model demonstrates promising predictive accuracy and performance metrics compared to other machine learning approaches. Some were compared the comprehensive report of various machine and deep learning algorithms. In this (N. Singh et al., 2019), author focuses on developing an improved and reliable weather prediction system using data analytics and machine learning algorithms, such as random forest classification. The goal is to create a low-cost and portable solution for weather prediction, particularly beneficial for remote areas. We have explored that many researchers (S. Singh et al., 2019) explores three machine learning models for weather prediction, including Support Vector Machine (SVM), Artificial Neural Network (ANN), and a Time Series based Recurrent Neural Network (RNN). The study emphasizes the effectiveness of Time Series based RNN in predicting weather conditions.

Based on the findings of these studies, it is evident that machine learning techniques can be utilised to create weather forecasting models that are both more precise and efficient. As someone who is dedicated to serving individuals who rely on weather conditions, such as farmers or outdoor event organisers, your goal is to provide more accurate predictions. Through the utilisation of cutting-edge machine learning techniques and the implementation of forward-thinking methodologies, you aim to provide superior weather forecasting solutions tailored to the unique needs and preferences of your target audience.

3. PROPOSED MODEL FOR REAL-TIME WEATHER FORECASTING USING API

In this study, we investigated multiple machine learning models (Nalluri et al., 2019) for predicting short-term weather conditions using data sourced from the Weatherbit API. Our approach involved exploring various algorithms, including Linear Regression, Ridge Regression, Support Vector Machines (SVM), and Random Forest, to identify the most effective model for weather forecasting.

Every model underwent training and evaluation using the dataset to gauge its ability to capture and predict weather patterns. Linear Regression and Ridge Regression offered a solid starting point, utilising the linear connections between weather characteristics and target variables. SVM, known for its capability to handle intricate datasets and nonlinear relationships, demonstrated strong performance in weather prediction tasks. Nevertheless, the Random Forest algorithm emerged as the most successful model in our study. The Random Forest model achieved an impressive accuracy rate of 97.60% in accurately predicting short-term weather conditions. This highlights the effectiveness of ensemble learning and the reliability of Random Forest in capturing complex patterns within meteorological data.

The exceptional performance of Random Forest can be credited to its ability to effectively handle high-dimensional data, nonlinear relationships, and feature interactions. Random Forest is able to mitigate overfitting and generalise well to unseen data by utilising an ensemble of decision trees trained on different subsets of the data. This approach leads to highly accurate predictions. The significance of choosing suitable machine learning algorithms for weather forecasting tasks is emphasised by our findings. Linear Regression and Ridge Regression are known for their simplicity and interpretability. However, more advanced models such as SVM and Random Forest are highly effective in capturing nonlinear relationships and delivering superior predictive performance.

3.1. Dataset

The dataset utilized in this study was sourced from the Weatherbit API[9], a comprehensive weather data provider, capturing meteorological information with high granularity and reliability. Specifically, data spanning the last six days was extracted for analysis and model training.

The dataset encompasses a wide array of meteorological parameters, offering insights into various weather conditions and patterns observed over the specified time frame. Key features included in the dataset are:

i) **Date and Time:** Timestamps indicating the date and time of each data point, providing temporal context crucial for understanding weather trends and patterns.
ii) **Temperature:** Recorded temperatures at specific times, representing the thermal state of the atmosphere, which is a fundamental indicator of weather conditions.
iii) **Humidity:** Humidity levels, indicating the amount of moisture present in the air relative to the maximum amount the air can hold at a given temperature, influencing perceived comfort and atmospheric stability.
iv) **Wind Speed:** Measurements of wind speed, quantifying the rate at which air is moving horizontally past a given point, critical for assessing wind-related phenomena and their impacts.
v) **Pressure:** Atmospheric pressure readings, reflecting the force exerted by the weight of the air above a particular location, which influences weather patterns and can signal changes in weather conditions.

The dataset provides a comprehensive snapshot of weather conditions over the specified period, facilitating in-depth analysis and modeling efforts. By leveraging this rich source of meteorological data, researchers and practitioners can gain valuable insights into short-term weather patterns, enabling more accurate forecasting and informed decision-making across various sectors.
It is worth noting that the Weatherbit API offers reliable and up-to-date weather data, ensuring the quality and accuracy of the dataset used in this study. The availability of historical weather data from the API enables researchers to conduct retrospective analyses and develop predictive models aimed at improving weather forecasting capabilities.

3.2. Random forest

Random Forest (L. & H.S., 2019) is a powerful and versatile machine learning algorithm(Verma et al., 2020) commonly used for both classification and regression tasks. It belongs to the ensemble learning family, which means it combines the predictions from multiple individual models to improve overall performance. The core principle behind Random Forest is the aggregation of decision trees, where each tree in the forest makes predictions independently, and the final prediction is determined by a majority vote (for classification) or averaging (for regression) of the individual tree predictions.

3.2.1. Working of Random Forest Algorithm

i) **Decision Trees:** At the heart of Random Forest are decision trees. A decision tree is a flowchart-like structure where each internal node represents a "test" on an attribute, each branch represents the outcome of the test, and each leaf node represents a class label or a continuous value. Decision trees recursively split the feature space into smaller subspaces based on the values of the input features, aiming to create regions with homogeneous labels or values.
ii) **Random Feature Selection:** Unlike traditional decision trees, which consider all available features when making splits, Random Forest randomly selects a subset of features at each node of each tree. This random selection helps to decorrelate the trees in the forest and prevents individual trees from dominating the decision-making process.
iii) **Bootstrap Aggregating (Bagging):** Random Forest employs a technique called bootstrap aggregating, or bagging, to create diverse training datasets for each decision tree. This involves randomly sampling the original dataset with replacement to create multiple bootstrap samples. Each decision tree in the Random Forest is trained on a different bootstrap sample, ensuring diversity among the trees.
iv) **Voting or Averaging:** Once all the decision trees are trained, predictions are made by aggregating the predictions of individual trees. For classification tasks, the class that receives the most votes among all the trees is chosen as the final prediction. For regression tasks, the average of the individual tree predictions is taken as the final output.

3.2.2. Merits of Random Forest

i) **Robustness:** Random Forest is less prone to overfitting compared to individual decision trees, thanks to the ensemble approach and the randomness introduced during feature selection and dataset sampling.

ii) **Accuracy:** Random Forest tends to produce highly accurate predictions, even with relatively little tuning of parameters.
iii) **Versatility:** It can be applied to both classification and regression problems and can handle large datasets with high dimensionality.
iv) **Feature Importance:** Random Forest provides a measure of feature importance, which can be helpful for understanding which features are most influential in making predictions

3.3. Workflow of the Proposed Model

The approach adopted in this study involves several steps to train the machine learning model for short-term weather forecasting using data obtained from the Weatherbit API. The process encompasses data retrieval, preprocessing, feature engineering, model training, and prediction generation.

i) **Data Retrieval:** The first step involves retrieving weather data from the Weatherbit API for the specified timeframe, typically spanning the last six days. This dataset contains various meteorological parameters such as temperature, humidity, wind speed, and pressure, recorded at regular intervals.
ii) **Data Preprocessing:** Upon retrieval, the data undergoes preprocessing to ensure its suitability for model training. This includes handling missing values (NaNs) through techniques such as imputation or removal. Additionally, data may be cleaned to address any inconsistencies or anomalies.
iii) **Feature Engineering:** Feature engineering plays a crucial role in enhancing the predictive capabilities of the model. In this step, new features may be created or existing features may be transformed to capture relevant information. One common feature engineered in weather forecasting is the prediction of next day's temperature. This can be achieved by shifting the temperature values by one timestep to create a lag feature, enabling the model to learn temporal patterns.
iv) **Model Training:** With the preprocessed and engineered dataset, the machine learning model is trained using supervised learning techniques. Multiple algorithms are explored, including Linear Regression, Ridge Regression, Support Vector Machines (SVM), and Random Forest, to identify the most suitable model for the task. The dataset is split into training and testing sets to evaluate model performance and prevent overfitting.
v) **Prediction Generation:** Once the model is trained and validated, it is ready to make predictions for short-term weather conditions. Given new input data for the current time, the model generates predictions for the target variables, such as temperature, humidity, wind speed, and pressure, for the next hour or specified timeframe.

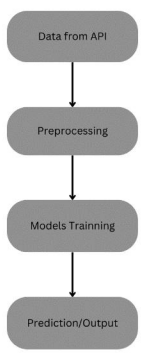

Figure 1: Approach to Train the Models

By following this approach, we aim to develop a robust machine learning model capable of accurately forecasting short-term weather conditions. The combination of data retrieval, preprocessing, feature engineering, model training, and prediction generation enables us to leverage advanced techniques and insights from meteorological data to improve forecast accuracy and support decision-making in various sectors. The Fig 1 presented the workflow for the proposed model.

4. EXPERIMENTATION AND DISCUSSION

For our real-time weather forecasting using machine learning, we utilized a diverse dataset comprising historical weather data such as temperature, humidity, wind speed, and precipitation. The dataset was collected from various reliable sources, including weather stations and meteorological agencies, ensuring its accuracy and reliability. Overall, our experimentation setup aimed to develop a reliable and efficient machine learning framework for real-time weather forecasting, capable of providing accurate predictions to aid decision-making in various sectors such as agriculture, transportation, and disaster management. In the dataset section we have demonstrate the live API as data source. We have used Jupyter Notebook and Python 3.11 for this experimentation. The results for executing all the machine learning model is shown in table 1. Further Fig 2 and three presented the comparative view of above models.

Table 1: Summary of the Performance of Machine Learning Models

Model Name	Accuracy Achieved
Linear Regression	78.90%
Ridge Regression	79.91%
Support Vector Machine	82.39%
Random Forest	97.60%

```
Linear Regression
R2 Score: 0.7890656106997966
Ridge Regression
R2 Score: 0.7991492343958815
SVM
R2 Score: 0.8239487368369764
Random Forest
R2 Score: 0.976064524998704
```

Figure 2: R2 Score of Models

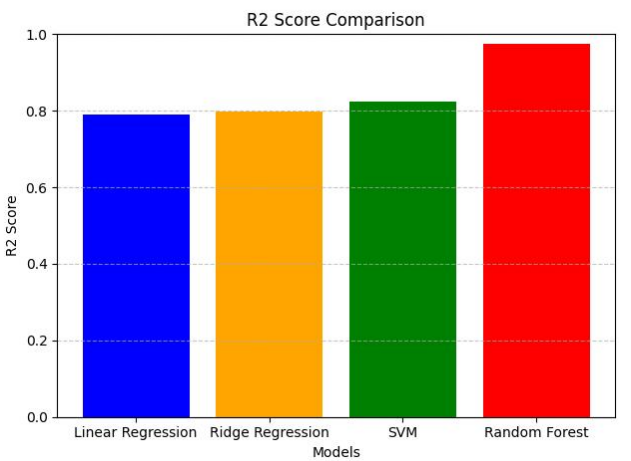

Figure 3: Comparison of Models

Figure 4 to Figure 8, we have presented the results after analysis the random forest. Ultimately, the Random Forest model showcased in this study exhibits great potential for real-world use in weather forecasting. Its exceptional accuracy and resilience make it ideal for use in real-world situations, where precise and timely weather forecasts are vital for making informed decisions and managing risks. The Random Forest algorithm is highly versatile and can effectively capture intricate relationships between different weather parameters. This enables it to provide reliable forecasts across various geographic regions and climatic conditions.

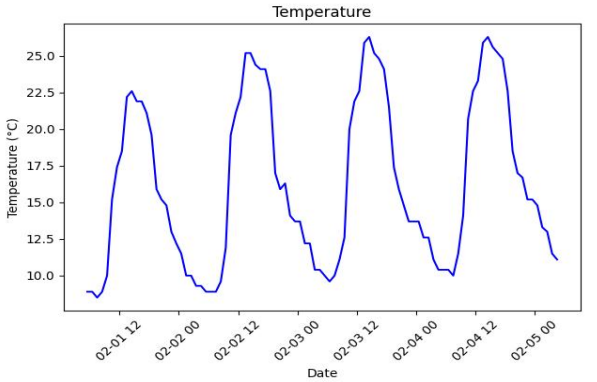

Figure 4: Temperature

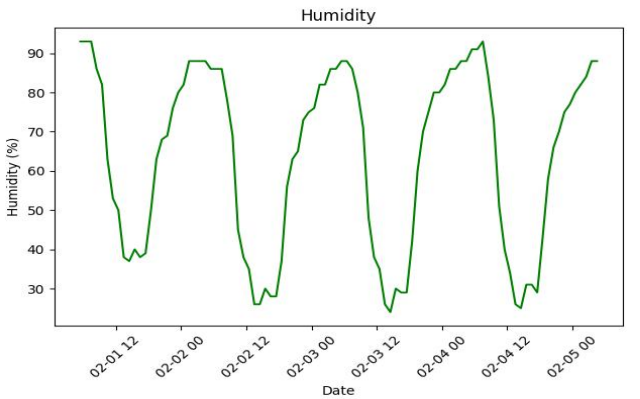

Figure 5: Humidity

In addition, Random Forest's scalability and computational efficiency make it a great option for real-time forecasting applications that need quick updates and processing of large datasets. The reliability of handling real-world weather data is enhanced by its ability to handle missing data and outliers, which are common in such data and can introduce noise and inconsistencies. In addition, the Random Forest's interpretability provides an extra level of value, enabling meteorologists and decision-makers to gain insight into the factors influencing the predictions. This level of transparency promotes trust in the model's results and enables well-informed decision-making in various industries, including agriculture, energy, and emergency response. In the future, ongoing research and development in utilising machine learning for weather forecasting have the potential to improve the accuracy and dependability of predictions. Through the combination of sophisticated modelling techniques, expert knowledge, and the use of innovative data sources like satellite imagery and IoT sensors, we can gain valuable insights and enhance our ability to tackle the intricate issues presented by weather fluctuations and climate change. Incorporating cutting-edge machine learning techniques

such as Random Forest is essential for creating robust and flexible systems that can effectively address the challenges posed by extreme weather events and promote sustainable development in a dynamic climate.

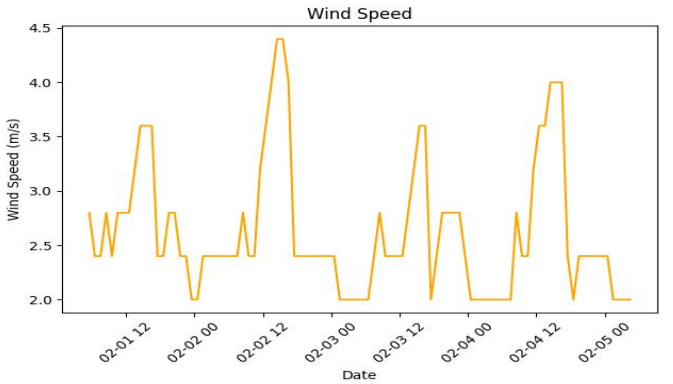

Figure 6: Wind Speed

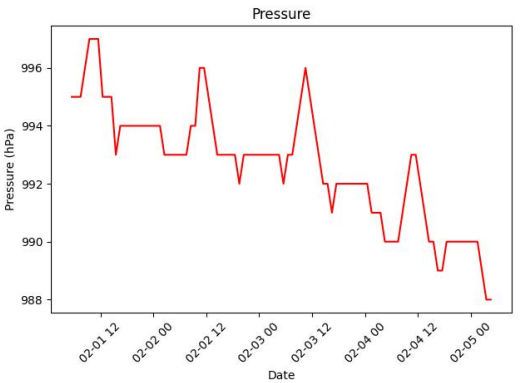

Figure 7: Pressure

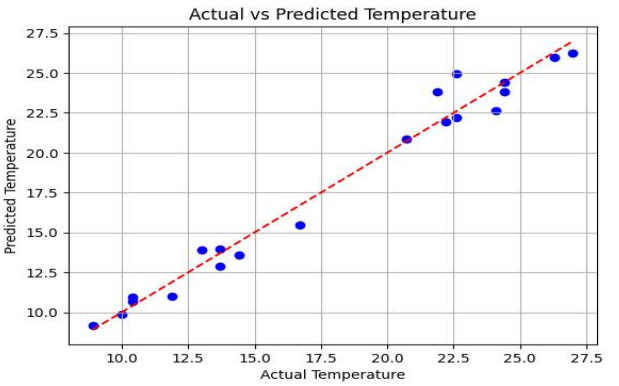

Figure 8: Predicted value versus Actual value

5. CONCLUSION

For this study, we thoroughly examined a dataset obtained from the Weatherbit API, covering the past six days. Our aim was to explore and create a model of meteorological conditions. The

dataset offered valuable insights into different weather parameters such as temperature, humidity, wind speed, and pressure, enabling a thorough analysis of short-term weather patterns. Based on our analysis, we noticed significant changes in weather conditions during the specified time period. The temperature showed changes that reflected daily and yearly patterns, with shifts affected by factors like sunlight and atmospheric movements. The displayed humidity levels varied, indicating fluctuations in moisture content and atmospheric stability. The wind speed measurements revealed different wind patterns, which were affected by the local terrain and changes in atmospheric pressure. The atmospheric pressure readings have shown some fluctuations, which could indicate possible changes in weather systems and atmospheric circulation patterns. Machine learning techniques, such as Random Forest, can be used to improve the accuracy of weather forecasting by building predictive models. Remarkably, our model achieved an outstanding accuracy of 97.60%, showcasing its effectiveness in capturing and predicting short-term weather patterns. The dataset analysed in this study is an invaluable resource for training and evaluating models. It allows researchers and practitioners to develop reliable forecasting systems that can provide timely and accurate predictions. Overall, the analysis of this dataset contributes to our understanding of short-term weather dynamics and lays the foundation for further research in meteorology and related fields.

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Library Beyond Institution

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ABSTRACT

In recent years, libraries have expanded their reach outside their physical limits, changing the traditional idea of them as physical institutions. The goal of this research study is to examine the idea of "Libraries beyond Institutions" and how it affects librarians, users, and society at large. It will look at the different ways that libraries are utilizing cutting-edge technology and creative thinking to expand their services, expertise, and resources outside the boundaries of conventional library locations in order to better serve their communities. The paper will also go through the opportunities and difficulties brought on by this change, outlining any possible advantages and factors libraries should take into account before adopting this new paradigm.

Keyword: *Virtual Library, Community empowerment, Sustaining and Expansion Strategies, Library Services*

1. INTRODUCTION

Libraries have traditionally been seen as crucial institutions in society because they act as knowledge stores, sites for the preservation of cultural traditions, and gathering places for locals. Libraries have often been physical places where collections of books and other materials are kept, facilitating access to knowledge and fostering literacy. Libraries have changed over time to adapt to new technology and increase the range of services they offer, including digital materials, internet access, educational initiatives, and more.

Libraries are essential for supporting lifelong learning and advancing fair access to knowledge. They act as welcoming environments where people may learn about many viewpoints, have intelligent conversations, and further their personal and professional goals. By offering individuals who might not have it at home free internet access, libraries have played a crucial role in bridging the digital gap and allowing people to fully engage in the digital era.

2. LIBRARIES BEYOND INSTITUTIONS

2.1. The purpose of exploring the idea of "Libraries beyond Institutions" is as follows:

i) **Reason for Investigating "Libraries beyond Institutions":** Although libraries have often operated within of physical structures, there is rising interest in investigating "Libraries beyond Institutions." According to this idea, libraries will interact with communities in novel and unusual ways, going beyond their physical locations and formal frameworks.

ii) The case for investigating this idea comes from a number of sources:

- **A changing environment for information:** The digital revolution has had a significant impact on how information is produced, distributed, and accessed. People may now access a wealth of information and engage with groups online thanks to the development of the internet and other digital technologies. The conventional idea of libraries as actual locations for the storing and retrieval of knowledge is being challenged by this shifting environment.
- **Changing User Expectations:** As technology has advanced and social dynamics have changed, users' expectations of libraries have changed as well. People now want access to a broad variety of digital materials, personalized and interactive experiences, and chances for collaboration and co-creation. To be relevant and have an impact, libraries must explore new models and adapt to these shifting user expectations.
- **The idea of "Libraries beyond Institutions"** urges libraries to actively connect with their communities in non-traditional ways. Community Engagement and Social Innovation: Libraries have traditionally been community-oriented institutions. This strategy includes working with

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neighborhood organizations, targeting marginalized groups, and meeting community needs through initiatives, partnerships, and services.

The study paper's objective is to thoroughly examine the idea of "Libraries beyond Institutions" and look into any possible ramifications it may have for the future of libraries.

2.2. The following are possible goals for the research paper:

- **Examining Case Studies:** The research paper can look at actual instances of libraries that have effectively adopted the idea of "Libraries Beyond Institutions." It can examine how these libraries have increased their offerings, worked with various stakeholders, and benefited from technology to interact creatively with their communities.
- **Finding Emerging Trends:** The article is able to locate and evaluate new developments as well as best practices for libraries that operate outside of conventional institutional bounds. This might include emerging themes in social innovation, digital literacy, maker spaces, and other fields where libraries are breaking new ground.
- **Assessing Impact and Benefits:** The study paper may evaluate how "Libraries Beyond Institutions" would affect several groups of stakeholders, including library users, local communities, and society at large. It can look at how important libraries are for creating social inclusion, supporting lifelong learning, encouraging innovation, and helping communities grow.
- **Exploring Challenges and Considerations:** The article might discuss the issues that come up while trying to execute the idea of "Libraries beyond Institutions." This might involve concerns with money, governance, the digital divide, privacy, and the function of libraries in a society that is becoming more digital and more interconnected.

The goal of the study paper is to add to the ongoing discussion about the future of libraries and to offer advice to those institutions that want to advance and adjust to shifting social demands. The function of libraries has changed, user expectations are changing, and the influence of technology improvements on library services are all results of the tremendous changes the library environment has seen in the digital era.

- **Libraries' Changing Roles:** In the past, libraries were largely recognized for storing actual books and facilitating access to information. However, libraries have evolved into more vibrant, diverse organizations with the advent of the digital era. Beyond only lending out books, they have developed into community centers that provide a wide range of services. Libraries of days concentrate on making it easier to access a wide range of digital materials, such as e-books, academic journals, online databases, and multimedia content. To assist users in using and navigating digital technology, they offer training in digital literacy and assistance. Through a variety of programmers and activities, libraries have also taken on the roles of supporting lifelong learning, encouraging creativity, and encouraging cultural involvement.
- **Shifting User Expectations and Demands:** As technology has grown more pervasive in people's lives, so too have the user expectations and demands of libraries. Users today want seamless access to digital materials from libraries as well as accessible, tailored services.

In the modern day, customers frequently choose remote information access to going to a physical library. As a result, libraries have created strong online platforms and digital catalogues that let users remotely search for, access, and borrow resources. To improve user experience, libraries have included features including online reservation systems, virtual reference services, and e-book lending platforms.

- **Technology improvements and Their Impact on Library Services:** Libraries have been able to broaden their offerings and reach new audiences as a result of technological improvements, which have had a significant impact on library services. Several significant technical developments that have impacted library services include:

a) **Digitization:** Libraries have digitized their holdings to make them online accessible and to preserve priceless or rare items in digital formats. This has made it possible to spread knowledge more widely and adopt better preservation techniques.

b) **Open access & open education resource:** Libraries have embraced the open access movement, pushing for unlimited, free access to scholarly research. This is known as "open access" and "open educational resources" (OER). They actively promote the production, duration, and distribution of OER by giving consumers access to cost-free learning resources.

c) **Data management and research support:** Libraries are a key component of the research support infrastructure. They offer training on data analysis tools and methodologies, access to data repositories, and assistance to researchers in maintaining and crating research data.
d) **Networking and collaboration:** Libraries use technology to work with other establishments and businesses. Users can access resources from various libraries thanks to their participation in resource sharing networks. Additionally, libraries work together on projects to create digital collections and raise the standard of resources as a whole.
e) **User experience and analytics:** Libraries employ data analytics to gain a deeper understanding of user behavior and preferences. They may better customize their offerings, enhance customer experience, and develop their collections with the use of this information.

The functions of libraries have changed to reflect the digital era. They provide users access to a variety of digital resources, provide individualized and creative services, and employ technology to improve the user experience. Libraries may remain important information hubs in the digital age by embracing technology improvements, fostering lifelong learning, and acting as community hubs.

2.3. Access Expansion Using Virtual Libraries

The manner that individuals acquire information has changed as a result of the proliferation of virtual libraries. People may now more easily than ever access a wide variety of materials from the comfort of their own homes or from any location with an internet connection thanks to the growth of digital libraries and online collections.

The availability of e-books, audio books, and digital media lending is one of the essential elements of virtual libraries. Libraries may now provide a broad variety of books and other media without any physical restrictions thanks to digital forms. There is no need for physical copies when users can borrow and download e-books or audio books onto their devices. This has substantially improved accessibility for those who may otherwise have trouble visiting physical libraries owing to their location, physical limitations, or other restrictions.

Remote support and virtual reference services have also emerged as essential components of virtual libraries. Through online platforms, email, or chat services, users may access reference resources, ask questions, and get support from librarians. Even if users are remote from the actual library, librarians may offer assistance, suggest resources, and respond to questions. This function has made it possible for people to get professional assistance and support no matter where they are, promoting a more inclusive and equal access to information.

In order to increase access to information, collaborative platforms for knowledge exchange have been extremely important. Users may contribute and share their knowledge on platforms provided by virtual libraries, fostering a lively and engaging learning environment. Users are able to interact with peers, exchange insights, and work together on projects using online forums, discussion boards, and social media platforms. This encourages the democratization of information, learning groups, and the interchange of ideas.

The extension of access through virtual libraries has increased the availability of information and resources to a larger audience. Many obstacles to information access have been removed by digital formats, virtual reference services, and collaborative platforms, enabling people to study, explore, and engage with knowledge regardless of their physical location or other restrictions.

Community involvement and outreach are crucial components of contemporary library services. In addition to serving as storehouse of books and knowledge, libraries have developed into vibrant community centers and public places.

2.4. The following are some essential components of outreach and community involvement in libraries:

- **Libraries as Civic Spaces and Community Hubs:** Libraries currently operate as inclusive venues that cater to the needs and interests of the whole community, serving as community hubs and civic spaces. They offer chances for people to get together, study, work together, and participate in numerous activities and events. In order to become active community centers, libraries frequently hold author talks, seminars, reading clubs, lectures, art exhibitions, and cultural events.

- **Pop-up services and mobile libraries:** Pop-up services and mobile libraries have grown in popularity as a way to reach communities who are underserved or have limited access to typical library services. These libraries move to schools, community centers, parks, and other areas to offer services directly to the community. They are stocked with books, digital materials, and occasionally even computers. at order to reach a wider audience, pop-up services entail creating temporary library facilities at out-of-the-way places like farmers' markets, festivals, or transit hubs.
- **Partnerships with Institutions and Community Organizations:** Collaborations with Local Government Agencies, Educational Institutions, and Non-Profit Organizations: Libraries actively partner with these organizations to broaden their reach and provide a variety of programmers and services. They establish collaborations to engage on community projects, hold joint events, co-design educational programmers, and make resources more accessible. These collaborations improve the library's capacity to meet the unique requirements and preferences of various user groups.
- **Adapting Library Services and Programmers to a Range of User Groups:** Libraries work hard to be inclusive and cater their programmers and services to the requirements of various user groups in the neighborhood. Understanding the particular needs and preferences of various demographic groups, such as kids, teens, elders, immigrants, individuals with disabilities, or certain cultural or ethnic communities, is necessary for this. In order to serve these various populations, libraries offer specialized programmers, materials, and services, such as multilingual story times, language study tools, job search support, or focused cultural events.

Libraries may successfully interact with their communities, develop a feeling of belonging, and offer beneficial resources, programmers, and services that suit the changing requirements of their users by putting these principles into pasties.

2.5. Initiatives spearheaded by libraries to advance information literacy

- **Workshops on information literacy:** Information literacy seminars are put on by libraries to teach people how to find and assess information efficiently, analyze sources critically, and correctly cite sources. These programmers frequently incorporate practical activities and advice from librarians to improve participants' information literacy abilities.
- **Research Guides and Tutorials:** Libraries produce research guides and online tutorials that outline in detail how to do research, access databases, and make the most of different information sources. These manuals aid users in acquiring the abilities needed to find and assess credible information.
- **Initiatives developed in collaboration:** Libraries work with educational institutions to create initiatives that encourage information literacy. on instance, libraries and schools or universities may collaborate to provide assignments that call on students to examine sources critically and make good use of library resources.
- **Librarians Embedded:** Libraries embed librarians in academic divisions or particular courses to offer focused information literacy help. These librarians collaborate closely with academic staff and students, providing training and direction on how to access and use material pertinent to certain areas.

2.6. Training and workshops in digital literacy

- **Seminars on Basic Digital Skills:** Libraries provide seminars that instruct people on the fundamentals of utilizing digital tools, such as email, the internet, and productivity software. The goal of these courses is to give people the confidence and skills they need to use digital tools.
- **Seminars on Online Safety and Privacy:** Libraries provide seminars to advise users about online safety precautions, such as safeguarding personal data, identifying and avoiding frauds, and comprehending privacy settings on social networking platforms. These courses promote ethical and secure online behavior in order to improve users' digital literacy.

- **Workshops on coding and programming:** Workshops on coding and programming are offered by libraries for anybody looking to advance their digital literacy. With the help of these seminars, participants may build their own websites, mobile applications, or software by learning about programming languages and tools.

2.7. Using programmers to increase access to technology to close the digital divide

- **Centers for Public Computing:** Libraries set up public computer centers where anybody may use a computer, the internet, and other electronic devices at no charge. These facilities give those who don't have access to technology at home the chance to use computers for communication, online education, and job searches, among other things.
- **Mobile Technology Outreach:** Libraries provide mobile technology outreach programmers via which they engage underserved populations with digital resources and services. In community centers, schools, or other public areas, this can entail setting up temporary computer stations or offering Wi-Fi connectivity.
- **Device Lending Programmers:** Libraries run programmers for lending out tablets, computers, and other digital equipment to patrons who don't have access to it. Through this programmer, people may rent out gadgets for a predetermined amount of time to do jobs that need for digital tools.

2.8. Support for career development and lifetime learning

- **Programmers for Continuing Education:** Libraries coordinate programmers for Continuing Education that include workshops, courses, and seminars on a variety of subjects. These programmers offer possibilities for professional growth while meeting the learning demands of various audiences.
- **Online Resources for Learning:** Online learning platforms and resources, including e-books, e-courses, and instructional films, are collected and made available by libraries. These materials provide people the freedom to study at their own speed and pick up new skills whenever it's convenient for them.
- **Events for Professional Networking:** Professional networking events are held by libraries and bring together people from different disciplines and companies. Professionals may network, exchange expertise, and gain from one another at these events.
- **Sharing resources and lending across libraries:** Access to materials and resources from other libraries is made possible by libraries' facilitation of resource sharing and interlibrary loan services. Through this assistance, customers are guaranteed access to a broad variety of material for their ongoing educational and professional requirement.

Emerging technology can significantly improve user engagement and experience as a whole in library services. Here are some strategies libraries may use to adopt cutting-edge technology:

- **Maker spaces:** Libraries can establish specialized maker spaces that provide users access to tools and resources for doing things like 3D printing, robotics, electronics, and more. These areas promote cooperation, innovation, and problem-solving among library patrons.
- **STEM programmers and coding clubs:** To advance digital literacy and spark interest in STEM subjects, libraries can organize coding clubs and STEM (Science, Technology, Engineering, and Mathematics) programmers. These courses may include of coding classes, robotics contests, science projects, and engineering difficulties.
- **Gasification and interactive learning:** Libraries can use gamification components to increase learning's interactivity and enjoyment. This might entail developing educational challenges and games pertaining to various topics or adding gamified components like badges, leader boards, and awards to already existing programmers.
- **Virtual reality (VR) and augmented reality (AR):** Libraries can experiment with augmented reality (AR) and virtual reality (VR) technology to offer immersive learning experiences. They can make interactive displays, provide virtual tours of historical places, or employ AR to overlay more information on real books or items. For instructional simulations, virtual field excursions, or interactive storytelling, VR can transfer viewers to virtual surroundings.

2.9. These advances to be implemented successfully, libraries can

- In order to gather knowledge, resources, and assistance, collaborate with technological specialists, nearby schools, and institutions.
- Train library employees to be knowledgeable about cutting-edge technology so they can successfully advise and direct patrons.
- Look for financing sources to purchase the hardware and software required for developing technologies.
- Engage the community, learn about their needs and interests, and adapt your programmers as necessary.
- In order to make changes over time, you should constantly monitor and assess how these technologies are affecting library services and user engagement.
- Libraries may become dynamic learning centers by embracing these new technologies, providing engaging experiences that meet the changing requirements of their users.

2.10. Challenges and Things to Think About for Library Services

- **Concerns about data security and privacy:** Privacy and data security issues have become crucial ones as library services increasingly take place in virtual settings. Libraries must take precautions to secure user data from unauthorized access, including personal data, reading histories, and search queries. Maintaining user confidence and protecting their privacy requires the implementation of strong data protection measures, the use of secure authentication techniques, and adherence to pertinent privacy rules**.**
- **Equity and Accessibility in Virtual Library Services**: While virtual library services are practical and provide access to a wider variety of materials, equity and accessibility concerns must be addressed. Libraries must make sure that people with impairments may access digital materials and technology. This can entail offering alternate forms, including text-to-speech or audio book alternatives, and making sure assistive technology is supported. Libraries should also take into account the availability of gadgets and internet connectivity for people who might not have them at home.
- **Physical and Virtual Library Spaces in Balance:** In order to meet the varied demands of its patrons, libraries must strike a balance between physical and virtual library locations. Even while virtual services provide accessibility outside of the library's physical location; physical places are still required to foster collaboration, community involvement, and access to tangible items. In order to ensure a seamless transition between the physical and virtual worlds, libraries should think about designing adaptable facilities that can handle both traditional library operations and cutting-edge technologies.
- **Staff Development and Training for New Technologies:** As new technologies are incorporated into library services, staff development and training are essential. New technology, digital platforms, and tools that are pertinent to library services must be kept up to date for librarians and library employees. To improve worker competencies, this may entail seminars, training programmers, or partnerships with technological specialists. Libraries may make sure that their staff is prepared to serve patrons efficiently and offer advice on utilizing new technology and digital resources by investing in staff training.

The environment of virtual library services is always changing, and libraries must take a number of factors into account. Delivering inclusive and efficient library services in the digital era requires addressing privacy and data security issues, encouraging fairness and accessibility, balancing physical and virtual places, and educating employees on new technology.

2.11. "Libraries beyond Institutions" Future Directions and Recommendations

1) Sustaining and Expansion Strategies:

a) **Adopt digital technology:** Utilizing digital technology and online platforms is essential to maintaining and extending the reach of "Libraries beyond Institutions." Create effective online library infrastructures that give users access to digital resources, e-books, audio books,

and other multimedia content. To engage a larger audience, think about creating online exhibitions, interactive learning modules, and virtual library tours.

b) **Community involvement:** Involve the neighborhood and other key players in the creation and management of "Libraries Beyond Institutions." Organize community activities, classes, and talks that are open to all ages and interests. To reach marginalized groups and promote a sense of ownership and engagement, work in partnership with nearby schools, community centers, and other organizations.

c) **Library services on the go:** Consider setting up mobile library units to deliver publications, materials, and services to areas where regular libraries are difficult to access. To provide on-site library services, such as book lending, storytelling sessions, and digital literacy instruction, these mobile units may go to schools, community centers, elderly homes, and other sites.

2) Creating Collaborations and Partnerships:

a) **Collaborate with educational establishments:** Work together with educational institutions to expand library services for learners, teachers, and researchers. a. Form partnerships with schools, colleges, and universities. Look into the possibility of collaborating on projects, pooling resources, and offering specialized help like research support or access to academic databases.

b) **Work with both public and private organizations:** Create alliances with governmental, nonprofit, and commercial entities to expand the influence and reach of "Libraries beyond Institutions." Look for partnerships to share resources, support technology, engage the community, and raise money. Together provide programmers that cater to particular community needs, such as adult literacy campaigns, workshops on job development, or assist.

c) Encourage international cooperation: Encourage international cooperation by looking into ways to work with libraries and other cultural organizations throughout the world. Through virtual exchanges, joint exhibits, and cooperative research initiatives, people may exchange resources, cultural artifacts, and information across international boundaries. By fostering a diversity of viewpoints and experiences, promote cross-cultural learning and understanding.

3) Promotion of Financial and Moral Support

a) **Create a convincing narrative:** Write a story that demonstrates the value of "Libraries beyond Institutions" and its influence on social cohesion, literacy, and information transmission. Describe the ways in which these libraries support the growth of the local community, lifelong learning, and equal access to information.

b) **Involve local officials and policymakers:** Engage in active dialogue with local officials and decision-makers to promote financing and support. Give those case studies, success stories, and evidence-based research demonstrating the advantages of "Libraries Beyond Institutions." Work together with advocacy organizations and library associations to improve group efforts.

c) **Look for a variety of financing sources:** In addition to government support, look into non-traditional funding options such grants, corporate sponsorships, private donations, and crowd funding. Establish strategic alliances with charitable institutions and foundations that support the objectives of "Libraries Beyond Institutions.

4) Research Possibilities and Subjects worth Investigating Further

a) Impact evaluation: Conduct thorough research to evaluate how "Libraries Beyond Institutions" has affected people's lives, communities, and social consequences. Examine the impact on educational achievement, digital literacy, community involvement, and social wellbeing. Utilize study results to boost programmer efficiency and promote ongoing funding**.**

b) User needs and preferences: To learn about the needs, preferences, and expectations of a variety of library users, conduct surveys, focus groups, and user experience research. In order to ensure inclusion and accessibility for all age groups, ethnic backgrounds, and abilities, tailor services and resources accordingly.

c) Technological developments: "Libraries Beyond Institutions" will keep you up to date on new technologies and their possible uses. Look at integrating virtual reality, artificial intelligence.

2.12. Key conclusions and ideas summarized:

We discussed the idea of "Libraries beyond Institutions" and its ramifications for society and the library profession throughout the debate.

The main conclusions and ideas are outlined here:

a) **Extension of the term "libraries":** The phrase "Libraries Beyond Institutions" broadens the notion of libraries by proposing that they are not restricted to physical structures or conventional institutions. Libraries may take on many different shapes, including online platforms, mobile units, community centers, and virtual places. With this broadened definition, libraries are able to reach a larger audience and adjust to the shifting requirements of society.

b) **Democratizing access to information:** By embracing the idea of "Libraries Beyond Institutions," libraries may lower restrictions on information access. In order to provide equitable access to information, education, and opportunities, they might offer resources, services, and programmers to underprivileged populations. This strategy encourages inclusion and gives people from many backgrounds more authority.

c) **Collaboration and partnerships:** By establishing partnerships and collaborations with other institutions including schools, colleges, government agencies, and community groups, libraries may broaden their influence and effect. They can pool resources, exchange knowledge, and collaboratively address social issues by cooperating. Collaboration helps libraries to provide their consumers more thorough and customized services.

d) **Technology innovation:** Adopting the idea of "Libraries Beyond Institutions" requires adopting new technologies. To provide digital collections, virtual programmers, online learning platforms, and interactive experiences, libraries might use technology. Libraries can stay relevant, connect with people in fresh ways, and support lifelong learning by adjusting to digital changes.

Embracing the idea of "Libraries Beyond Institutions" is crucial.

It is essential to embrace the idea of "Libraries beyond Institutions" for a number of reasons:

a) **Meeting changing user demands:** Traditional library models might not be able to completely take into account the preferences and wants of contemporary users. Libraries may respond to user requests, offer flexible services, and reach people who would not generally interact with traditional library settings by broadening the notion of libraries.

b) **Improved community involvement:** Libraries have a special role as community centers. By providing pertinent programmers, services, and resources, libraries that embrace "Libraries beyond Institutions" are able to forge closer ties with the community. This fosters social cohesiveness, encourages civic involvement, and boosts community engagement.

c) **Encouragement of lifelong learning:** Libraries are crucial in fostering lifelong learning, according to research. Libraries may provide diversified learning opportunities to people of all ages and backgrounds by adopting new forms and media. Through cutting-edge programmers, technology, and resources, "Libraries Beyond Institutions" enables libraries to engage people and promote a culture of lifelong learning.

Potential effects on society at large and the profession of libraries. The idea of "Libraries beyond Institutions" has the potential to have a variety of effects on society and the library profession:

a) **Redefining the function of a librarian:** Librarians must adapt and pick up new skills in order to embrace this idea. As well as being technological professionals, librarians become becoming knowledge facilitators and community builders. To serve consumers in a variety of situations, they must embrace digital literacy, cooperation, and community participation.

b) **Increased sustainability and relevance**: Libraries that support "Libraries Beyond Institutions" are more likely to stay relevant in an information world that is changing quickly. Libraries may demonstrate their continuous worth to communities by broadening their reach and implementing creative strategies, assuring their sustainability and ongoing support.

c) **Community empowerment:** Communities are empowered by "Libraries Beyond Institutions" through democratizing information access, encouraging inclusion, and encouraging lifelong learning. Libraries operate as catalysts for social empowerment, academic success, and personal development, having a positive effect on society as a whole.

3. CONCLUSION

Adopting the idea of "Libraries Beyond Institutions" broadens the potential applications and influence of libraries. Libraries may change into dynamic, inclusive, and transformational forces in society by rethinking the role of the librarian, encouraging cooperation, embracing technology, and placing a priority on community participation**.**

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Workplace Anger Management

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ABSTRACT

Anger is a feeling that is defined by hostility toward someone or something that you believe has intentionally wronged you. Anger is not always a bad thing. It can help you discover a means to communicate your bad emotions or inspire you to solve issues. Excessive anger, though, might lead to issues. Anger-related physiologic changes, such as elevated blood pressure, impair your physical and mental well-being and make it difficult to think clearly (Kazdin, 2000). Anger at work has the potential to be detrimental not only to the company but also to major psychological and social issues such as depression, anxiety attacks, high blood pressure, and heart disease. Doubt in the role-playing aspect of the teaching-learning process. It can be difficult for library management professionals to prevent, diffuse, and manage rage at work given the rising incidence of violent behavior at work and job dissatisfaction. The general trend of reducing staffing, reform, and revamping; the generic elements of the structure of an organization which give a boost to dominant leaders and frustrate staff; a workplace atmosphere that is suppressing and increases anxiety; unfavorable feedback that makes personnel worried hostile, and frightened; worker individual issues. and staff members dependence on drugs are some of the causes that are often blamed for the growing amount of anger and frustration across individuals. By carefully reviewing potential hires, putting in place explicit guidelines on harassment and associated behaviors, and gently firing problematic staff members, libraries can reduce the likelihood of workplace violence.

Keywords: *Emotion, Workplace violence, Organizational culture, Library manager, Prevalence.*

1. INTRODUCTION

Management is an expansive one. It is also a growing literature. In some way, this reflects that we do not know much about the kind of manager who are required in modern world and kind of management techniques in broad on different profession and passion to make a healthy social, cultural and professional society. Library and library professional day by day transforming towards a new era of management where Libraries are Digital, Virtual, Information hub and area of research support warehouse and librarians are Organisational content developer, Networking expert, Database manager, Educational counsellor, Career advisor, ITC Ambassador and over all central nerves system of any Academic or Research organisation. About 75% of careers are detailed for reasons related to emotional competencies, including in ability to handle interpersonal problems; unsatisfactory team leadership during times of difficulty or conflict; or inability to adapt to change or elicit trust, Center for Creative Leadership.

Employees frequently experience rage and other unfavorable feelings while working. Conflict with a coworker, dissatisfaction with corporate practises, or even unreasonable deadlines may be the cause of such sentiments. Having excellent anger management skills may improve your productivity and the atmosphere at work. In this post, we'll go over some easy-to-follow advice for controlling your rage at work.

The Medical College Thiruvananthapuram's consultant psychiatrist, Dr. Arun B Nair, concurs. "Generalised intolerance and impatience are problems for society. Conflicts arise when one party does not respect the other, he says.

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"Over the past three years, anger problems have increased. As the use of digital gadgets increased, so did impulsivity—the tendency to act without considering the implications."

Dr. Arun claims that the age ranges of 15 to 40 show a pronounced increase in anger problems. "Any disagreement used to be communicated by letter back before communication was mostly done online. In a physical group environment, arguments frequently resulted in angry outbursts."

According to Dr. John, stress at work frequently results in tantrums among colleagues and spouses. These have been instances of people venting pent-up resentment against family and friends as a result of work stress. Relationships have ended as a result, and depressed individuals have been reported," he claims.

"Being underappreciated and given little credit increases dissatisfaction. Additionally, many firms lack tools that might relieve stress among workers."

The problem of a "imbalanced job and personal life scenario" is brought up by Dr. Arun. "Especially among women who are responsible for managing the domestic and office tasks without the help of their spouses. They lash out at their partner or their children.

"The man used to stay online until 4 am and leave for college at 7 am. Lack of sleep was his issue. Additionally, excessive use of technology impairs the synchronisation of the left and right hemisphere of a person's brain, and lack of sleep causes emotional instability. These cause more frequent angry outbursts, which are widespread in today's youth."

2. WHY IS IT IMPORTANT TO CONTROL YOUR ANGER AT WORK?

Managing your anger at work and getting rid of it quickly may increase interpersonal relationships with your coworkers, foster a more pleasant workplace culture, and assist resolve conflicts. Anger and other related emotions can build up over time and materialise as other undesirable attributes if left unresolved. This may have a detrimental effect on staff morale, worker efficiency, and even the organization's turnover rate. Finding answers to problems at work by being aware of your anger may additionally assist you handle it in a healthier way.

2.1. Here are a few additional advantages of controlling your anger at work:

- Enhances professional connections: By confronting and solving the cause of your rage, you may foster stronger relationships with your coworkers.
- Lowers stress and boosts wellbeing: Managing your anger and other unpleasant emotions in a healthy and timely manner may lower stress, boost general wellbeing, and raise your level of professional as well as personal satisfaction.
- Reduces distractions and improves attention: Maintaining anger or distress regarding an event or circumstance can make it harder to focus on your task and increase your susceptibility to distraction.
- Enhances performance: You are able to work more effectively and perform better when you can focus on your task without being interrupted or distracted by unpleasant feelings.
- Avoids passive aggression: Passive aggression with coworkers may result from unresolved frustration or bitterness. Such actions and attitudes may harm your professional connections.
- Assists in preventing the formation of harmful habits: By expressing and releasing your anger in a healthy way, you can stop yourself from turning to unhealthy getaways or addictive behaviours as a way to cope with stress.

2.2. How to control your anger at work

To deal with rage and other unpleasant emotions at work, follow these steps:

i) **Recognize the emotion:** Recognizing the causes of your anger will help you recognize it as a feeling. Instead of rationalizing your anger, consider what is making you feel that way. It's critical to keep in mind that rage is a completely normal human emotion that often arises in reaction to a danger. Understanding your growing anger may assist you decide whether or not the scenario or issue justifies such a response, as opposed to allowing it to build.

ii) **Inhale deeply:** Every time you feel anxious or furious, put an end to what you're currently doing while taking a few breathes in deeply. Deep breathing practises can almost immediately relax you or cause your anger to subside since they boost the oxygen supply to your brain. If you are

highly agitated or fear that you will argue verbally with a coworker, close the eyes for a moment and begin counting the breaths you take. An instance of great anger may pass when you count to 10 while breathing through the nose and releasing via the mouth.

iii) **Discuss with a trustworthy friend:** Once the agitated state has passed, talk to a family member, friend, or trusted acquaintance about the cause of your agitation. Talking about the topic with someone else might not only help you express your thoughts, but it can also give you a fresh viewpoint and help you see the situation more clearly. To protect anonymity while speaking to someone at work, be careful to do so with a trusted coworker. Speaking with a sympathetic person who will listen to you might help you process your feelings more effectively.

iv) **Move away from your place of work:** If at all feasible, get up from your workstation or take a little break outside the building. By physically removing yourself from the situation, you can lessen the impact of the anger's triggering. You may find that going to a local park or café gives you a chance to think about the problem. Try to locate a peaceful space if you are unable to leave. If listening to music helps you unwind, try using earbuds and playing any of your preferences till you're feeling in full control of your emotions and reactions. Using a break might assist you in approaching the problem from a new angle and coming up with potential answers.

v) **Taking consideration of various viewpoints:** You might think about how a supervisor or role model that you admire would respond to the current circumstance. Do not act in a way that you would assume a respected and trustworthy senior would not. Instead, visualise them handling the problem. Consider not raising your voice when speaking to someone if your mentor or role model avoids doing so. By doing this, you may also gain a fresh perspective on the event, evaluate your response without prejudice, and verbally practise the way you responded.

vi) **Discuss the matter with the appropriate authorities:** You can talk about the matter with the parties concerned after consulting someone else, reflecting on your response, and calming down. Stay away from approaching them at their desks without warning or notification to discuss the issue. Ideally, call a meeting and invite all parties to participate. You can also ask them to attend the meeting if you believe an experienced team manager is required to resolve the conflict. Don't accuse or personally criticise your coworkers when you bring up the matter. Discussing how the issue affected you, how to proceed, and creating an alternate arrangement that is suitable to everyone might be more productive approaches. The emphasis on solving the problem rather than any other matter.

vii) **Choose how to handle similar circumstances in the future:** You can create your own strategy to ensure that you can handle similar difficulties in the future after having the advantage of looking back on the scenario and resolution with greater objectivity. If the situation's triggering variables are beyond of your grasp, you can concentrate on accepting it so that you can cope with it successfully in the future. Concentrating on what aspects are more significant to you will help you discover methods to accept the situation and release the anger if you think that doing so would be more harmful to yourself.

viii) **Concentrate on learning:** Make sure to exclusively concentrate on the aspects of the occurrence that can assist you grow and improve as you move forward from it. You may better manage your emotions and successfully block the effects of unpleasant emotions like rage by concentrating on the good parts of a difficult circumstance. Use the lessons learned to enhance your academic achievement and professional experience so that you may live a more fruitful and meaningful life.

3. ADVICE ON CONTROLLING ANGER AT WORK

Listed below are a few additional suggestions for controlling your rage at work:

i) **Determine what makes you react and get irritated:** Understanding the specific circumstances or problems that might make you angry or elicit a strong negative feeling can help you better control them. These triggers are often determined by personality type and personal experience. Negative emotions like rage may also be accompanied by physical signs like perspiration, trembling hands, or an elevated cardiac rate. Understanding how anger affects you can help you learn how to control it before it gets out of control.

ii) At **discussions and meetings, refrain from responding:** If you sense that your feelings are becoming really strong and you could end up yelling or criticising a colleague, leave the room. You may ask for a brief break or a postponement of a meeting during talks and meetings. Once

your feelings are under control, you can return to the meeting or discuss your issues with the appropriate coworkers.

iii) **Maintain a healthy life:** If you have a healthy lifestyle, it may be simpler to regulate your negative moods and emotions. For instance, when you take every meal on time, have enough rest, drink plenty of water, and exercise frequently, it may be simpler to respond to circumstances with greater objectivity and mindfulness. Better mental health may be supported by physical health, which can lessen the harmful effects of emotions like rage.

iv) **Be more patient:** When you believe that somebody at work has mistreated you, decide to forgive them and put your attention on the more uplifting emotions of forgiveness and empathy rather than the unfavorable emotion of wrath. You could develop the ability to be more tolerant and empathetic towards others by becoming more thoughtful, aware, and confident in who you are. Additionally, it can improve your ability to concentrate at work and stop you from wasting energy on pointless arguments and disagreements.

v) **Think about theories or counseling:** You could also think about seeking professional assistance if you feel that you are unable to control your anger and adverse emotions and that this is starting to affect your job performance and professional relationships. A therapist may assist you in discovering the root causes of your rage, locating unique triggers for and learning effective coping mechanisms. You might also look for expert counseling for managing your anger that helps you feel less angry.

4. HOW CAN WE ACT PROFESSIONALLY AT WORK?

For advice on how to conduct yourself professionally at work, read on:

i) **Be on time:** Being punctual demonstrates time management that might indicate you are a competent employee. Allow yourselves lots of time to travel when you're obliged to go somewhere, like a meeting. By doing this, you demonstrate that you respect every individual's time, are organised, and are concerned about the meeting.

ii) **Effective time management:** Being on time is only one aspect of time management. It is crucial that you finish the assignment by the due date if you've been given a project timeline or agreed to deliver an email by a specific time. Learning time management techniques is a good approach to become more professional and to help you cope with the stress that comes with working.

iii) **Be trustworthy:** A person with expertise is an individual who can be trusted to do tasks properly and on schedule by their teammates. Make sure you carry out any tasks you are given at work or whatever you commit to complete. You may demonstrate a feeling of dedication to a bigger cause that is influenced by the company's aims by acting dependable.

iv) **Maintain an optimistic outlook:** Positive attitudes are valued in most workplaces. cheerful influences on people around professionals who can keep a cheerful mindset. Your employees may begin to see you as a leader if you maintain this optimistic outlook even during difficult circumstances.

v) **Be truthful:** Being truthful at all times in the job is advantageous. People may be more inclined to trust you implicitly as a result. People make blunders while working; it's only normal. Being direct and truthful in these circumstances demonstrates your maturity and professionalism.

vi) **Request comments:** Honest comments and constructive feedback are essential for your personal growth. Be receptive to criticism from your superiors and fellow employees as a professional. When someone provides you with feedback, lets them aware that you value it and will give it adequate consideration. For frequent feedback on your job, most organisations have mechanisms in place, such as performance reviews and appraisals.

vii) **Demonstrate empathy:** Try to remember that everyone in your company has a unique perspective on the world of work that is complex and subjective. They could also experience difficulties that you are mostly ignorant of. You must evaluate these factors and avoid passing judgement in order to be compassionate. Before offering advise or reprimanding someone, make an effort to fully comprehend their circumstance.

viii) **Prevent workplace chitchat:** In informal conversations at work, gossip is practically inevitable. You may always try to deliberately refrain from engaging in such activities, though. You can politely let your employees know that you don't have any interest in their extracurricular activities. You are accountable in the workplace for both your words and how they are heard by

others. It is better to avoid participating in talks that might harm someone's morale or productivity at work.

ix) **Distribute the knowledge you have:** Share your expertise with your coworkers if you believe it will help them. Encourage people to increase their output at work. For instance, if you have extensive expertise dealing with a certain piece of software, attempt to pinpoint the office job functions that may stand to gain from its use. Sit down with your employees who are doing those job functions and show them useful processes, shortcuts for the keyboard, and automatic processes that will streamline the way they work.

x) **Improve your nonverbal communication skills:** Your manner conveys your perspective towards a circumstance. People may assume you are not engaged in whatever they are trying to convey if you squirm as they are speaking. In a similar vein, slouching in your office chair conveys the idea that you are worn out from your work. Leaning in while sitting straight up throughout meetings conveys that you are attentive and interested in what is being said.

xi) **Sincerely highlight your achievements:** It's critical to take pride in your accomplishments. But it's equally important to show modesty while discussing your successes and accomplishments. Otherwise, you could unintentionally come out as arrogant or egotistical. Understand that there are many individuals that have accomplished things that are comparable to or greater than what you have in life. Compared yourself to these people and setting higher goals for yourself may be really beneficial to you. Having this mindset could help you maintain perspective while you highlight your achievements.

Psychologists—especially female specialists—need opportunities and supportive workplaces to improve their state of mind. Policies that minimize emotional labor should be developed as well. Examples of these are programs that support constructive job engagement, assist individuals in positively managing their anger, and protect work-life balance (WLB).

5. CONCLUSION

When is it appropriate to handle anger? The majority of professionals concur that excessively frequent, severe, persistent, or poorly controlled anger are problems (Thomas, 1990). Irritation may result from minor unpleasant circumstances. Allowing these tiny irritants to fester until one's finally snap, usually for someone trivial, is the "final straw." It is always the mistake of another individual whether an adverse event occurs or going wrong. Instead of accepting accountability for your own private life, you place the blame for your circumstances on other people. Although it's harmful to repress and ignore anger, releasing isn't more beneficial. Although you may not always control your circumstances or how they make you feel, you do have control over how you choose to show your rage. Additionally, you can express your rage without abusing others verbally or physically. You may learn how to manage your anger before it spirals out of hand by being aware of how it affects you.

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Security Systems Adapted by Selected Private University Libraries in Kamrup District, Assam

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ABSTRACT

A library is a sanctuary of knowledge. It is the main core point of any educational institute, just like a temple is for the civilization. And no one likes it when something is stolen or mutilated in their temple with correspondence to that the library's document are as precious as gold as they have vast knowledge. To protect those resources from theft or vandalism one must input library security tools in their library. Hence safety is a great issue of importance in libraries. This paper deals with the security systems adapted by four selected private university libraries in Kamrup district, that areAssam Don Bosco University, Assam Down Town University, Royal Global University and Girijananda ChowdhuryUniversity,Assam. The survey research method has been adapted and a self-constructed questionnaire has been circulated for collecting the data regarding security tools and system in these four private university libraries.Data that have been collected in regarding security systems such as Security guards, CCTV, Fire extinguishers, Fire alarms, RFID, ID card access and authorization for users, Gate registration, Cyber security etc. Tables consisting of the situation showing library security in these four universitieshas been employed as a statistical tool for data analysis. Results of this study showed that though security systems were adapted in these private university libraries but they are not up-to the mark.It is recommended that University libraries whether private, govt. or central they should adapt maximum number of security tools to safeguard the library resources for the next generation.

Keywords: *Theft, Vandalism, Security systems, Private university, Security guards, CCTV, Fire extinguishers, Fire alarms, RFID, ID card access authorization, Gate registration, Cyber security*

1. INTRODUCTION

Libraries must be welcoming and open while maintaining security for users, employees, and holdings. How can you guarantee that your library is safe and easily accessible? The secret to proactively addressing any safety hazards is security planning, which is a component of continuous operations planning and disaster response planning.

For most of the population, security generally means protection and vandalism. Though it is important to prevent or detect the source of theft or vandalism as it is increasing so, but security does not only speak of theft or vandalism. A satisfactory security system is concerned with all risk that can be natural or man-made. Security is a necessity in libraries, weak point in security added with other kind of failures leading to loss of trustworthiness with the data stored (Tyrväinen, 2005).Library has different number of security systems though its electronic anti-theft tools, CCTVs, Fire alarms, user IDs for entry and exit etc. These systems can help stopping uncertified removal of documents and also realistic monitoring and detection of users present in different parts of the library.

As noted by Chaney and MacDougall (1994), "library managers need to keep this characteristic well to the forefront of the library because collections are very vulnerable to abuse of one sort or another."Strong collection security measures are necessary to ensure long-term viability, accessibility, and effective use. Oyewusi and Oyeboade (2009) talked about how crucial collection access is to advancing the university's goal. The significance of quality collections is seen by the researchers as a sign that those collections require safety and protection.

2. LITERATURE REVIEW

Ewing (1994) in the study named "Library security in the UK: Are our libraries of today used or abused?"This discusses the many mistreatments that occur in libraries, such as book theft, items

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 | ISBN: 978-93-92958-97-7
Chapter 52; S. Hasan, S. Kumar, S. Panda, K. N. Khan & G. Samdani (Eds); PP. 407-412; Synergy Books India, N.D.

that are not returned, property theft, abuse by staff, and vandalism. Investigates strategies for lowering different forms of abuse and reviews current surveys that concentrate on library crime. concludes that both book theft and item non-return are widespread. Property theft has been extensively documented, and book mutilation and outside damage are also frequent occurrences. However, loss has not been adequately defined, and counting procedures in libraries are subpar. suggests implementing strict legal deterrents, developing clear security standards for authorities, and improving inventories and loss calculations to increase the quality of statistics gathered and provide greater evidence of theft.

Bello (1998) in their study discussed "an analysis of the issue in Nigeria's technological institutions showed that, like their conventional counterparts, they are not exempt from theft and mutilation. The materials most likely to be destroyed are periodicals and references. The issue could not be stopped or contained by librarians. At the entry and departure of the libraries, all of them still rely exclusively on manual checks performed by inexperienced staff. The reasons behind material theft and mutilation from libraries were the high cost of photocopying and the regular malfunctions of copiers."

Ajegbomogun (2004) in their study conducted in Nigerian University stated that "The frequency of material theft and mutilation in libraries, as well as user opinions of security in libraries and the variables influencing theft and mutilation in Nigerian university libraries. Among the explanations offered for this are the scarcity of library books, the worry that the materials might not be on the shelf, and the carelessness of the security guards in the library. Dealing with perpetrators who are apprehended was suggested."

Boss (2005) discussed in his paper that "RFID which also signifies Radio Frequency Identification, and it is the newest technology utilized in theft detection systems for libraries. In contrast to the decades-long use of EM (Electro-Mechanical) and RF (Radio Frequency) systems in libraries, the RFID-based systems that started to install in the late 1990s. They supported computerized inventorying and shelf searching, speed the staff charge and discharge, streamlined and expedited patron self-charging and self-discharge, and interfaced with materials handling systems. They also detected the illicit removal of library goods."

Singh (2018) in his article stated the technological, organizational, and physical information security measures used at Delhi's Jawaharlal Nehru University (JNU), University of Delhi (DU), and Jamia Millia Islamia (JMI). His investigation has also shown that, in terms of physical security protocols, every university library that was the subject of the study has lagged behind. He hoped that this study will contribute to closing information security gaps in the libraries that are the subject of the investigation. The study's conclusions will not only help university libraries strengthen their information security protocols, but they will also pave the way for further advancements in information security in a world of rapidly advancing technology, enabling librarians to surpass their current constraints.

Lincoln and Lincoln (n.d) discussed in their book named Library Crime and Security the trends in disturbance and criminality at libraries in the US, Canada, and Great Britain. There is a wealth of information regarding the features of the institutions and communities where these issues are present, in addition to significant data on these issues. Examined is the effect of crime on both the individual and the institution. The writers offer insightful information on how to create crime control plans for libraries of all sizes that deal with or expect to deal with issues related to theft of books, vandalism, troublesome customers, and assaults on employees. Along with pertinent information from the disciplines of library science, management, criminology, victimology, and security, major concerns in the measurement, incidence, and repercussions of crime are covered.

3. LIBRARY SECURITY

Security may be a person or thing that secures or ensures something, measures used to prevent theft or espionage, or a promised freedom from poverty or desire (Collins English Dictionary and Thesaurus, 1992).

Plans for safety and security must be in libraries and archives so that staff members are ready to handle situations including fire, flooding, and other serious risks to collections.Making sure the collection is well-secured to deter theft is part of protecting it. This is particularly problematic when archives and libraries have to offer offsite storage for excess items or specialized cold storage units for delicate assets like motion picture film, microfilm, and film and color negatives.

Regardless of whether a library has closed stacks, where patrons must locate a book in the catalog and rely on staff to retrieve it, or open stacks, where readers can access the bookshelves directly, staff members must periodically monitor patron behavior to deter intentional destruction or damage to library materials. Cutting out illustrations or books is a common type of mutilation.Particularly susceptible to theft and alteration are materials that are on display. Displays showcasing uncommon or unique materials may draw in intruders or vandals.Display cases ought to be placed in a monitored area where they are watched over and securely stored when the control point closes.

3.1. Types of Security systems present in Libraries

i) ID card access and authorization

A person's name, a color portrait or digital image, the name of the department or organization issuing the card, the expiration date (no more than five years from the date of issuance), and a number exclusive to the card are all required for identification cards.

ii) Security guards for patrol

A security guard, also referred to as a security officer or protective agent, is a person hired by a public or private entity to protect the employing party's assets (money, people, property, and other assets) from various threats such as waste, damaged property, worker conduct, criminal activity (stealing, for example) by implementing preventative measures. Security guards accomplish this by maintaining a conspicuous presence to discourage illicit and improper activities, keeping an eye out for signs of crime or other hazards (like fires) directly through patrols or indirectly through the use of alarm systems or CCTV cameras, and acting to prevent harm.

iii) Signature for every user also known as Gate registration

Anyone planning to use an academic library in person should show their private identity cards provided by the institute or organization and also provide accurate information at the gate register in order to gain access to the library. A single entry & exit point should be maintained for staffs and users of the library.

iv) Fire alarms & fire extinguishers

A Fire alarm detects and notifies emergency personnel of the presence of fire, smoke, carbon monoxide, or other fire-related emergencies is known as a fire alarm system. Most business buildings are required to have fire alarm systems. These could consist of heat detectors, smoke detectors, and pull stations, which are manual fire alarm activation systems. Whereas an active fire protection tool, a fire extinguisher is frequently used in emergency situations to control or put out small flames. It is no longer intended for use on an out-of-control fire that poses a risk to the consumer (i.e., no escape route, smoke, explosion hazard, etc.) or has reached the ceiling.

v) CCTVs

Video cameras are used in closed-circuit television (CCTV), commonly referred to as video surveillance, to relay signals to several displays at a specified place. An open circuit gadget is one that is intended for a wider audience, such as television broadcasts. Conversely, closed-circuit systems are made to deliver video to specific viewers. A closed-circuit television system, also known as a CCTV, is one device that is specifically made for surveillance. Secondly, CCTV is utilized for a wide range of applications, including security, disaster relief, energy and labor savings, advertising and record-keeping, manufacturing management, industrial measurement, scientific research, training, and military domains.

vi) RFID System

Radio frequency identification (RFID) is a device for access control as it allows only authorized people to enter a certain area of a building. People that are authorized are given unique tags that they can use to gain entry into that region. The purpose of the self-service station is to allow users to check out books one at a time without assistance from library workers. The system that detects theft using clever tags for deactivating that e-book allows easy access from the security gate.

Unique components make up a protection device; the human aspect, security measures, and bodily security are all included in a safety computing device.

vii) Cyber Security

Cyber security is a form of defending programs, networks, and systems from online threats.Cyber security systems improve protection, scalability, and performance by integrating security visibility, analysis, and controls across many security levels and data sources.

4. OBJECTIVES OF THIS PAPER

i) To find out what are the different types of security systems were adapted in these four private university libraries
ii) To find out which one these four private university libraries have best library security.
iii) To find out the which one of these four private university library has the weakest level of library security.

5. METHODOLOGY

The data have been gathered by a self-constructed questionnaire made by the researcher which is given to the librarians or the in-charge of these private university libraries that areAssam Don Bosco University, Assam Down Town University, Royal Global University and Girijananda ChowdhuryUniversityfor the necessary information regarding library security systems present in the libraries.

6. DATA ANALYSIS

The data that has been collected by providing questionnaire to the librarians or the in-charge of these four selected private university libraries are as follows.

6.1. General information about the library

Table 1: Basic details of the four selected Private University Libraries

Name of the university	Name of the Library	Year of Establishment	Address
Assam Don Bosco University	Central Library	2008	Airport road, Azara, Guwahati-17
Assam Down Town University	Hari Narayan Dutta Baruah Central Library	2010	Gandhi Nagar, Panikhaiti, Guwahati-26
Royal Global University	Central Library, RGU	2013	Betkuchi, Guwahati-35
Girijananda Chowdhury University	Bina Chowdhury Central Library	2018	NH-37, Azara, Guwahati-17

6.2. Library Security

The types of library security systems that have been adapted by these four private university libraries are shown below in a form of table.

Table 2: Security systems present in all the four selected private university libraries

Library Security Systems	Assam Don Bosco University	Assam Down Town University	Royal Global University	Girijananda Chowdhury University
ID card access and authorization	Present	Present	Present	Absent
Security Guards	Present	Present	Present	Absent
Gate Registration	Present	Present	Absent	Present
Fire Alarms	Present	Present	Absent	Absent
Fire Extinguishers	Present	Present	Present	Present

CCTV	Present	Present	Present	Present
RFID	Present	Absent	Absent	Absent
Cyber Security	Present	Present	Absent	Absent

7. FINDINGS

The Objective 1 fulfillment

The types of security system that are adapted in these four selected private university libraries of Kamrup district are:

- Id Card access and authorization of readers were done in all three private university libraries except Girijananda Chowdhury University.
- Security Guards were seen in all three private university libraries except Girijananda Chowdhury University.
- Gate Registration of users in done in all three private university libraries except Royal Global University.
- Fire alarms were only found in Assam Don Bosco University and Assam Down Town University.
- Fire extinguishers are present in all four private University libraries.
- CCTVs are present in all four private University libraries.
- RFID system is only found in Assam Don Bosco University.
- Cyber security is installed at only in Assam Don Bosco University and Assam Down Town University.

The Objective 2 fulfillment

The best library security systems adapted by Assam Don Bosco University as they consist of ID card access & authorization of users, Security guards for safety purpose, Gate Registration for users, Fire alarms and fire extinguishers in case of sudden fire breakout, CCTVs to prevent theft or vandalism in library, RFID system for circulation, tracking and security of library materials and cyber security system is installed to prevent data theft.

The Objective 3 fulfillment

The weakest library security system is found in Girijananda Chowdhury University as they do not have ID card access & authorization to users, Security guards, Fire alarms, RFID system and Cyber security to prevent data theft.

8. CONCLUSION

As the center of learning, libraries have an obligation to protect its collection and structure from a variety of security risks brought about by their patrons as well as the elements, such as document theft and destruction and natural catastrophes.Security system in the library is a necessity as it the main powerhouse of any educational institute or organization. Only a secured library can fully flourish and spread its roots of knowledge into the society. Therefore, this study goals have been to find out what are types of security systems were adapted and how much secured are these private university libraries. There is a clear need for more supervision, patrolling, and surveillance to ensure the safety of the library's grounds.Security is essential to prevent damage for user's advantage from comprehending assistance and money spent on it. It is the responsibility of every librarian to implement excellent security devices and procedures. An adequate amount of safety systems should be implemented to prevent damage and loss of library resources, personnel, and user security.

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A Comparative Study on Top Three Freely Available Plagiarism Detection Tools

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ABSTRACT

In a world of constantly increasing demand of e-resources, plagiarism is an emerging issue in academic world, and it has a high impact on student performance and quality of education. In caseof academic plagiarism-the perpetrator is that person who has plagiarized the work of others and presented the stolen work as if it were his own. The Traditional manual detection of plagiarism by humans is a difficult, inaccurate and time-consuming process because it is difficult for anyone to verify with current data. There are many freely or commercially available anti-plagiarism software, which can be used for plagiarism detection. However, commercially available softwares are very expensive. So purchasing those softwares is not affordable for a normal person or student. However, with this many choices of plagiarism softwares, even freely available software, it is sometimes difficult to choose the most appropriate software to use. This Paper highlights top three plagiarism tools that are freely available online, which can be easily used by anyone. Different Free plagiarism checker tools are available to check the originality of content, example: Grammarly, Small SEO tools, Duplichecker, etc. The aim was to observe the performance of the tools in the corpus and then analyze, compare and discuss the outputs.All of the softwares that are mentioned and referred to in this paper are valuable resources for discovering plagiarized material.The current scenario of plagiarism requires strict and stringent rules, strategies and resources like plagiarism tools to minimize the rising trend.Plagiarism can destroy anyone's career and this paper creates awareness towards plagiarism tools for students to avoid plagiarism and have a successful academic career in future.

Keywords*: Plagiarism, manual, inaccurate, time-consuming, free tools, Grammarly, Small SEO tools, Duplichecker.*

1. INTRODUCTION

Plagiarism is the use of another's work, words or ideas of others without giving them credit. Plagiarize (and plagiarism) comes from the Latin plagiarius "kidnapper." This word, Derived from the Latin plaga ("a net used by hunters to catch animals"), it expanded its meaning in Latin to include a person who stole words instead of another's little human. The first English Copyright Act 1709 was passed on 30 June.

In contrast, Merriam-Webster, which is one of the most reliable dictionaries in America, defines plagiarism as "to steal and pass off (the ideas or words of another) as one's own and: to commit literary theft".

1.1. Types of plagiarism:

i) Word for Word Plagiarism: Copy the source text as it is written.
ii) Paraphrasing: Condense in your own words without quoting someone else's work.
iii) Copy & Paste Plagiarism: Copy and paste text from electronic sources and use it as your own.
iv) Word Switch Plagiarism: Taking a sentence from the source and switching around just a few words.
v) Style Plagiarism: Replicate the style and layout of the source's writing.
vi) Metaphor Plagiarism: To use a simile or metaphor from a source as one's own.
vii) Idea Plagiarism: Using someone else's creative ideas as your own.
viii) Self-Plagiarism: Reusing parts of previous papers in subsequent papers, either as retitled papers, or as collections of bits and pieces from earlier papers.

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1.2. Plagiarism Tools:

Plagiarism tools are modern tools that we use to detect duplicated or copied sections of content in everything from research journals to site content. They are very fast, accurate and can work in numerous languages. The AI-powered tools are pushing multilevel search systems even further, allowing them to comb through billions of personal documents, scientific and medical journals and public databases. Indeed, they also manage to access websites that are password protected and that are not easily accessible.

With plagiarism tools, we can easily find copied or duplicated content. Usually when we check on google to find out if it is authentic content, the duplicated section is quickly illustrated with the pages from where it was taken. Together with Google, we can test a set of 32 words from our content. The source of those initial 32 words we pasted into the Google search bar will show up in a minute.

1.2.1. Types of Plagiarism Tools:

There are two types of plagiarism tools available.

a) Free plagiarism tools:

Free plagiarism tools are online services that allow users to check their documents for plagiarism at no cost. These tools typically have limitations in terms of the number of words that can be tested at once or the frequency of testing. Example of free Plagiarism tools include Scribbr, Small SEO Tools and Duplichecker.

b) Paid plagiarism tools:

Paid plagiarism tools offer more advanced features and capabilities for a fee. These tools are usually used by professionals, educators, and businesses who require more in-depth plagiarism detection and analysis. Paid plagiarism tools often have features such as bulk scanning, file uploading, and detailed reports. Examples of paid plagiarism tools include Turnitin, Copyscape, and Drillbit.

1.2.2. Advantages and Disadvantages of Plagiarism Tools:

a) Advantages:

- Plagiarism tool is free of cost and you can use it easily.
- It not only checks for plagiarism, but also provides you with editing services for any errors or mistakes so that you have perfect writing.
- These plagiarism tools can immediately scan vast amounts of text and compare them with online sources, saving educators and researcher's time.
- It also checks for grammatical errors, detects spelling mistakes.

b) Disadvantages:

- It fails to fully locate errors and mistakes that could help to some extent.
- Sometimes provides false positives and inaccuracies.
- Free plagiarism tools have limited database coverage.

2. OBJECTIVE OF THE PAPER

This paper seeks to:

i) Compare the key features and capabilities of selected free plagiarism tools.
ii) Analyze out of three which free plagiarism tool can give more precise results.
iii) To find which one of the best plagiarism tools.

3. INTERPRETATION

3.1. Key Features

i) Grammarly tool

- Grammarly tool provides free demo service to users.
- If one wants to subscribe to get more benefits the subscription fee for Grammarly is Rs 2250/- per month as premium version and Rs 11,808/- on yearly basis for business version.
- Grammarly is available for all everyone.
- With providing plagiarism report of any content it also checks spellings, grammars, integration, punctuation checker, API integration, Style checker, Data security.
- Grammarly is supported by platforms like Ubuntu, Windows, MacOS, Linux.
- Grammarly supports only English language contents.

- Grammarly also gives sentence recommendation.
- Grammarly cannot detect incorrect spellings with different meaning within a sentence.
- It is a simple and effective tool.

ii) Duplichecker tool

- Duplichecker is a free plagiarism tool that compares the provided text with various web pages on internet to find any kind of duplicate text.
- In duplichecker one can upload any text file example .tex, .txt, .doc, .pdf, .rtf etc or simply copy paste the content in it.
- Duplichecker is developed by AI technology so it can pin point the exact copied content from the internet.
- Duplichecker price starts from $10/ month and $110/year for basic plan.
- Duplichecker provides multi-file format support, provides result in percentage, privacy is guaranteed for users, AI- based technology, multilingual support, fast & deep scanning, highlights duplication.
- Duplichecker is supported by windows platform.

iii) Small SEO tools

- Small SEO tool is a popular plagiarism checker among users.
- Small SEO plagiarism tools provide cross-platform compatibility i.e it is accessible through various devices and browsers.
- It has a simple interface for easy user usability.
- Small SEO tools provide multilingual support.
- It provides user with multiple input support.
- Small SEO tool subscription price starts from $19.80/ monthly and $217.8/ on yearly basis.
- Small SEO tools gives a detailed report such as sentence by sentence results, highlights plagiarized patches showing their sources in an orderly manner.
- Small SEO tool is supported by windows platform.

3.2. Analysis

- It has been noticed that Grammarly provides 10,000 word count whereas Duplichecker and Small SEO tools provides 1000 word count check.
- Fastest plagiarism results are shown by Grammarly followed by Duplichecker meanwhile Small SEO tool takes maximum time to provide results.
- Though Grammarly has the highest word count it only does not specify or highlights the plagiarized parts of the uploaded content and also it does not shows the source of plagiarized parts.
- Whereas duplichecker and Small SEO tool has only 1000 word count but it shows the source of plagiarized contents and highlights such parts.
- Though they are free plagiarism tools but they can also be subscribed by users, so in case of subscription fees Duplichecker has the lowest fees, followed by Small SEO tools but out of these three tools Grammarly has the highest subscribtion fees.

So, it can be said that Duplichecker and Small SEO tool provides precise results.

3.3. From the above analysis it can be said that by comparing all the criteria, Duplichecker is the best freely available plagiarism checker tool with less time consuming, variety of document format, shows sources of plagiarized materials as well as highlights it and also has the lowest subscription fees compared to all three plagiarism tools.

4. CONCLUSION

Plagiarism is a widely recognized ethical issue in education, journalism, publishing and other fields. Many institutions have set clear guidelines and repercussion for plagiarism which is why plagiarism tools are commonly used to ensure the originality of written works. This paper tried to reveal some of the strengths and weaknesses of three plagiarism detection tools, namely Grammarly, Small SEO tools and Duplichecker. They were compared according to their features and performances. The criteria for selecting these tools for this study was to discover how the readily

available or free source tools are performing and ultimately which of them can be considered the best for users. It turns out that Duplichecker and Small SEO Tools, in most cases, produce the same results also they highlight the plagiarized contents while mentioning the source of it. Whereas Grammarly only shows that the content is plagiarized or not and does not mention the sources nor they highlight the plagiarized content. In case of their subscription Duplichecker is budget friendly for users, followed by Small SEO tools and Grammarly.

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Online Databases for the Development of the Sports Community: Overview

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ABSTRACT

The purpose of this paper is to give information about online databases in the field of physical education and sports sciences that can be accessed by information and Communication Technology (ICT) platforms. ICT platforms are beneficial for all communities whether they belong to any profession or field such as a doctor, teacher, student, or sports person. Each field requires information and this information can be restored as a database to disseminate and provide good knowledge and command of their field for better growth.

Keywords: *Information communication technology (ICT), Information, E-resources, Online Databases, Sportspersons, Sports community*

1. INTRODUCTION

Information is vital in all facets of life and the workplace. In addition to our necessities, we require information to plan and manage our lives. We cannot move forward in the proper direction without information. We require information in every aspect of our lives, be it at home, at school, in the workplace, in sports, or any other professional setting. Data that has been arranged for communication or storage is called information (Ur Rehman et al., 2021). To give its users, information should be well organized and maintained. To facilitate their users every working organization has a well-organized information centre these days. To disseminate the information properly and easily ICT platforms play a vital role. ICT is generally accepted to mean all technologies that combined, allow people and organizations to interact in the digital world.

Products that store, process, transmit, convert, replicate, or receive electronic information are included in the category of information and communication technology. It is the fastest way to spread, share, and access information anywhere in the world. It is very helpful in the development of community and nation. It makes citizens, digital citizens. Those who are using the Internet regularly and effectively are called digital citizens (K. Mossberger, et.al., 2007). It also can help in accessing learning resources for the community whether they are students, teachers, sports persons, doctors, etc. Here we will talk about the sports community. Sports persons are indulged in sports activities. Much of the time is spent on sports activities. They do not have much time to give their academics. Apart from this in sports careers, they also need to analyze their performance as compared to previous but with the development of ICT, it is easy to gain knowledge anytime, anywhere without any restriction. They can connect themselves with the expert in their field across the world with the help of ICT. There are some examples of ICT which provide platforms to gain knowledge and information such as Facebook, WhatsApp, Twitter, Instagram, LinkedIn, E-mail, e-resources, etc. (Khoro, L., (2019).

For academic and professional purposes, e-resources are very beneficial for the sports community. They can easily know about the current trends and developments in their field without physically visiting the library. They can download and save the article on their PCs. Through ICT they can access e-books, e-journals, e-newspapers, online databases, social media, etc. Here we will discuss sports databases because they are most valuable and have high academic quality. Nowadays video databases exist in the sports field. These video databases are used in coaching for the better performance of the sports persons to provide them with better techniques and analyses of performances in sports. By analyzing performance, they can improve their strength and performance which can boost their career. Sports analytics can be used in many different contexts such as player and team performance, coaching tactics, recruitment and scouting, injury prevention and recovery, fan interaction, media exposure, and business operations. Sports organizations can benefit from sports

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Chapter 54; S. Hasan, S. Kumar, S. Panda, K. N. Khan & G. Samdani (Eds); PP. 417-423; Synergy Books India, N.D.

analytics' ability to give them a competitive edge (Bhosale, S., & Ray, S. (2023). Following are some online databases that are useful for the physical education and sports community are as follows.

2. SPORTS DATABASES

Table 1: Sports Databases

Sr. No	Databases	Useful (Subjects covered)	Link
1.	Sport Discus	• Athletic training • Coaching and education • Consumer health • Exercise science and fitness • Health Education • Kinesiology • Nutrition • Occupational health and safety • Orthopedics • Physical education • Physical therapy • Sociology of sports • Sport psychology • Sports injuries and rehabilitation • Sports management • Sports sciences	https://www.ebsco.com/products/research-databases/sportdiscus-full-text
2	Psyc INFO	• Psychology	https://www.apa.org/pubs/databases/psycinfo
3	AUSPORT (Informit)	• Social Sciences • Sport and Recreation	https://eresources.sl.nsw.gov.au/ausport-australian-sport-database-informit
4	Sports Medicine & Education Index (formerly Physical Education Index) (ProQuest)	• physical education curricula • sports medicine • sports law, kinesiology, motor learning, recreation, standardized fitness tests, sports equipment, business and marketing, coaching and training, and sport sociology/psychology.	https://about.proquest.com/en/products-services/pei-set-c/
5	Leisure Tourism Database	All aspects of leisure and tourism, including policy and planning, education and training, travel, sports, hospitality, the arts and entertainment, sustainability, recreational activities, and cultural heritage.	https://www.cabi.org/publishing-products/leisure-tourism-database/
6	Sports Litigation Alert	Sports Law	https://sportslitigationalert.com/

7	SBRnet (Sports Business Research Network)	online platform of nationwide sports business, sports marketing and sports marketing analytics, using syndicated custom and proprietary research for professional and college sports, consumer research, industry reports, and licensed industry articles.	https://www.sportsmarketanalytics.com/About.aspx
8	ERIC (Education Resources Information Center)	education researchers of all kinds.	https://eric.ed.gov/?q=ebscohost
9	Own the Podium (OTP)	Performance databases at Olympic and Paralympic	https://www.ownthepodium.org/en-CA/
10	Athletics Podium (international medallist database)	Track and field events	https://www.athleticspodium.com/
11	JSTOR	Public health Medicine @Allied health Health science	https://www.jstor.org/

2.1. SPORTDiscus

SPORTDiscus was developed by the Sport Information Resource Centre (Canada) in the early 1970s. It is the authoritative resource for research on sports and sports medicine with Full Text. It is a vital resource for medical professionals and researchers looking into sports, health, and fitness because it offers hundreds of full-text sports medicine journals. It is an essential tool for health professionals and researchers studying fitness, health, and sports. It is a jewel of the EBSCO databases. Undergraduate and graduate students in sports management find *SPORT Discus* helpful for both scholarly and popular material.

Content: It includes references to books, book chapters, Conference proceedings, journal articles, magazines, and dissertations.

Scope: Athletic training, Coaching and education, Consumer Health, Exercise science and fitness, Health Education, Kinesiology, Nutrition, Occupational health and safety, Orthopedics, Physical education, Physical therapy, Sociology of sports, Sport Psychology, Sports injuries and rehabilitation, Sports Management, Sports sciences.

2.2. APA PsycINFO

APA PsycInfo began in 1967 with the first electronic publication of the bibliographic records included in that year's print Psychological Abstracts. It is the leading abstracting and indexing database from the leading psychology authority, encompassing the behavioral and social sciences.

Content: Over 5,000,000 peer-reviewed records,144 million cited references, spanning 600 years of content, Updated twice-weekly, Research in 30 languages from 50 countries, Records from 2,400 journals, Content from journal articles, book chapters, and dissertations, AI and machine learning-powered research assistance.

Scope: Artificial Intelligence, Business, Education, Law, Linguistics, Medicine, Neuroscience, Pharmacology, Political science, Social work, Sociology, Sports.

2.3. AUSPORT - Australian Sport Database (Informit)

It is a bibliographic database, produced by the Australian Sports Commission, which indexes and abstracts articles from published and unpublished material on all aspects of Australian sport.

Content: The library's e-resources include databases and websites that give access to a range of materials such as journals, magazines, newspapers, e-books, audiobooks, dictionaries, multilingual material, tutorials for learning a language, online films, and images.

Scope: All facets of Australian sport are covered, including administration, children, coaching, disabled, economics, facilities, history, medicine, nutrition, physiology, psychology, women, and the Olympic Games.

2.4. Sports medicine and education index (ProQuest):

Since 1970 Sports Medicine & Education Index has been covering this vast collection of material. The database was improved starting in January 2001 with the inclusion of abstracts, email addresses, more publisher and author details, and other information to make the full text easier to access.

Sports Medicine & Education Index allows all researchers and professionals in the field to acquire accurate and scholarly information in this comprehensive database. These abstracts feature a wide variety of content, ranging from physical education curricula to sports medicine, to dance. Other coverage includes sports law, kinesiology, motor learning, recreation, standardized fitness tests, sports equipment, business and marketing, coaching and training, and sport sociology/psychology. Health education and physical therapy are also covered as they continue to become more prevalent in our society.

Content: Records are indexed and classified from peer-reviewed journals, report literature, conference proceedings, trade magazines, patents, articles from the popular press, and many other publications**.** Monthly, with approximately 1,000 new records added.

Scope: Administration, Biomechanics-Kinesiology, Coaching, Curriculum, Dance, Facilities, Health, History, Law, Measurement-Evaluation, Motor Learning, Patents (that pertain to sporting goods and exercise equipment), Perception, Philosophy, Physical Education, Physical Fitness, Physical Therapy, Recreation, Research, Sport Activities, Sport Psychology, Sport Sociology, Sports, Sports Medicine, Teaching Methods, Training.

2.5. Leisure Tourism Database:

The Leisure Tourism Database is the enhanced online version of Leisure, Tourism, and Recreation Abstracts. Coverage begins in the 1970s and continues to the present. A meeting calendar, web links, and thousands of articles on travel, leisure, sport, hospitality, and culture are among the website's other features. Most of the articles have links to database entries and/or outside resources for more information.

Content: It Includes references to books, journals, conference proceedings, bulletins, reports, and news items.

Scope: Tourism and Travel, Leisure and recreation, Sports, Arts and Entertainment, Hospitality industry.

2.6. Sports Litigation Alert:

Hackney Publications is the Nation's Leading Publisher of Sports Law Periodicals. Hackney Publications delivers valuable and important information about the legal side of the sports industry. Almost 4,000 articles and case summaries can be found in the searchable archive of Sports Litigation Alert, which has been in publication for nearly 20 years. Sports Litigation Alert tracks legal developments as they occur in amateur and professional athletics as well as legislative issues that impact sports law professionals. Its primary goal is to keep a tight editorial focus on topics that are important to its subscribers through its publications.

Content: Sports Litigation Alert, which features an extensive archive of case summaries and guest articles written by sports law professionals, is published by veteran legal journalist Holt Hackney, whose company Hackney Publications currently produces Legal Issues in College Athletics, Sports Litigation Alert, Journal of NCAA Compliance, Legal Issues in High School Athletics, Concussion Litigation Reporter and Professional Sports and the Law.

Scope: Sports Law

2.7. SBRnet (Sports Business Research Network):

A comprehensive online platform for national sports business, sports marketing, and sports marketing analytics is offered by SBRnet and the Sports Market Analytics Platform. SBRnet is lead by Neil Schwartz and Mark Sullivan. They have more than 40 years of combined experience in the sports industry.

Content: SBRnet provides a countrywide analysis of statistical trends and the degree of correlation between them in each of the main sports market segments. It is the leading source of sports market analytics for the academic community. They provide to students a thorough overview of the sports business, drawing on syndicated and proprietary market research, industry reports, and industry articles from leading trade and sports business publications and resources. All the information students could want about sports fans, participation patterns, locations, sportswear, and equipment, are available here.

SBRnet is the perfect platform from which to incorporate relevant research, whether you are teaching sports marketing, sports business, sports analytics, or using sports marketing case studies in general marketing courses. Librarians together with faculty members at colleges and universities across the country subscribe to SBRnet because of the "triple-threat" program: the depth of content, the breadth of market coverage, and academic support with topical newsletters, curated video and audio content, and tutorials.

Scope: The service offers in-depth analysis and custom reports on a wide range of topics, including fan behaviour, venues, sponsorships, spending on sporting goods, brand preference, sports participation, and more. The service also provides the academic community with a comprehensive Sports Business Resource Center to provide additional research support and insights.

2.8. ERIC:

ERIC, the Education Resource Information Center, is a subject-specific database that provides access to education literature and resources. The database provides access to information from journals included in the Current Index of Journals in Education and Resources in Education Index. It is an internet-based digital library of education research and information sponsored by the Institute of Education Sciences (IES) of the U.S. Department of Education. It provides access to bibliographic records of journal and non-journal literature from 1966 to the present. The goal of ERIC is to give educators, researchers, and the general public access to a comprehensive, user-friendly, searchable bibliographic and full-text database of education-related material on the Internet.

Content: The ERIC collection includes bibliographic records (citations, abstracts, and other pertinent data) for 1.6 million items indexed since 1966, including journal articles, books, research syntheses, conference papers, technical reports, policy papers, and other education-related materials. Currently, over 1,000 journals are indexed in ERIC.

Scope: It includes all levels of education from early childhood to higher education and all educational specialties, such as multilingual education, health education and testing.

2.9. Own the Podium:

It is a National Performance database that manages performance competition data. This database is created by the Sport Technology Research Laboratory, University of Calgary for Own the Podium 2010. This national sport technical initiative aims to support winter athletes in Canada.

Content: Performance results Olympic and Paralympics

Scope: It includes competition results and performance data for all 152 sports disciplines participating in the 2010 Winter Olympic and Paralympic Games. The database allows athletes' performances to be compared to their benchmark, as well as provides the Own the Podium decision-makers with information on which countries are the best in a variety of sports and disciplines.

2.10. Athletics Podium:

This database aims to be an open database that contains all major championships across all competition levels and categories. Athleticspodium.com was planned and realized in two years. Opened it for trial basis on May 10th, 2020, during the Covid-19 pandemic quarantine.

Content: In the initial stage of the project, it has mainly 'championships'. We can find all the top three medallists, results, technical data, and - if needed - some notes about the medal from Europe to Oceania. It has all senior, U23, U20, and U18 level competition podiums on the database. Athletics

Podium provides an easy way to find an athlete's journey in international athletics from the very beginning.

Scope: The Athletics Podium is an international medallist database that covers track and field events.

2.11. JSTOR:

JSTOR is part of ITHAKA. It is a not-for-profit organization assisting the academic community use digital technologies to preserve the scholarly record and to advance teaching and research in sustainable ways. It is a digital library of academic journals, books, and primary sources founded in 1994.

Content: JSTOR currently offers more than 12 million academic journal articles, 100,000 books, and millions of images and primary source materials in 75 disciplines.

Scope: Major areas which are covered; Area Studies, Arts, Business & Economics, History, Humanities, Law, Medicine & Allied Health, Science & Mathematics, Social Sciences.

3. CONCLUSION

After a thorough evaluation of databases in physical education and sports sciences we see that valuable databases are available to satisfy the information needs of the sports community. The sports community can make the best use of these databases to grow in their field. Nowadays physical education and sports are very valuable fields and allure most of the population toward itself. To perform in a better way these databases can play a vital role in improving the skill and strategy because they include the ability to retrieve previous data for comparison with new performance and the use of data to highlight issues of consideration. This can be quantified with numerical data, graphics, and audio/video recording (Vincent et al. (2009)). The SportsBR system can take video from the massive number of sporting competition recordings available, it automatically selects event-based clips from the video, and indexes and stores them in a database for later browsing and retrieval (Hua-Yong Liu, 2005). More video databases can be managed by multimedia resources because they are more beneficial for coaches as well as for athletes to improve performance.

Apart from this, databases can serve to bring fragmented information together into useful resources for a particular field and enhance the quality and consistency of the information. It saves the quality of time of the users. Multiple users can use it at a time. In the databases, data can be integrated for specific fields. Databases can be designed to keep in mind the user's friendly concept. Users' valuable time is preserved. Furthermore, physical education and sports science databases can be kept on one platform as a consortium for the sports community for better use of information. Its access can be given to the libraries in subscription form at minimal prizes for the use of information at a maximum level. Databases are useful for the quick and efficient exchange of information that promotes the growth of the sports community.

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- https://www.ownthepodium.org/en-CA/
- https://www.athleticspodium.com/
- https://www.jstor.org/
- https://en.wikipedia.org/wiki/PsycINFO
- https://www.cabi.org/Uploads/CABI/publishing/training-materials/resources-by-product/leisure-tourism-database-user-guide-low-res-v2.pdf
- https://libraries.indiana.edu/leisure-tourism-database
- https://kinesiology.ucalgary.ca/sites/default/files/teams/12/ijcss-volume8_edition2_vincent.pdf

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Private Blockchain, Hybrid Blockchain, Public Blockchain Technologies in Digital Library Service

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ABSTRACT

Purpose: This study main purpose examine the Private block chains, Hybrid Block chains, Side Block chains Technology in Digital Library Service. Design /Methodology/Approach: Block chain application use in library service and function. Block chain a peer to peer network of transaction of data. Findings: This application use the librarian for better library services generate the metadata systems for the libraries, and Protect the copywriter of digital sale. Librarian can be connecting to network library use the block chain technology. Share the network to other library. Originality/value: This application is very useful for Transparency and All transactions on this ledger are authorized by the owner's digital signature, which authenticates the transaction and protects it from tampering. Therefore, the information contained in the digital ledger is highly protected.

Keyword: *Block chain, Sharing, Network, Web3.0, Chain processing, Digital library, Meta data, Private Block Chains, Hybrid Block chain, Side Block chain*

1. INTRODUCTION

Block chain is a distributed database and peer-to-peer network that stores a cryptographically protected ledger of transactions. Block chain is the ledger or record side of transactions and subsequent transactions. Simply put, block chain technology uses distributed databases (multiple devices that are not connected to a common processor). This database organizes data into records (blocks) that have encrypted verification, are time-stamped, and are linked to previous records. It is modified by the person holding the encryption key to write the file. Block chain records the date, time, participants and other contractual or legal parts of Bit coin transactions. Block chain is an important part of the underlying infrastructure of Bit coin and other cryptocurrencies.

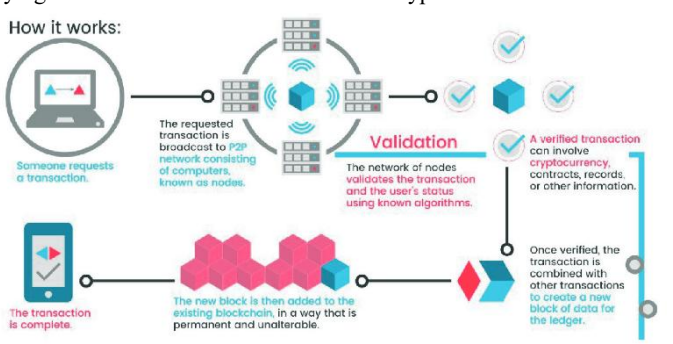

Figure 1

 | ISBN: 978-93-92958-97-7
Chapter 55; S. Hasan, S. Kumar, S. Panda, K. N. Khan & G. Samdani (Eds); PP. 424-427; Synergy Books India, N.D.

2. FEATURES OF BLOCK CHAIN

There are publicly distributed ledgers that use hashed cryptography. Each block has a hash price that represents the block's digital signature. All transactions are certified and verified on the block chain network using the Proof of Work consensus algorithm. The block chain network uses the assets of miners on it to validate reward transactions.

2.1. What is Block chain Technology?

Blockchain technology is a structure that capture the transaction records, also called blocks, to multiple databases called "chains" on a network connected by peer-to-peer nodes. This storage is commonly referred to as a "digital ledger". All transactions on this ledger are authorized by the owner's digital signature, which authenticates the transaction and protects it from tampering. Therefore, the information contained in the digital ledger is highly protected.

Simply put, a digital ledger is like a Google spreadsheet shared by many computers on a network, storing a record of transactions based on actual purchases. The attractive aspect is that anyone can see the data, but they cannot tamper with it.

2.2. Block Chain Several Layers:

i) Computer infrastructure (hardware)
ii) Digital networking (node discovery, information propagation and verification)
iii) consensus (proof of work, proof of stake)
iv) Spread data (blocks, transactions)
v) Software application (smart contracts/decentralized applications

2.3. Type of Block chain Technology:

A Public blockchains have no access restrictions at all. Anyone with an internet connection can submit transactions there and become a validator (that is, participate in running the consensus protocol The largest and most famous public block chains are the Bitcoin block chain and the Ethereum block chain.

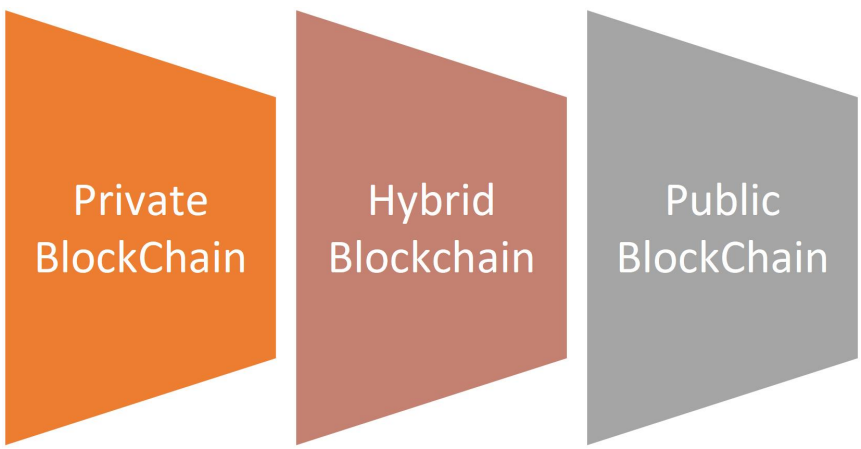

Figure 2

i) **Private Blockchain:** A private blockchain is permissioned. One not join its unless other network invited by the network administrators. Participant and validator access is restricted. To distinguish between open blockchains and other peer-to-peer decentralized database applications that are not open ad-hoc compute clusters, the terminology Distributed Ledger (DLT) is normally used for private blockchains. Library should be create private internal communication to library

users and staff. Library can be operate a private blog and collect to feedback library staff and users.

ii) **Hybrid Blockchain:** A hybrid blockchain has a combination of centralized and decentralized features. The exact workings of the block chains may vary based on which portions of centralization and decentralization are used in various network Private and Public Network Flexibility and privacy.

iii) **Public Blockchain:** Public blockchain mean that No central authority . Its means that public blockchain is use public perspective, Public Blockchain don't have any restrictions, the computer and internet anyone having the participate in the network. Following are examples of Public Blockhain in library. Editing the library record by the library staff. WebOPAC-Users can be search and access the content available in library.

3. ROLE OF LIBRARIAN

i) Need to understand block chain
ii) Use and Implication of Block chain in various applications in Library function and Service
iii) To Provide Block chain user awareness education to users
iv) Easily work process under to chain process
v) Make a privacy at the work
vi) Make a Digitization of the Library equipment under to Block Chain process.

4. APPLICATION OF BLOCKCHAIN TECHNOLOGY IN LIBRARIES

i) Plagiarism Copy right permission a chain process
ii) Library book Payment fine and overdue of Library equipment
iii) Issue and Return book a chain process
iv) User to user login
v) Cataloguing and classification Block Chain
vi) Scholarly Publishing
vii) DRM

i) **The Plagiarism:** The author can be allowing the plagiarism to own work. The author send the copy right permission to allow on the chain to sneak – peak into earlier stages of his work .

ii) **Library book Payment fine and overdue:** Block chain process is very use full for library book late fine collect to user the block process a chain to network the received the transaction show the all library system connect to the server.

iii) **Issue and Return book:** Circulation service is most important services of any library the issue the book automatically update the all systems and update the user account block chain technology are using in Circulation section issue and return book of library materials

iv) **User to User Login:** Library User to user login is example of Block chain the user the user login a system easily connect to multiple computer the user easily login and connect to chain processing.

v) Online Cataloguing and classification services: block chain is a process of structure that stores transactional records, also known as the block, of the public in several databases, known as the "chain," in a network connected through peer-to-peer nodes. He library cataloguing and classification services a part of block chain if any books entry he cataloguing the peer-to peer update to all network library and classification book a shared online network , easily peer to peer transaction.

vi) **Scholarly Publishing:** Fundamentally, block chain aims to store information in a decentralized, tamper-proof environment. This aligns well with what librarians have always done: collecting, preserving, and disseminating reliable information. Block chain can help librarians do this, especially in the world of scholarly publishing. A potential application of block chain is to create time-stamped and verifiable versions of journal articles. Irving and Holden successfully tested the use of the Bitcoin block chain "as an inexpensive, independently verifiable method that can

be used extensively and easily to test and confirm the scientific research." They did this by creating a plaintext cryptographic hash of the effort to log document and using that hash to create a new Bitcoin secret key. This creates a time-stamped record on the blockchain that other researchers can quickly review later. If the document is changed, the hash of the new document will not match the one stored on the block chain.

vii) **Digital Rights Management:** Digital resources are inherently reproducible, and this creates problems for libraries and publishers. Publishers have imposed strict and often impractical DRM tools on libraries and consumers to prevent copying of materials. Because block chain creates a unique, verifiable record that is accessible to everyone, it can be used as a way to link to digital materials and indicate the "provable scarcity" of that resource. This allows us to uniquely identify, manage and transmit digital materials. Publishers can be reassured that no copies have been made, but it is questionable whether prices will drop accordingly.

5. CONCLUSION

Blockchain technology opens up new possibilities. Besides financial services applications, blockchain-based systems can be implemented in other library-related areas such as: Digital Preservation and Tracking Community-based collections for sharing objects, tools, and services Blockchain-based currency for international financial transactions (IFLA) Interlibrary loan and voucher system Library verification of credentials (information literacy) provenance and Archives/special collections where authenticity is important Corporate library archive management Organizational data management Intellectual property such as Research and Development.

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Developing Digital Paradigm: An Evaluation of Growth and Comparison of Different Payment Interfaces

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ABSTRACT

The National Payments Corporation of India (NPCI) has pioneered the Unified Payments Interface (UPI), an innovative payment ecosystem facilitating real-time transactions between banks, covering both peer-to-peer (P2P) and person-to-merchant (P2M) transactions. UPI has witnessed rapid adoption across India, emerging as the leading mode of payment nationwide. This study explores the regulatory framework governing UPI LITE, a refined version Customized for feature phones, and examines the impact of volatility spill-over on transaction volumes of Real-Time Gross Settlement (RTGS), National Electronic Funds Transfer (NEFT), and UPI, employing the DCC GARCH model. It analyses the trajectory and evolution of UPI in conjunction with other payment modalities in India, elucidating the surge in UPI utilization and its correlation with P2P and P2M transaction volumes. The study underscores the potential of UPI LITE to sustain financial inclusion in India and identifies UPI as a primary driver of digital commerce expansion. In conclusion, it deliberates on the future pathway of UPI and other commerce-related payment mechanisms in India.

Keywords: *UPI, UPI LITE, P2P, P2M, Volume, Value, Digital Payments, NPCI*

1. INTRODUCTION

The Unified Payments Interface (UPI), launched by the National Payments Corporation of India (NPCI) in 2016, revolutionizes the way users can transfer funds between bank accounts via a mobile application, providing rapid and convenient transactions. With UPI, users can make payments, receive money, pay bills, and do much more, all with just a few clicks on their smartphones. UPI has transformed the payment landscape in India, making it easier, faster, and more convenient for users to transact digitally. Since its launch, UPI has witnessed marvelous growth, with the number of transactions increasing exponentially. There is a growing interest in understanding the impact of UPI on various stakeholders, including users, merchants, banks, and the broader economy. According to data from NPCI, UPI maintains its position as the primary channel for digital payments. In 2022, the volume of transactions reached 74 billion, marking a remarkable 70 percent surge over the previous year. UPI has become one of the most comprehensive digital payment solutions in India. Encouraged by its achievements, several nations have implemented UPI systems for their internal transactions. This research paper aims to explore the various aspects of UPI, including its adoption, usage patterns, transactional dynamics, and impact on the Indian payments landscape. By analyzing these factors, we hope to better understand UPI's success and identify potential avenues for future research and development.

2. LITERATURE REVIEW

The Trust PAY mobile payment framework is developed to grab security concerns arising from sharing sensitive information and data over open networks and devices. With growing threats such as malicious software and data breaches targeting mobile operating systems, Trust PAY ensures secure payment transactions and safeguards user privacy. It's based on the Truston platform and utilizes ARM FastModel and the Open Virtualization Software Stack for ARM Trust Zone in a simulated environment. Trust PAY aims to boost security and facilitate secure and private mobile payments (Kashiwa et al. 2007). A multivariate GARCH model was employed to analyze the interconnections among stock markets in Jamaica, Trinidad, Barbados, and the NYSE. The research

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Chapter 56; S. Hasan, S. Kumar, S. Panda, K. N. Khan & G. Samdani (Eds); PP. 428-436; Synergy Books India, N.D.

revealed notable spillover effects between each of the regional exchanges, along with influences originating from the NYSE (Grosvenor and Greenidge 2010). Prior studies on mobile payments between 1999 and 2006 predominantly centered on a narrow set of topics. To stabilize this trend, a research approach was introduced to raise the survey of novel subjects. However, recent investigations suggest that despite efforts, researchers have continued to focus primarily on established areas like consumer acceptance and technology. Alongside reviewing existing literature, this study clarifies possible explanations for the lack of diversity in research and offers fresh perspectives to enhance forthcoming studies on mobile payments (Dahlberg et. al 2015) A survey was conducted with a sample size of 100 individuals and statistical analysis was performed using the chi-square test, t-test, and Friedman test. The results revealed that users preferred 24/7 services and safe transactions. Their main issues were related to internet connectivity and the reimbursement of money. (Vineeth and Geetha (2017). The implementation of demonetization in India has prompted the adoption of digital payments, forced by government initiatives. This study examines the UPI digital payment method, encompassing its structure, technological aspects, functionalities, stakeholders, advantages, and obstacles. It compares UPI with other digital payment methods and emphasizes the importance of customer confidence and awareness, particularly among rural users. Overall, UPI offers convenient and affordable monetary transactions. (Neema, K., & Neema, A. (2018). UPI has played a significant role in the reduction of cash usage in India. The convenience and security offered by UPI have made it highly favored among consumers, while the growing prevalence of smartphones has enhanced its accessibility. Consequently, UPI holds the promise of substantially diminishing cash utilization in India going forward (Agarwal, A., & Tiwari, A. (2022). There is a valuable contribution to the literature on UPI and digital payments. It provides valuable insights into the factors that have contributed to the success of UPI and the potential of UPI to revolutionize the way people make payments in India and around the world. (Amogh Das and Ashish Das (2022). A research paper investigates the security challenges linked with mobile payment systems in India, taking into account the instant expansion of the country's mobile phone market. It offers insights into the current landscape of mobile payment systems in India and delves into the particular security issues surrounding fraud, data breaches, and cyberattacks. Additionally, the paper presents suggestions for enhancing the security measures of mobile payment systems in India (Amita Garg et.al. 2023).

3. METHODOLOGY

The entire study relies on secondary information obtained from the reports sourced from the online data repositories of the National Payments Corporation of India (NPCI) and the Reserve Bank of India (RBI). The data covers the period from June 2020 to May 2023 and includes daily volume and monthly value data for UPI and other payment modes. The data will be used to track the growth of UPI and other payment modes in India.

4. OBJECTIVES

i) To study the policy framework and use of UPI LITE on the PhonePe application.
ii) To analyze the trend and progress of UPI and other payment modes.
iii) To track the growth of UPI and other payment modes.
iv) To examine the relationship between P2P and P2M transactions and volumes.

5. POLICY FRAMEWORK FOR UPI LITE

i) It should be noted that UPI LITE is not applicable to all accounts associated with UPI IDs. UPI LITE specifically allows for the usage of a single account within the mobile application.
ii) For UPI LITE transactions, there is a maximum transaction limit of Rs. 200/-, and the overall balance limit for UPI LITE is set at Rs. 2000/- or as determined by the National Payments Corporation of India (NPCI) periodically. It should be noted that NPCI retains the authority to modify these limits at its discretion, without prior notification.
iii) The balance shown in the app for UPI LITE is a virtual "on-device" balance, representing the allocated UPI LITE balance within a user's account. This balance does not accrue any interest. The National Payments Corporation of India (NPCI) does not directly receive or transfer actual funds related to the UPI LITE Balance from the issuing bank. Instead, the issuing bank holds and manages the funds associated with the UPI LITE balance.

iv) To augment the UPI LITE balance, users can initiate a top-up transaction to allocate or add additional funds to their UPI LITE from their account.
v) If access to UPI LITE is disabled, issuing bank will credit any unutilized UPI LITE balance back to the user's account. Any refunds or reversals of funds associated with a transaction will also appear in the user's account, rather than in the app.
vi) Accessing and conducting transactions with UPI LITE is a straightforward process that involves logging into the app installed on the phone and providing phone or device biometric or pattern validation. It is worth noting that utilizing UPI LITE does not necessitate a separate authorization or UPI PIN for transactional activities.
vii) Please note that transactions conducted using UPI LITE, excluding top-up transactions, will not be shown in the account's statement or passbook. Instead, users will receive a daily SMS from the issuing bank containing a summary of UPI LITE transactions performed during the day.
viii) Any disputes concerning the enabling, topping up, or disabling of UPI LITE will be referred to and managed by the issuing bank.
ix) The user bears the responsibility for safeguarding the confidentiality of their app password and other details linked to UPI LITE transactions. They are solely accountable for all activities performed under their password and on mobile devices where UPI LITE is enabled.

6. USE OF UPI LITE IN PHONEPE

PhonePe, a leading digital payments platform, made an exciting announcement on May 2nd, 2023. They introduced a new feature called UPI LITE on their app, which is now live and available to users. UPI LITE enables users to initiate quick and hassle-free low-value payments, specifically those under Rs. 200. With UPI LITE, users can make payments with just a single tap, without the need to enter a PIN. The transaction is processed directly by deducting the amount from the user's on-device UPI LITE balance. This innovative approach eliminates the involvement of the customer's bank's core banking systems in real-time, making the entire transaction more seamless and significantly faster than regular UPI transactions. Additionally, this streamlined process enhances the likelihood of successful transactions. But currently, the payment can only be done by using an internet connection.

6.1. Steps for Activating UPI Lite on the PhonePe App

To enable UPI LITE on the PhonePe app, follow these steps:

i) Launch the PhonePe app on the device.
ii) On the app's home screen, you will find the option to enable UPI LITE. Tap on it.
iii) Enter the desired amount to add to the UPI LITE account and select the bank account from which the amount will be deducted.
iv) Enter UPI PIN when prompted to authenticate the transaction. Once the UPI PIN is successfully entered, the UPI LITE account will be enabled and activated on the PhonePe app.

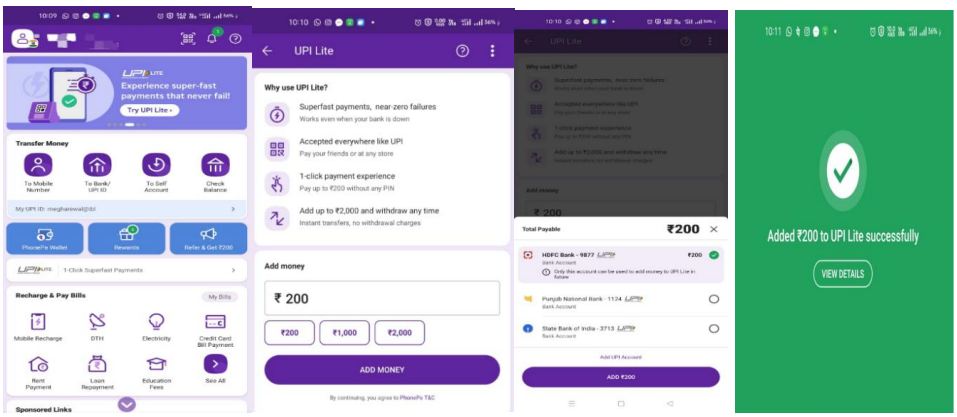
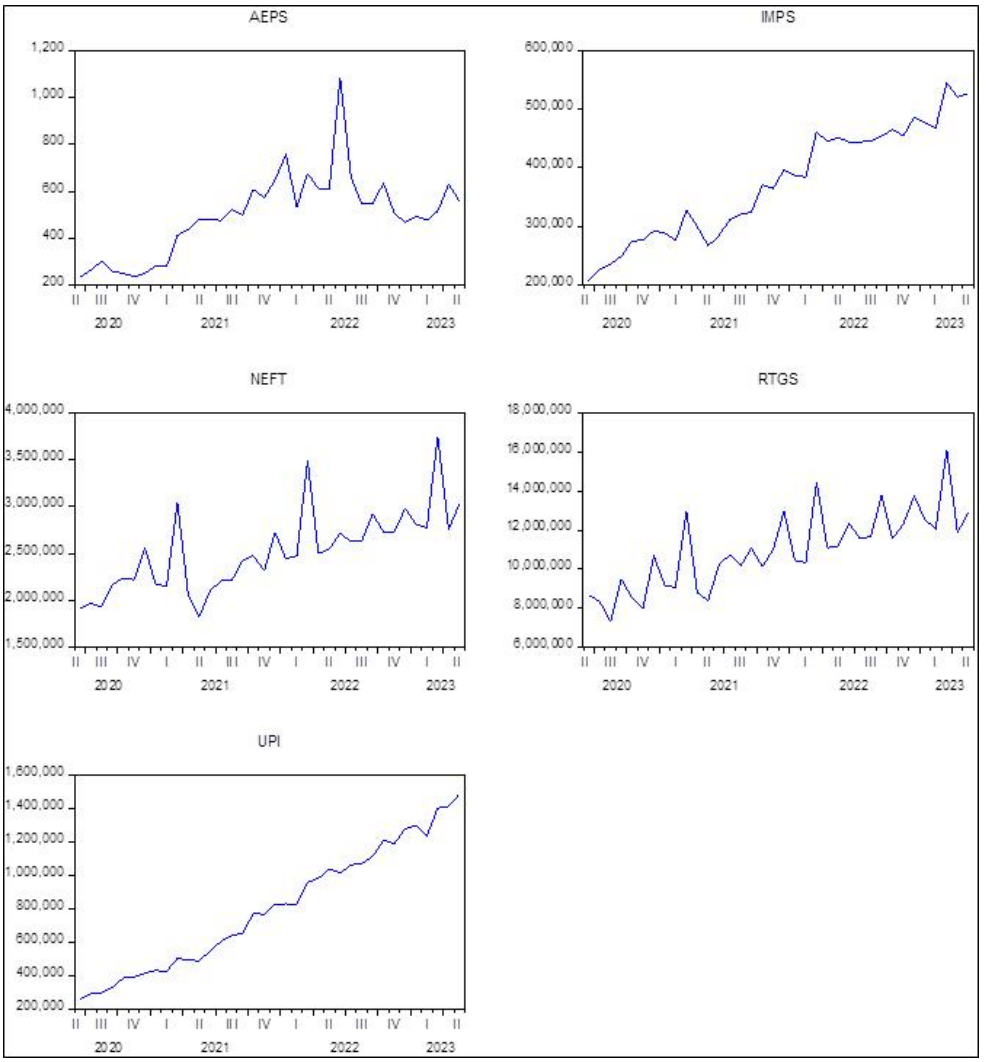


Figure 1: Steps for Activating UPI Lite on the PhonePe App



Source: Prepared by Author in E-Views

Figure 2: Showing the Trend of Values of Different modes of payments

Figure 2 shows the trends in the various modes of payments. UPI is the most popular payment method in India. Its popularity has increased significantly from 2021 to 2023. This is likely due to the convenience and speed of UPI payments. NEFT is the second most popular payment method in India. Its popularity has also increased from 2021 to 2023. This is likely due to the fact that NEFT payments are a cheaper option than UPI payments. AEPS is the third most popular payment method in India in 2021 and 2022, but its popularity has declined in 2023. This is likely due to the increasing popularity of UPI payments.

The popularity of different payment methods varies by region. For example, AEPS is more popular in rural areas, while UPI is more popular in urban areas. This is likely due to the fact that AEPS payments can be made using aadhaar-enabled devices, which are more common in rural areas.

Table 1: Multiple Regression on Volumes

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UPI	-1388.69	66.7443	-20.8062	0.0000

AEPS	-93.8084	56.1660	-1.6702	0.0952
IMPS	24.6233	0.5651	43.5716	0.0000
NEFT	-0.0943	0.4456	-0.2117	0.8324
RTGS	-39.8466	7.3546	-5.4178	0.0000

Source: Prepared by Author in E-Views

Table 1 represents the coefficient for UPI is -1388.69, with a p-value of 0, and for AEPS is -93.8084, with a p-value of 0.0952. This means that the amount of money transferred is significantly less when UPI is used as the payment method. The coefficient for IMPS is 24.62338, with a p-value of 0. This means that the amount of money transferred is significantly more when IMPS (Immediate Payment Service) is used as the payment method. The coefficients for NEFT and RTGS are both negative, but their p-values are not significant. This means that the amount of money transferred is not significantly different when NEFT or RTGS are used as payment methods. Overall the results of the regression analysis suggest that IMPS is the most effective payment method for transferring money. The amount of money transferred is significantly more when IMPS is used, compared to C, AEPS, NEFT, or RTGS.

Table 2: Unit Root test on volumes

Variables	**ADF Test**	
	Intercept	
	t-statistics	**Probability**
UPI	-13.845	0.0000
IMPS	-12.6036	0.0000
NEFT	-15.6009	0.0000
AEPS	-5.96148	0.0000
RTGS	-14.0382	0.0000

Source: Prepared by Author in E-Views

Table 2 shows that on 1st difference except on AEPS, all of the variables are stationary. However, AEPS has stationarity on the level. This means that the mean and variance of the time series do not change over time. This is important for other statistical analyses, as it allows us to make inferences about the time series without having to worry about the non-stationarity of the data. As the UPI, NEFT, and RTGS are not having satisfactory significance at the level, therefore, Lags are to be created for the DCC GARCH model.

Table 3: DCC GARCH Model on Volumes of UPI, RTGS, and NEFT

	Coefficient	**Std. Error**	**z-Statistic**	**Prob.**
theta(1)	0.027531	0.007402	3.719321	0.0002
theta(2)	0.963604	0.011311	85.19241	0.0000

Source: Prepared By Author in E-Views

In table 3 theta (1) represents the alpha (α) and theta (2) represents the Beta (β) value. Both the values show the degree of volatility spillover in between the time series. Alpha and Beta represent the Volatility spillover for the short and long periods, respectively. Both the significant values of Alpha and Beta represent that there is a positive spillover of UPI payments with the other modes of payments both in the short and long time period.

The growth of UPI transactions is driven by the increasing popularity of P2P transactions. P2P transactions are convenient and easy to use, and they are becoming increasingly popular for a variety of purposes. Overall, UPI is a popular and growing payment method in India. The number of UPI transactions and the value of those transactions have been steadily increasing over the past two years. This growth is being driven by the increasing popularity of P2P transactions.

Table 4: Volumes and Values of P2P and P2M transactions

Month	**P2P**		**P2M**	
	Volume (Mn)	**Value (Cr)**	**Volume (Mn)**	**Value (Cr)**

Apr'21	1,448.53	4,11,827.19	1,192.53	81,836.48
May'21	1,396.99	4,03,884.58	1,142.58	86,754.07
June'21	1,550.08	4,47,775.59	1,257.43	99,597.58
July'21	1,781.79	4,93,664.08	1,466.03	1,12,617.06
Aug'21	1,945.80	5,16,207.43	1,609.74	1,22,909.52
Sep'21	1,981.03	5,28,973.37	1,673.26	1,25,378.44
Oct'21	2,507.12	6,21,400.74	1,711.53	1,50,044.24
Nov'21	2,547.94	6,18,101.55	1,638.54	1,50,334.56
Dec'21	2,812.00	6,69,127.56	1,754.30	1,57,720.66
Jan'22	2,757.61	6,67,270.65	1,859.54	1,64,722.46
Feb'22	2,631.65	6,63,841.98	1,895.84	1,63,001.03
Mar'22	3,201.15	7,77,823.30	2,204.50	1,82,758.36
Apr'22	3,319.85	8,05,925.89	2,263.20	1,77,376.39
May'22	3,408.55	8,27,153.68	2,546.65	2,14,366.39
Jun'22	3,302.67	8,00,412.50	2,560.08	2,13,971.81
Jul'22	3,289.15	8,32,265.84	2,999.25	2,30,725.92
Aug'22	3,289.26	8,33,370.86	3,290.37	2,39,421.82
Sep'22	3,233.61	8,62,049.27	3,547.19	2,54,388.83
Oct'22	3,436.66	9,28,872.06	3,868.76	2,82,710.45
Nov'22	3,401.49	9,21,601.77	3,907.96	2,68,991.61
Dec'22	3,602.19	9,91,748.31	4,227.30	2,90,306.69
Jan'23	3,625.95	9,97,781.02	4,410.94	3,00,945.60
Feb'23	3,381.56	9,56,834.37	4,153.20	2,79,012.26
Mar'23	3,859.05	10,88,096.36	4,826.25	3,22,346.66
Apr'23	3,868.39	10,85,903.07	5,029.74	3,21,104.48
May'23	4,045.48	11,45,072.32	5,369.70	3,44,073.18
Jun'23	3,971.43	11,25,422.26	5,363.63	3,50,042.01

Source: UPI Ecosystem Statistics of NPCI

Table 4 shows the total number of UPI transactions and the value of those transactions in India from April 2021 to June 2023. The data is divided into two categories: P2P (peer-to-peer) transactions and P2M (peer-to-merchant) transactions. P2P transactions are those that are made between two individuals, such as splitting the bill for a meal or sending money to a friend. P2M transactions are those that are made between an individual and a merchant, such as paying for groceries or a cab ride.

In May 2023, P2M UPI transactions experienced significant growth, increasing by 110% to 536.9 crores in volume and 60.5% to Rs 3.44 lakh crore in value. P2M transactions accounted for a 57.03% share of the total UPI volume in May 2023. However, in terms of value, P2M transactions had a 23.11% share compared to a 76.89% share of P2P transactions. P2M transactions surpassed P2P transactions in volume in the second half of 2022. The count of P2M transactions is expected to increase further due to partnerships between NPCI and payment aggregators and the proposal of pre-approved bank credit on UPI by the Reserve Bank of India.

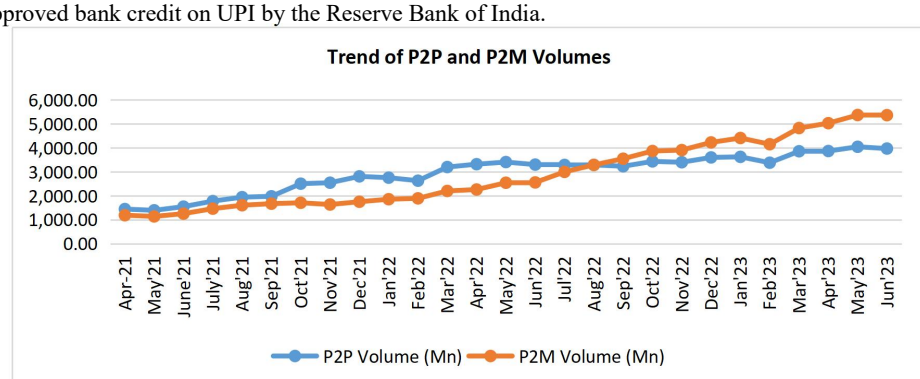


Figure 3: Monthly Trend of Volumes UPI Ecosystem Statistics of NPCI

Figure 3 shows the trend of P2P and P2M volumes over time. The orange line represents the increase in P2P volumes, while the blue line represents the decrease in P2M volumes. The graph shows that P2P volumes have been increasing steadily over time, while P2M volumes have decreased steadily. This suggests that people are increasingly using P2P payments instead of P2M payments.

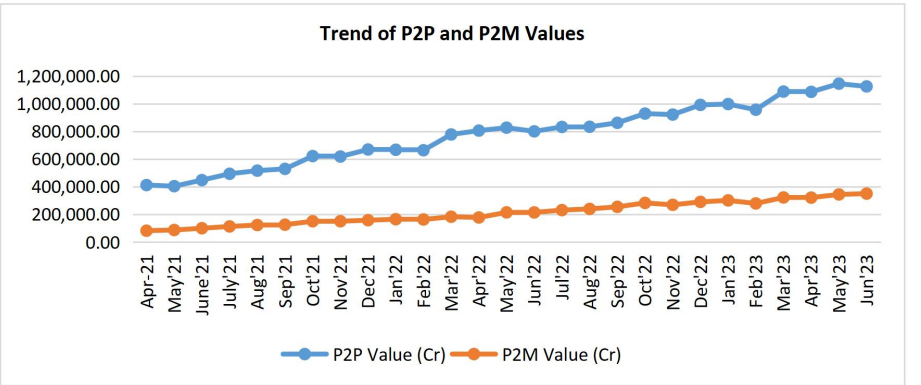


Figure 4: Monthly Trend of Values of UPI Ecosystem Statistics of NPCI

The figure 4 shows the P2P and P2M values over time. The P2P value is increasing, while the P2M value is declining. The graph shows that the P2P value has been increasing steadily since April 2021. In April 2021, the P2P value was ₹493.66 million. By June 2023, the P2P value had increased to ₹1475.46 million. The P2M value, on the other hand, has been declining steadily since April 2021. In April 2021, the P2M value was ₹197.99 million. By June 2023, the P2M value had declined to ₹107.99 million.

There are several possible reasons for both of these trends (Shown in graphs 2 and 3). One reason is the growth of online shopping. As more and more people shop online, they are also using P2P payments to transfer money to merchants. Another reason is the increasing popularity of mobile payments. Mobile payments make it easy for people to make P2P payments, even if they are not near a computer.

Table 5: Percentage analysis of P2P and P2M values

Month	Total Value	P2P %	P2M %
Apr'21	4,93,663.67	83.42262	16.57738
May'21	4,90,638.65	82.31813	17.68187
June'21	5,47,373.17	81.80445	18.19555
July'21	6,06,281.14	81.42494	18.57506
Aug'21	6,39,116.95	80.76885	19.23115
Sep'21	6,54,351.81	80.83929	19.16071
Oct'21	7,71,444.98	80.55023	19.44977
Nov'21	7,68,436.11	80.4363	19.5637
Dec'21	8,26,848.22	80.92508	19.07492
Jan'22	8,31,993.11	80.20146	19.79854
Feb'22	8,26,843.00	80.28634	19.71366
Mar'22	9,60,581.66	80.9742	19.0258
Apr'22	9,83,302.27	81.96115	18.03885
May'22	10,41,520.07	79.41793	20.58207
Jun'22	10,14,384.31	78.90624	21.09376
Jul'22	10,62,991.76	78.29467	21.70533

Aug'22	10,72,792.68	77.68238	22.31762
Sep'22	11,16,438.10	77.21425	22.78575
Oct'22	12,11,582.51	76.66602	23.33398
Nov'22	11,90,593.39	77.40693	22.59307
Dec'22	12,82,055.01	77.35614	22.64386
Jan'23	12,98,726.62	76.82764	23.17236
Feb'23	12,35,846.62	77.42339	22.57661
Mar'23	14,10,443.01	77.14572	22.85428
Apr'23	14,07,007.55	77.1782	22.8218
May'23	14,89,145.50	76.89459	23.10541
Jun'23	14,75,464.27	76.27581	23.72419

The table shows the total value of transactions, the percentage of P2P transactions, and the percentage of P2M transactions for each month from April 2021 to June 2023. The table shows that the percentage of P2P transactions has been declining over time, while the percentage of P2M transactions has been increasing. This is likely due to the growth of online shopping and the increasing popularity of mobile payments. For example, in April 2021, P2P transactions accounted for 83.42% of the total value, while P2M transactions accounted for 16.57%. By June 2023, P2P transactions had declined to 76.27%, while P2M transactions had increased to 23.72%. The average percentage of P2P transactions is slightly higher than the average percentage of P2M transactions. This suggests that people are more likely to make P2P transactions than P2M transactions. The reason for this may be that the unique users are more than the merchant users. According to the report of Times Of India, there are about 25 crore unique users and 5 crore merchants.

7. CONCLUSION

UPI is a relatively new payment method, and it is still evolving. As it continues to grow in popularity, there are likely to be some challenges that need to be addressed. For example, UPI fraud is a growing concern, and there needs to be more done to protect users from fraud. UPI is a payment method that is heavily reliant on technology. If there is a disruption in the networks, it could not prevent UPI transactions from being processed. Despite these challenges, UPI is a valuable tool that has the potential to make a positive impact on the lives of millions of people in India. The future of UPI is bright. As UPI continues to grow in popularity, it will become an even more important tool for financial inclusion and economic growth in India.

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Digital Library Consortia: Challenges and Future Perspective

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ABSTRACT

Today's pupil no longer needs to go to the library because of internet access and electronic reading gadgets. Disruptive digital technology, knowledge, and various processes that enable digital transformation help to adapt to the digital era by impacting efficiency, innovation, and user experience, which leads to the formation of Library consortia which is being overheard globally. Various resources are shared among those libraries which have a common mission, and goals. Despite so many technological and ICT advancements, the formation and execution of consortia is not a piece of cake as it includes many parameters to be fulfilled from multi-dimensional growth of published documents to subscription of journals or periodicals, it has to undergo many challenges. Managing challenges becomes easier with the help of government organizations and various ministries who are selflessly providing financial as well as digital support to the member library of any consortium, The information paradigm has shifted from print-based communication to electronic channels of communication and the soaring prices of journals and various other information sources has made formation of consortium need of an hour. This article explains various challenges and future perspectives of library consortiums and the areas that still need some consideration.

Keywords: *ICT, library Consortium, Information explosion, Networking, Digitalization*

1. INTRODUCTION

Today, in an information age unexpected growth of information in all the subject areas has multiplied the role of libraries and information centers in managing such vast information, in an organized way and making easy access to the same. Inflated cost of information resources especially in journals is a big concern for libraries and information centers in fulfilling the latest information needs of their users.

Thus, present information center has a strong collection of books and periodicals in their library then too they are unable to meet the needs of their patrons; it is the collection of libraries and its digital resources that matter in satisfying users' needs.

Individual libraries can't procure all the documents through their means due to multiple reasons such as financial constraints, unavailability of the latest resources, and rising costs therefore, taking help from other institutions and sharing their resources is a great idea that enables each institution to serve their patrons with maximum resources and minimum cost. All the member libraries may mutually agree to buy the products on a sharing basis, if one library guarantees its availability other may withdraw its purchase. Numerous networks for libraries and information centers arose to accomplish the aforementioned goal.

Thus all the member libraries having similar objectives are joining their hands together to share their resources, which enables them to maximize their collection and minimize their cost, giving better services to their users. The combined efforts of the libraries result in the maximization of required information finally, giving birth to consortia of libraries.

2. DEFINITION

A consortium is an organization made up of two or more entities that have definite, related objectives. They join forces to accomplish a shared goal that calls for resource sharing and cooperation. Delivering *"more than the sum of the individual parts"* should be the goal. It enables publishers to reach out to more institutions than they have ever been able to by selling their e-journals

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in large bundles to multiple institutions simultaneously. Another name for it is "big deal." The formation of a library consortium can take place at the levels.

3. NEED FOR LIBRARY CONSORTIUM

Various reasons which led to the formation of the consortium are explained herewith: -

i) **Information Explosion:** Storming information in almost all the areas has led to its explosion.
ii) **Diversity of user needs:** The introduction of thousands of new subject areas has opened new career and study options for the upcoming students.
iii) **Financial crunch:** Every organization is not well equipped with finances.
iv) **Impossibility of self-sufficiency:** An organization could never be self-sufficient when there is a question of satisfying the number of users.
v) **Negotiation for best price:** Big Deal or Ultimate deal can only be achieved when a group does the negotiations in mass purchase.

4. CONCEPT OF LIBRARY CONSORTIA

The concept of library consortia originated with academic libraries, which established consortia primarily for the exchange of printed materials. Academic libraries are forming consortia on a statewide basis to offer shared access to electronic resources on the Internet. Reference for a single library, this task is extremely challenging. However, information can be acquired at stable, affordable prices by creating a consortium among libraries, as the formation of consortia depends upon the objectives and purpose of the institution.

5. FEATURES OF LIBRARY CONSORTIA

Features of library consortia are mentioned below:

i) Library consortia maintains the individual identity of each institution, even after being a member of a consortium.
ii) Participant members of the consortium enable their users to conduct qualitative research.
iii) The introduction of ICT in libraries has improved the data organization as well as the data delivery system, resulting in cost-effectiveness.
iv) Digitalization in libraries results in staff development and quality of services delivered.
v) Cooperative purchase of the journals directly from the publishers at a discounted price either online or offline results in reducing cost.
vi) Latest information is readily available at the minimum cost and in minimum time.
vii) Information requirements of the users can be accessed in many libraries at the same time through the Internet.
viii) ICT has enabled libraries and information centers to handle legal issues in no time.

6. ADVENT OF ICT

Librarians now have to play the role of information navigators rather than just document keepers, especially with the rise of electronic resources and information technology. Essentially, it has gotten closer to voluntarily and actively disclosing data

The new electronic environment of today is causing changes in scientific and technical journals. Because the internet is more widely available and used, there are a lot more e-journals and e-versions of paper journals. The transition from print-based to electronic channels of communication in this era of the information revolution involves the dissemination of information through a variety of mediums, including digital and electronic publishing.

7. FACTORS TO BE CONSIDERED FOR THE FORMATION OF CONSORTIA

To function effectively, a successful consortium needs to take into account several factors, such as selecting resources according to their usefulness and usability, planning the technology infrastructure in the long run, providing clear access to back issues of periodicals, handling copyright and licensing concerns, handling archival issues, and setting competitive prices.

In conclusion, the establishment and execution of a library consortium ought to serve as strong models and enduring assistance in achieving the previously mentioned goals.

Different types of consortia are formed based on their objective and purpose of formation. Many different types of consortia models have evolved based on their participation, affiliations, and funding resources.

Some of the important consortia models are mentioned herewith:

i) **Open Consortia:** It is open to everyone anyone interested can join the group and become a member of the same abiding by the rules of entry and exit in the specified consortium.
ii) **Closed Group Consortia:** Such consortia are formed among groups having similar affiliations or collaborations such consortia may have the same funding agency too. The process is fairly simple and easy.
iii) **Centrally Funded Model:** Such consortia member institutions have no say either in the formation or administration of the same they are solely dependent on the decision and guidelines of the parent body.
iv) **Shared-budget Model:** In a shared-budget consortium the member libraries take the initiative in designing and formation of library consortia, all the expenses incurred in designing and other activities are shared by all the member libraries.
v) **Publisher Initiatives:** In this form of consortium maximum discounts or benefits are being provided by the publishers to the member libraries. For example, The Emerald Full-Text Library published by the Emerald Publishing Group (formerly MCB University Press)

8. CHALLENGES FACED BY LIBRARY CONSORTIA

Formation of consortia is a boon in the present information age due to information flood in digital as well as print medium. The formation of a consortium came into existence to facilitate and organize the information systematically, to facilitate easy access of information to the specific users as per their specific requirements in different areas.

Dissemination of information is no longer an easy nut to crack due to propelling information needs in society, saving the time of the reader in searching the pertinent information is not as simple as it was a few years back, delivering authentic and effective information to its user has to go through rigorous efforts by the information providers or resource centers.

Thus, I would like to shed some light on the various challenges faced by the library consortium in providing pertinent information to their users in the minimum possible time as per the fourth law of library and Information science, which needs to be fulfilled by every information professional.

i) Diverse communities have access to information, education, and culture, library services are crucial, and changing user needs, scarce resources, and rapidly advancing technologies are just a few of the *numerous difficulties faced by library professionals in their line of work.*
ii) The *dysfunctional nature of library consortia poses a significant challenge*, as it can result in low morale, burnout, turnover, discrimination, and a lack of diversity and inclusion.
iii) *Security is yet another issue* because member libraries frequently, have to deal with information resource theft, mutilation, and other abuses.
iv) Member Libraries must *prioritize security standards and tools in their library budget*, to have strong security procedures, and educate staff and users about security-related issues.
v) To provide modern library services, librarians must also embrace *the technological advancements of the twenty-first century and develop IT skills.*
vi) Member libraries highlight the necessity *for providing technology training and privacy* to work among library professionals.
vii) It suggests ways for library professionals to fulfill their roles while minimizing legal, ethical, and privacy concerns.
viii) To function effectively, a successful consortium needs to take into account several factors, such as selecting resources according to their usefulness and usability, planning the technology infrastructure in the long run, providing clear access to back issues of periodicals, handling *copyright and licensing concerns, handling archival issues, and setting competitive prices.*
ix) In assisting patrons with *low digital literary skills in accessing* online government assistance.
x) Helping patrons *with low socioeconomic (SES)* to fulfill their information needs.

xi) Information providers *face challenges while ensuring, that personal information is kept private*, thus librarians are unable to fulfill their role as information intermediaries while minimizing legal, ethical and privacy concurs.
xii) *Librarians need to upgrade themselves technically and digitally* to become useful to others.
xiii) Many Libraries are *facing financial challenges, technical know-how, and IT skills* to become competent enough to serve in the 21st century, thus learning ICT skills is a necessity.
xiv) Finally, *the establishment and execution of a library consortium ought to serve as strong models* and enduring assistance in achieving the previously mentioned goals.

9. ADVANTAGE OF CONSORTIUM

Some of the important advantages of the library consortium are as follows:

i) Consortia leads to a minimum cost of various subscriptions either online or offline.
ii) Consortia makes full utilization of funds involved in the libraries.
iii) Helps to build up huge digital libraries.
iv) It leads to providing better and latest CAS and SDI to their users
v) Technical requirements and training requirements are combined and shared by the member institutions.
vi) Maximum use of E-journals leads to less usage of library space and spending a lesser amount in storage or maintenance of the same.
vii) Availability of information resources has increased, which provides better licensing terms and archival access.
viii) Reduces the financial burden on the institution and increases the information availability.

10. DISADVANTAGES OF CONSORTIA

Some of the important disadvantages of the library consortium are as follows: -

i) Printed copy of Journals is not available in the library.
ii) Technical training of staff is a necessity in handling various electronic documents etc.
iii) Formation of Consortia requires high financial investments in various licensing procedures
iv) Consortia might face various Copyright issues.
v) It leads to an extra dependency on internet connections.
vi) Lack of archiving and back files availability
vii) Authentication of users is a prerequisite before accessing information.
viii) Users are not very comfortable using online journals.

11. CONSORTIA AND ITS FUTURE ENDEAVOURS

In developing nations like India, the question of whether electronic journals are currently a need or a luxury is up for debate. Even if it is determined that electronic journals are necessary, controlling access to them can be challenging, high cost and inconsistent licensing terms provided by various publishers make it more difficult for librarians to make ends meet.

Thus, certain steps are being taken by library consortia members to enhance the functioning of consortia, to make it more useful, and effective for users in this competitive world, satisfying users in this ICT world is not an easy task, still, certain areas are untouched and unexplored, which needs lots of improvement digitally as well as in printed documents.

11.1. Origin of Consortia

With the establishment of a few government-funded library consortia, the availability of international journals in Indian universities and technical institutions has greatly improved. Before these consortia were established, only a small number of elite institutions, such as IISc, IITs, IIMs, and a few central universities, had access to e-journals. These institutions subscribed to multiple e-resources, such as bibliographic databases on CD-ROM, a few e-journals that were free to access with a print version subscription, and a negligible portion of journals that required a subscription.

Several government agencies in India founded more than six library consortia. To have maximum utilization of library consortia formed among the organizations having similar objectives are designed to serve the same purpose.

Formation of consortia enhances the usage of electronic resources, for which adequate training is provided to the working faculties which is also an essential part, one of the major university library consortia INFLIBNET under which 142 university libraries are equipped with computer and internet facilities, but the libraries having direct access of internet facilities, do not subscribe to e-journal due to financial crunch. Thus, several steps need to be taken by library professionals to make e-journals easily available to all the members of consortia.

11.2. Some of the important upcoming areas that need improvement/Changes for better consortia services are mentioned below:

i) **Working Together:** It means establishing a relationship or consortium between the homogeneous group of members is much easier than the heterogeneous group of members for example FORSA which initially consisted of eight members but gradually only five members were left.
ii) **Existing Heterogenous consortia members:** Member institutions are joining hands even though all the member institutions have different objectives to fulfill, they come together only to share their resources at a minimum cost.
iii) **Payment by parent organization:** In such an organization all the subsidiary branches of an organization are forming a consortium to avail the subsidized rates for the subscription of journals, but the cost of the journals is paid by the parent organization only.
iv) **To implement leadership qualities:** A properly planned library consortium with good leadership can go a long way in serving the libraries by providing value-added services to their users.
v) **Application of ICT for digital libraries:** Digital libraries are need of an hour thus ICT is being implemented and used by various libraries.
vi) **Union Catalogue:** Initially, Library consortia used to prepare a traditional union catalog for easy access to relevant documents, but users were not satisfied with the services as it did not show the real-time status of the availability of books in the library, thus a shared integrated library system came into existence.
vii) **Inter-Library Loan:** Books that are not available in the library are borrowed from the other member libraries for the user.
viii) **Digital Repositories:** Every web-based library service can be hosted in a cloud environment and a digital repository is no exception.
ix) **Shared print Archiving:** Libraries mutually decide what to retain and what to weed out as a greater number of journals and books are digitized.
x) **Open access Initiatives:** Publishers are imposing certain limitations on the usage of digital information to argue that they need greater protection from piracy, otherwise governments would limit the sharing of digital information.
xi) **Professional development:** Library consortia must take the initiative in organizing seminars, workshops, and training programs for the overall development of library professionals as well as library users.
xii) **Software development:** Various library software is being developed to customize existing software according to the user's need.
xiii) **Mentoring and consultancy services:** Library consortia provide consultancy services, to various users who need the same, they mentor or guide library professionals according to the modern requirements of users.

Thus, these are the various points to be kept in mind to achieve maximum results and to meet future endeavors of the library consortia, which fulfil all the basic needs in digital as well as printed form resources.

Finally, a consortium of libraries would bring together various institutions receiving financial support from major ministers and departments of the Government of India. We can say that library consortia are, were, and will be an indispensable part of providing the latest and updated information to their users, in the minimum possible time and the minimum possible cost in this ever-growing and ever-changing information avalanche, accessing desired information becomes much easier with the help of consortium.

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Enhancing Library Security: Exploring Tools and Technologies for Protection

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ABSTRACT

In today's digital era, libraries play a crucial role as guardians of knowledge, necessitating robust security measures to protect valuable resources and ensure the safety of patrons and staff. This paper explores the evolving landscape of library security, examining strategies to mitigate risks and safeguard assets. Libraries face various security threats, from theft and vandalism to cyberattacks and unauthorized access, highlighting the need for comprehensive security protocols. The paper discusses physical security measures like access control systems, surveillance cameras, and alarm systems, alongside cybersecurity solutions such as firewalls and encryption software. Furthermore, libraries are leveraging technology like RFID and automated inventory management systems to enhance security and streamline operations. Despite challenges like budget constraints and user privacy concerns, adopting a multi-layered security approach can help libraries fulfill their mission as trusted custodians of information. In conclusion, the paper emphasizes the critical role of library security in preserving intellectual freedom and ensuring equitable access to information, advocating for proactive measures to create safe environments for patrons and staff.

Keywords: *Library security, security tools, technologies, risk mitigation, asset protection*

1. INTRODUCTION

Libraries have long been regarded as sanctuaries of knowledge, offering a wealth of resources and information to the public. However, as the digital age progresses and information becomes more accessible online, libraries are faced with new challenges in ensuring the security of their physical and digital assets. The need to enhance library security has become paramount, not only to safeguard valuable collections but also to provide a safe and secure environment for patrons and staff.

In recent years, libraries have increasingly turned to advanced tools and technologies to bolster their security measures. This research paper aims to explore the various tools and technologies available for enhancing library security, examining their effectiveness, challenges, and implications for library management and operations.

The first section of this paper will provide an overview of the current security landscape in libraries, highlighting the threats and vulnerabilities they face. From theft and vandalism to cyberattacks and data breaches, libraries must contend with a wide range of security risks that can compromise the integrity of their collections and the safety of their users.

Next, the paper will delve into the different categories of tools and technologies that libraries can utilize to enhance their security posture. This will include physical security solutions such as surveillance cameras, access control systems, and alarm systems, which help deter and detect unauthorized access and activities within library premises. Additionally, the paper will explore the role of personnel training and security protocols in mitigating security risks and fostering a culture of vigilance among library staff.

In the digital realm, libraries face unique challenges in safeguarding their electronic resources and patron data from cyber threats. Therefore, the paper will examine cybersecurity measures such as

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firewalls, antivirus software, and encryption techniques, which are essential for protecting library networks and information systems from malicious actors.

Furthermore, with the increasing adoption of digital lending platforms and online catalog systems, libraries must also implement robust authentication mechanisms and data encryption protocols to ensure the privacy and security of patron information.

Throughout the discussion, the paper will assess the effectiveness of these tools and technologies in addressing the security needs of libraries, taking into account factors such as cost, ease of implementation, and scalability. Moreover, it will explore the ethical and legal considerations associated with the deployment of surveillance technologies and the collection of patron data, emphasizing the importance of striking a balance between security and privacy.

In conclusion, this research paper seeks to provide library administrators and stakeholders with a comprehensive understanding of the tools and technologies available for enhancing library security. By leveraging these resources effectively, libraries can create safer and more resilient environments for learning, research, and community engagement.

2. PHYSICAL SECURITY MEASURES

Physical security measures are essential for safeguarding library resources, infrastructure, and occupants. Theft of books and valuable materials, vandalism, and unauthorized access pose significant threats to library security. Adequate physical security measures not only deter potential threats but also mitigate risks, ensuring the uninterrupted operation of library services.

2.1. Exploring Tools and Technologies for Library Security Enhancement

i) **Surveillance Systems:** Closed-circuit television (CCTV) cameras play a vital role in monitoring library premises. High-definition cameras strategically placed throughout the library can deter theft and vandalism. Advanced features such as motion detection and night vision enhance surveillance capabilities. Moreover, integration with analytics software enables real-time monitoring and proactive threat detection.

ii) **Access Control Systems:** Implementing access control systems limits entry to authorized personnel only. Keycard or biometric access systems provide secure entry points while allowing easy management of access privileges. Integration with time-tracking software facilitates monitoring of staff movements and enhances accountability. Additionally, these systems can be programmed to restrict access to sensitive areas, such as archives or server rooms.

iii) **Alarm Systems:** Intrusion detection and alarm systems are crucial components of library security. Sensors placed on doors and windows trigger alarms in case of unauthorized entry. Integration with security monitoring services ensures timely response to security breaches. Modern alarm systems feature wireless connectivity and remote monitoring capabilities, enabling centralized management of multiple libraries from a single control center.

iv) **RFID Technology:** Radio-frequency identification (RFID) technology offers a sophisticated solution for inventory management and security. RFID tags embedded in library materials facilitate efficient tracking and inventory control. Furthermore, RFID-enabled security gates can detect unauthorized removal of items, triggering alarms to alert staff. Integrating RFID with library management systems streamlines circulation processes and enhances security protocols.

v) **Physical Barriers:** Physical barriers such as bollards, gates, and barriers can deter vehicular attacks and unauthorized entry into library premises. Deploying robust barriers at access points enhances perimeter security and protects against ram-raiding incidents. Additionally, landscaping features can be utilized to create natural barriers while enhancing the aesthetic appeal of the library surroundings.

3. DIGITAL SECURITY MEASURES

Libraries serve as custodians of knowledge, housing vast collections of books, periodicals, and increasingly, digital resources. As libraries transition towards digitalization, they face new challenges in safeguarding information against cyber threats such as data breaches, malware, and unauthorized access. This paper aims to elucidate the significance of digital security measures in bolstering library security and proposes a repertoire of tools and technologies to mitigate emerging risks.

i) **Encryption:** Encryption stands as a fundamental pillar of digital security, shielding sensitive information from unauthorized access. Libraries can employ encryption protocols such as AES (Advanced Encryption Standard) to safeguard data stored on servers, ensuring that only authorized personnel can decipher it. Additionally, implementing SSL/TLS encryption for web communications fortifies the security of online library catalogs and databases, thwarting interception attempts by malicious actors.

ii) **Access Controls:** Granular access controls empower libraries to regulate user permissions based on roles and privileges, thereby limiting the risk of data breaches and insider threats. Role-based access control (RBAC) frameworks enable administrators to assign specific access rights to patrons, librarians, and administrators, thereby enforcing the principle of least privilege. Furthermore, multifactor authentication (MFA) mechanisms add an extra layer of security by requiring users to verify their identity through multiple credentials, such as passwords and biometric markers.

iii) **Intrusion Detection Systems (IDS):** Intrusion detection systems serve as vigilant guardians, monitoring network traffic and system activities for signs of malicious behavior or policy violations. Host-based IDS (HIDS) and network-based IDS (NIDS) can detect anomalies indicative of cyber-attacks, including unauthorized access attempts, malware infections, and denial-of-service (DoS) attacks. By promptly identifying security incidents, IDSs enable librarians to mitigate threats and fortify defenses against future intrusions.

iv) **Security Information and Event Management (SIEM):** SIEM solutions amalgamate disparate security data sources, including logs, alerts, and event records, to provide comprehensive insights into the library's security posture. By correlating and analyzing security events in real-time, SIEM platforms enable librarians to detect and respond to security incidents swiftly. Moreover, SIEM functionalities such as threat intelligence integration and automated incident response streamline security operations, augmenting the library's resilience against evolving cyber threats.

4. CYBERSECURITY PROTOCOLS

Effective cybersecurity protocols are essential for safeguarding library assets and maintaining the trust of patrons. These protocols encompass a range of measures designed to prevent, detect, and respond to cyber threats. Key components of cybersecurity protocols for libraries include:

i) **Access Control:** Implementing strong access controls ensures that only authorized users have access to library resources and sensitive information. This involves the use of authentication mechanisms such as passwords, biometrics, and multi-factor authentication to verify the identity of users.

ii) **Encryption:** Encrypting data both in transit and at rest helps protect sensitive information from unauthorized access. Utilizing encryption protocols such as SSL/TLS for network communications and AES for data storage enhances the security of library systems and databases.

iii) **Network Security:** Securing the library's network infrastructure is crucial for preventing unauthorized access and mitigating the risk of cyber-attacks. Firewalls, intrusion detection systems (IDS), and virtual private networks (VPN) are examples of tools that can be deployed to enhance network security.

iv) **Patch Management:** Regularly updating and patching software vulnerabilities is essential for preventing exploitation by cyber adversaries. Establishing a robust patch management process ensures that security patches are applied promptly to mitigate known vulnerabilities.

4.1. Exploring Tools and Technologies

Several tools and technologies are available to libraries for enhancing cybersecurity posture:

i) **Antivirus Software:** Deploying antivirus software helps detect and remove malware infections, thereby reducing the risk of data breaches and system compromise.
ii) **Intrusion Detection and Prevention Systems (IDPS):** IDPS solutions monitor network traffic for suspicious activities and can automatically block or alert administrators to potential threats.
iii) **Security Information and Event Management (SIEM) Systems:** SIEM systems aggregate and analyze log data from various sources to identify security incidents and facilitate incident response.
iv) **Threat Intelligence Platforms:** Leveraging threat intelligence feeds enables libraries to stay informed about emerging cyber threats and take proactive measures to mitigate risks.

5. STAFF TRAINING AND AWARENESS

Library staff members play a pivotal role in safeguarding library collections, facilities, and systems. However, many security breaches can be attributed to human error or lack of awareness. Therefore, investing in staff training and awareness programs is essential for mitigating risks and promoting a culture of security within the library environment. Training sessions can cover topics such as information security best practices, threat recognition, emergency response procedures, and the proper use of security technologies. By equipping staff with the necessary knowledge and skills, libraries can reduce vulnerabilities and enhance overall security posture.

5.1. Exploring Tools and Technologies for Protection

A wide range of tools and technologies are available to enhance library security, spanning both physical and digital domains. In the physical realm, access control systems, surveillance cameras, and alarm systems are commonly used to monitor and protect library facilities. These technologies can help prevent unauthorized access, deter criminal activity, and facilitate rapid response to security incidents. Additionally, biometric authentication methods, such as fingerprint or iris scanning, offer advanced levels of security for restricted areas or high-value assets.

In the digital sphere, firewalls, antivirus software, and intrusion detection systems are essential for safeguarding library networks and systems against cyber threats. Encryption technologies can protect sensitive data during transmission and storage, ensuring confidentiality and integrity. Furthermore, security awareness training platforms and simulated phishing exercises can help educate staff members about common cyber threats and teach them how to recognize and report suspicious activities.

6. CHALLENGES AND ETHICAL CONSIDERATIONS

Libraries serve as repositories of knowledge and information, making them invaluable resources for communities worldwide. However, with the rise of digital resources and the proliferation of online platforms, libraries face new challenges in safeguarding their collections from theft, vandalism, and unauthorized access. Enhancing library security requires a nuanced understanding of the tools and technologies available, as well as careful consideration of the ethical implications associated with their implementation.

6.1. Challenges in Library Security

One of the primary challenges in enhancing library security lies in the diverse nature of library collections. Libraries house a wide range of materials, including books, manuscripts, archival documents, and digital resources, each requiring unique security measures. Physical security threats such as theft and vandalism pose a significant risk to tangible collections, while cybersecurity threats such as data breaches and hacking can compromise digital assets. Balancing the need to protect these collections with the principles of accessibility and intellectual freedom presents a formidable challenge for librarians and security professionals alike.

6.2. Ethical Considerations

When implementing security measures in libraries, it is essential to consider the ethical implications of these actions. One ethical concern is the potential infringement on patrons' privacy rights. As libraries increasingly collect and store user data for administrative and analytical purposes, there is a risk of encroaching on individuals' privacy and confidentiality. Additionally, the use of surveillance technologies such as CCTV cameras and biometric systems raises concerns about surveillance creep and the erosion of civil liberties. Librarians must navigate these ethical dilemmas carefully, ensuring that security measures do not undermine the principles of intellectual freedom and privacy upon which libraries are founded.

6.3. Tools and Technologies for Protection

Despite the challenges and ethical considerations involved, libraries can leverage a variety of tools and technologies to enhance security. Access control systems, including RFID tags and biometric authentication, can help prevent unauthorized entry and protect valuable collections. Video surveillance systems equipped with advanced analytics capabilities can improve monitoring and deterrence efforts, while cybersecurity solutions such as firewalls and encryption help safeguard digital assets from cyber threats. Additionally, training staff and raising awareness among patrons about security best practices can contribute to a culture of vigilance and accountability within the library community.

7. CONCLUSION

In conclusion, the enhancement of library security through the exploration of tools and technologies for protection is imperative in safeguarding valuable resources and ensuring a conducive learning environment for patrons. Throughout this research paper, various tools and technologies have been examined, ranging from traditional security measures such as surveillance cameras and access control systems to advanced solutions like RFID technology and biometric authentication.

It is evident that while traditional security measures play a crucial role, they are often insufficient to combat modern security threats. Therefore, the integration of advanced technologies such as RFID, biometrics, and AI-based surveillance systems is essential to bolster library security and mitigate risks effectively.

Furthermore, the implementation of these tools should be complemented by robust security policies, staff training programs, and regular security audits to ensure their effectiveness. Collaboration with cybersecurity experts and staying updated with emerging threats and technologies will also be vital in maintaining a proactive security posture. Despite the advancements in technology, it is essential to strike a balance between security and patron privacy to uphold ethical standards and foster trust within the library community. Additionally, budgetary constraints and resource availability may pose challenges in implementing comprehensive security measures, necessitating careful prioritization and resource allocation. In conclusion, enhancing library security requires a multifaceted approach that integrates both traditional and advanced tools and technologies, along with robust

policies and practices. By adopting a proactive and holistic approach to security, libraries can create safer and more secure environments for their patrons while preserving the integrity of their collections for generations to come.

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Research Management Tools and Technologies: A Special Description of Paraphrasing Tools

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ABSTRACT

The paper describes the importance of research management tools and how these tools are essential in ensuring the accuracy, integrity, and efficiency of academic research. They help researchers organize, manage, and analyze data, format citations properly, detect plagiarism, and streamline the research process. These tools play a crucial role in facilitating research processes, improving time management skills, and enhancing the overall quality of research articles. The present paper delves upon the research management tools particularly paraphrasing tools which help the researcher in reframing the context of the research papers. The paper presents the advantages and disadvantages of the paraphrasing tools. The paper briefly explains the various types of paraphrasing tools with examples.

Keywords*: Grammarly, Quillbot, Paperpal, Commercial software and Artificial Intelligence tools*

1. INTRODUCTION

The progress made in the field of information and communication technology has significantly altered the perspectives on scientific production and data dissemination, paving the way for innovative approaches to research and scholarly exchange within an open environment. As the volume of scientific data continues to grow at an unprecedented rate, the challenge of effectively managing this vast amount of information becomes increasingly critical (Hey and Trefethen, 2005). ICT has enhanced academic research by providing easier access to resources, improving productivity, and efficiency among research students and universities, ultimately leading to better outcomes (Bibi, Ayub and Ismail, 2023). The extensive utilization of computational resources has also led to the collaboration of researchers across different countries and disciplines. This has resulted in the generation of vast amounts of data that must be reused and shared with others for further analysis and reinterpretation (Tripathi, Chand, Sonkar and Jeevan, 2017). This has led to the development of numerous research management tools to better manage research data. These tools enhance documentation, milestone tracking, and communication among facility coordinators. They assist researchers from literature search to the production of grammatically correct research papers using paraphrasing tools, and the dissemination of research results through institutional repositories and academic social networking sites. The research management tools under consideration include paraphrasing tools, plagiarism checkers, reference style manuals, citation management software, data analysis software, and other related tools. These tools play a crucial role in streamlining research processes, improving time management skills, and enhancing the overall quality of research articles.

Paraphrasing tools are used by students to evade detection by text matching tools used to detect plagiarism in Universities. These tools allow students to easily rewrite assignments with minimal effort, making it harder for plagiarism detection systems to identify copied content. The availability and accessibility of automatic paraphrasing software have made it a convenient option for students looking to avoid plagiarism detection. Students may use paraphrasing tools to save time and effort in creating original content, especially when faced with multiple assignments or tight deadlines. The use of paraphrasing tools has become more prevalent during the COVID-19 pandemic, possibly due to the shift to online learning and increased reliance on digital resources (Forgas, Lancaster, Marin, and Garma, 2023).

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2. Literature Review

Xuyen (2023) emphasized the significance and practicality of paraphrasing tools. To gather information regarding second-year English major students' perspectives on using Quillbot, a survey was distributed to 220 students at a public university's linguistics faculty in Vietnam. The outcomes revealed that 50% of the participants occasionally employed Quillbot, while 25% frequently used the tool. Moreover, the study indicated that students primarily utilized Quillbot due to its convenience and user-friendly interface. The students asserted that using Quillbot had no detrimental effects on their work. Ginting and Fithriani (2022) carried out a case study on twenty Indonesian students majoring in English Language. The study's findings indicated that sixty percent of the participants utilized Peers for student writing evaluation, while fifty-seven percent occasionally used Grammarly. The students preferred Peers over Grammarly for reasons such as accuracy, clarity, engagement, and delivery. Panda (2023) examined the role of academic libraries in aiding resource discovery and compared five RMS—Citavi, EndNote, Mendeley, Qiqqa, and Zotero. The study analyzed their features, user demand, and popularity using website data and Google Trend Analysis. Mendeley emerged as the most preferred RMS, while Qiqqa showed the least popularity. Nawaz, Hussain, & Bughio (2023) found that students had high preferred corrective feedback for vocabulary and grammar. Ardhy, Waris, and Kryati (2023) utilized a QUAN-qual mixed method approach to evaluate the perceptions of twenty-six Manado IAIN English students regarding Grammarly software. The findings revealed that ninety-two percent of the students held a positive view of Grammarly, as it was able to correct English grammar more quickly than manual correction. Dizon and Gold (2023) found that the use of Grammarly decrease the foreign language anxiety and support learner's autonomy. Giglio and Pereira da Costa (2023) stressed upon the fact that the use of artificial intelligence to improve the scientific writing and better research management. They discussed about various AI tools like research rabbit, Elicit, Zotero, PaperPal which helped the researcher in better managing their research. In a recent study, Forgas, Lancaster, Marin, and Garma (2023) explored the employment of automatic paraphrasing tools by students to prevent plagiarism. By utilizing search engine analytics and data from SEMrush and Google Trends, the authors estimated the level of interest in these tools online for the period between 2016 and 2020, with a focus on the United States, the United Kingdom, Canada, and Australia. Roe and Perkins (2022) examined the literature on the increasing use of automated paraphrasing tools (APTs) as a threat to educational integrity. This paper aims to provide a comprehensive review of the historical usage of APTs and to place them within the broader context of the ongoing battle between educational integrity and technology.

3. RESEARCH MANAGEMENT TOOLS AND TECHNOLOGIES

Research management tools are essential for effectively organizing and managing all aspects of a research project. They can help streamline processes, enhance collaboration between team members, track progress and deadlines, and ensure that resources are allocated efficiently. Some popular research management tools include reference management systems like EndNote or Zotero, and data analysis software such as SPSS or R, paraphrasing tools like Quillbot, Grammarly etc. These tools can greatly improve efficiency and productivity in research, allowing researchers to focus more on their work.

3.1. Paraphrasing tools

Paraphrasing tools are software applications that help researchers rephrase or reword sentences or paragraphs without changing the original meaning. They can be useful for avoiding plagiarism and improving the clarity and readability of research papers. ## Plagiarism tools refer to software or online platforms that help researchers detect and identify instances of plagiarism in their work (Morgan & Vaughn, 2010). These tools analyze the text and compare it against a database of published works and online sources to identify potential matches or similarities. Examples of Paraphrasing tools include Grammarly, Turnitin, and Copyscape.

3.2. Reference style manual

A reference style manual is a tool that provides guidelines and rules for citing sources in research papers. It helps researchers to format their references correctly and consistently, ensuring that proper credit is given to the original authors.Citation management software is another crucial research

management tool. It helps researchers organize and manage their references, generate citations in different styles, and create bibliographies automatically. Some popular citation management software include EndNote, Zotero, and Mendeley.

3.3. Data Analysis Software

Data analysis software is an essential research management tool that aids in processing and analyzing large amounts of qualitative or quantitative data (Sánchez-Gómez et al., 2019). This software allows researchers to organize, code, and analyze data efficiently. It provides features such as data coding, identifying themes, and querying data to address research questions. Overall, research management tools are valuable resources that can enhance documentation, milestone monitoring, and communication efficiency among facility coordinators. Software such as Mendeley, a research management tool, can greatly support researchers in their work by serving as a citation tool that automates formatting in APA or MLA style.

3.4. Plagiarism Detection tools/Software

Plagiarism detection tools or software are designed to help researchers identify instances of plagiarism in their work. These tools scan the text and compare it against a vast database of published works and online sources to detect any similarities or matches. By using these tools, researchers can ensure that their work is original and properly cited, avoiding any potential ethical violations. Research management tools are crucial for researchers to ensure accurate referencing, detect and prevent plagiarism, organize references effectively, format citations correctly, and analyze data efficiently.

4. TYPES OF PARAPHRASING TOOLS

The main types in paraphrasing tools include automatic paraphrasing tools, online paraphrasing tools, and text spinners. These tools use algorithms to rephrase or reword existing text, allowing users to avoid plagiarism while still conveying the same meaning. Another type of paraphrasing tool is language translation software, which transforms text from one language to another while maintaining the original intent.

i) **Automatic Paraphrasing Tools**: Automatic paraphrasing tools are software programs designed to automatically rephrase or rewrite existing text. They utilize algorithms to analyze the original text and generate alternative, paraphrased versions that maintain the same meaning. For e.g.: ParaphraseBot, Paraphrase.ai, Quillbot etc.

ii) **Online Paraphrasing Tools**: Online paraphrasing tools are web-based platforms or websites that offer paraphrasing services. Users can simply copy and paste the text they want to paraphrase into the tool, and it will generate a rephrased version for them. For e.g.: Rewordify, Quillbot,

iii) **Text Spinners**: Text spinners are paraphrasing tools that work by replacing words and phrases with their synonyms or similar expressions. While these tools can be convenient and time-saving, it's important to note that their results may not always be accurate. For e.g.: SpinnerChief, Spinbot, WordAi.

5. DESCRIPTION OF SOME PARAPHRASING TOOLS

5.1. Grammarly (URL: https://www.grammarly.com)

Grammarly was founded by Alex Shevchenko, Max Lytvyn and Dmytro Lider in 2009. Grammarly headquarters was based in Grammarly is available for desktop, mobile and as browser extension. Grammarly is proprietary software. Grammarly launched a beta-stage product using generative AI called Grammarly GO, built on the GPT-3 large language models (Wikipedia, 2024). Grammarly has features of grammar checker, plagiarism checker, citation generator and essay checker. Grammarly ensures the privacy of data and information security. Grammarly offers three pricing plans: first one is free. In this plan, Users can check their mistakes, see their writing tone and generate text with 100 AI prompts. The seconds is premium plan which cost users INR984 per month and third one is business plan USD 15 per month. In premium plan, Users can generate 1000 AI prompts /month and in business plan 2000 prompts/month.

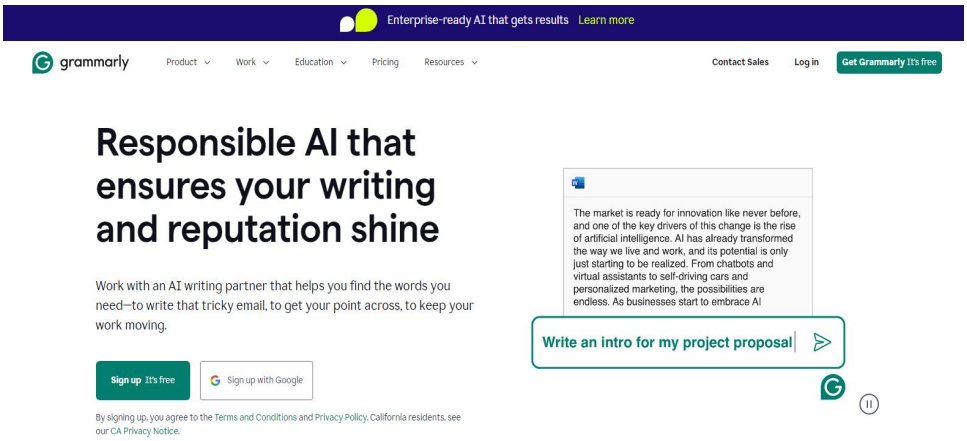

Figure 1: Screenshot of Grammarly

5.2. Quillbot (URL: https://www.quillbot.com/)

Quillbot has features like paraphrase, grammar checker, plagiarism checker, Quillbot flow, summarizer, citation generator and translator. Quillbot premium is available at $9.95 per month. Quillbot premium offers features like full use of synonyms slider, unlimited freeze words, 6000 words in summarizer and plagiarism checker (100 pages/month). Quillbot is available for operating systems like word, Mac and as chrome extension. Quillbot is available in English (US), English (UK), French and Spanish.

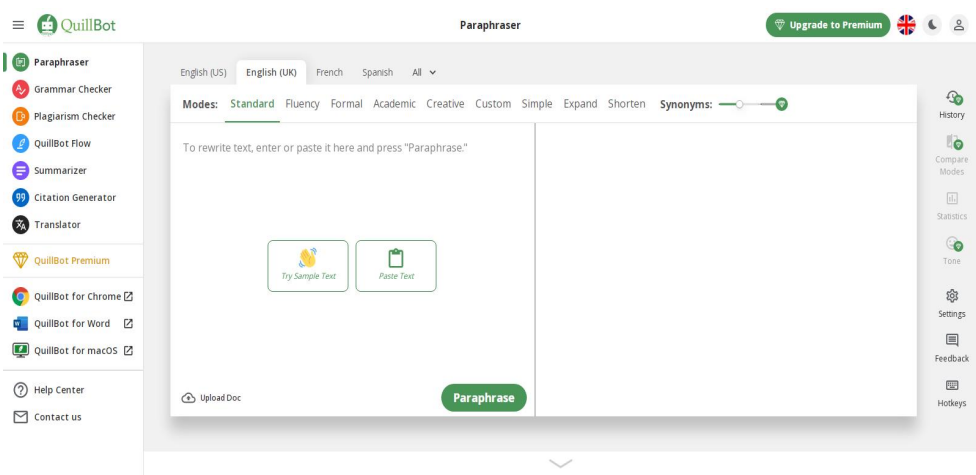

Figure 2: Screenshot of Quillbot

5.3. Paperpal (URL: https://www.paperpal.com/)

Paperpal has features like language & grammar, plagiarism checker, paraphrase, generative AI (co pilot) and pre submission checks. Paperpal blog provides research papers which helps the researchers in their research journey. Paperpal is rated 4.6 stars by Trustpilot. It is available in two versions: free and premium. The premium version is available at INR 420 per month.

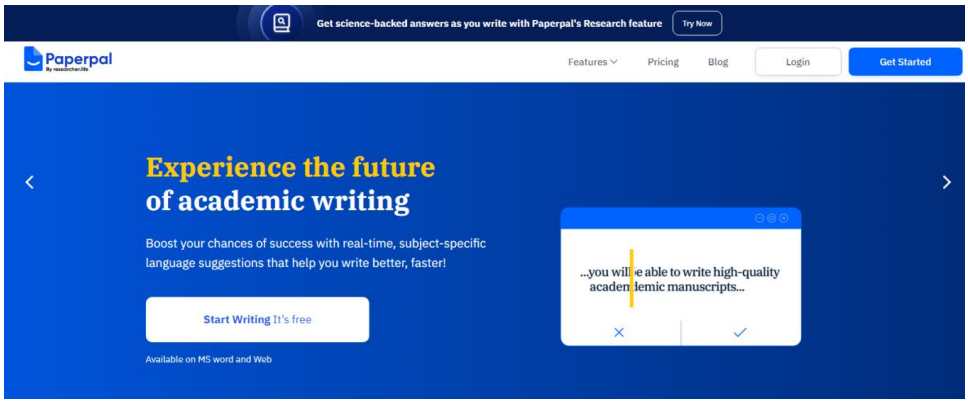

Figure 3: Screenshot of PaperPal

6. ADVANTAGES AND DISADVANTAGES OF PARAPHRASING TOOLS

6.1. Advantages

Paraphrasing tools offer several advantages to users. One advantage is that they save time and effort by automatically generating paraphrased versions of the text. This eliminates the need for manual rewriting and allows users to quickly generate new content. Another advantage is that paraphrasing tools help to maintain the original meaning of the text while providing a fresh perspective. Additionally, paraphrasing tools can help improve writing skills by challenging users to manipulate language and grammatical features. Furthermore, paraphrasing tools can assist users in avoiding plagiarism by helping them rewrite and rephrase content in their own words. However, it is important for users to exercise caution when using paraphrasing tools. They should ensure the paraphrased content accurately reflects the meaning and intention of the original text.

6.2. Disadvantages

Despite their advantages, paraphrasing tools have some disadvantages as well. The results generated by the paraphrasing tools may not always be accurate or grammatically correct as they rely on algorithmic analysis and word substitution. Additionally, paraphrasing tools may not fully capture the nuances and context of the original text, leading to potential misunderstandings or misinterpretations. Furthermore, paraphrasing tools lack the ability to understand the specific requirements and objective of the user.

7. CONCLUSION

Overall, research management tools are essential in ensuring the accuracy, integrity, and efficiency of academic research. They help researchers organize, manage, and analyze data, format citations properly, detect plagiarism, and streamline the research process. By utilizing these tools, researchers can save time and efforts, maintains the integrity of their work, and enhance the overall quality of their research output. Research management tools are essential for researchers as they provide various benefits such as organizing and managing references, generating citations in different styles, automating formatting, facilitating collaboration, and improving the overall research process.

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Evaluating the Effectiveness and User Satisfaction of Online Public Access Catalogue (OPAC) Systems

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ABSTRACT

Online Open Access Catalog (OPAC) is replacing the traditional card system. In the new system, information can be viewed on computers and necessary items can be retrieved instantly from the OPAC system in the desired format. Now users can search for information from the OPAC and the nearest website. This article introduces what OPAC is, discusses the use of OPAC and Web OPAC technology in libraries, and explains the various functions, uses, and advantages of Web OPAC.

Keywords: *OPAC, Catalogue cards, ICT, digital library, library services*

1. INTRODUCTION

OPAC (Online Open Access Catalogue) has replaced the traditional card system. In the new system, information can be viewed on computers and necessary items can be retrieved instantly from the OPAC system in the desired format. Now users can search for information from the OPAC and the nearest website. Keyword search and Boolean operators make it easy to find the relevant information user needs.

2. OBJECTIVE OF STUDY

i) Find out the Advantage of Card catalogue and OPAC
ii) Explore the Disadvantage of card Catalogue and OPAC
iii) Examine the Feature of Card catalogue and OPAC
iv) Comperation with Card Catalogue and OPAC

3. WHAT IS OPAC?

OPAC stands for Online Public Access Catalog. OPAC is a key of any Library collection OPAC is a modern and flexible directory that provides quick and easy access to all information stored on the computer. The Online Dictionary of Libraries and Information Science (ODLIS) defines OPAC as: "Abbreviation for Online Public Access Catalog, a database of records describing books and other information held in a library or library and that can be transmitted from public places or places of business, most of the groups meetings nearby, users can easily seek assistance from trained faculty. Most online directories are searchable by author, title, subject, and keyword and allow users to copy, download, or send: Dictionary uses OPAC to library defines it as a computer workstation used to search catalogs. OPAC can refer to an actual office in the library, or it can refer to an interface that can be accessed from anywhere in the library. ALA Terminology defines an OPAC as "a computer-based and supported library catalog (bibliographic database) designed to be accessed through devices for direct and efficient use by library users with the assistance of library staff from human agents (such as specialized staff)." To search and retrieve records."

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Figure 1: Old Card Catalogue

4. ADVANTAGE OF CARD CATALOGUE

i) Card catalogues provided a physical representation of the library's holdings, allowing users to physically browse through cards to discover materials. This tactile experience could sometimes help users stumble upon resources they might not have found through a digital search.

ii) Library users, particularly older generations, were accustomed to using card catalogues and found them easy to navigate. The system followed well-established classification schemes like the Dewey Decimal Classification (DDC) or Library of Congress Classification (LCC), which users could understand with minimal instruction.

iii) Online systems which require access to computers and internet connectivity, card catalogues did not rely on technology. This made them accessible to users who might not have been comfortable with or had access to digital systems.

iv) Reliability: Card catalogues were not subject to technical failures or network issues. Users could rely on them to access information consistently without concerns about system downtime or malfunctions.

v) Visual Organization: Card catalogues offered a visual representation of the library's organization system. Users could see how materials were arranged alphabetically by author, title, or subject, making it easier for them to understand the library's organizational structure.

vi) Legacy Preservation: Many libraries still maintain card catalogues as a historical record of their collections. Researchers and historians may find value in accessing these catalogues to understand the evolution of library systems and the materials available during different time periods.

5. DISADVANTAGE OF CARD CATALOGUE

i) Card catalogues were physically located within the library, requiring users to visit the library in person to access the catalogue. This limited accessibility for individuals who were unable to visit the library due to distance, mobility issues, or other constraints.

ii) Card catalogues occupied a significant amount of physical space within the library. As library collections grew, maintaining and expanding card catalogues required additional storage space for the cards and cabinets, which could be costly and impractical for some libraries.

iii) Browsing and Searching through card catalogues could be time-consuming, especially for users unfamiliar with the library's classification system or searching for materials across multiple categories. Users had to physically flip through cards, which could slow down the search process.

iv) Card catalogues typically provided only basic bibliographic information, such as title, author, and call number. Additional details about the materials, such as summaries, tables of contents, or subject headings, were often not available on the catalogue cards themselves, requiring users to consult other sources for more information.

v) Keeping card catalogues up-to-date required significant manual effort. Adding new materials, removing outdated items, or making changes to existing entries involved physically updating or replacing catalogue cards, which could be time-consuming and prone to errors.

vi) Maintaining alphabetical order in large card catalogues could be challenging, especially if cards were misplaced or misfiled. Users might encounter difficulties finding materials if cards were not properly organized, leading to frustration and inefficiency.

vii) Card catalogues were susceptible to damage from handling, environmental factors (e.g., humidity, pests), or accidents. Cards could become torn, soiled, or lost, compromising the integrity of the catalogue and making it difficult for users to access information reliably.

6. OPAC (ONLINE PUBLIC CATALOGUE CARD)

Flowing are many feature of online public access catalogue:

OPAC stands for Online Public Access Catalog. It is a computerized catalog of a library's collection that is accessible to library users over the internet or through dedicated computer terminals within the library. OPACs have replaced traditional card catalogues in many libraries and offer several advantages:

- **Library Users can access** the library catalog remotely from anywhere with internet access, allowing them to search for materials, place holds, and manage their accounts outside of library hours.

- **OPACs offer powerful search features**, allowing users to search for materials by author, title, subject, keyword, ISBN, or other criteria. Advanced search options enable users to narrow down search results based on specific parameters.

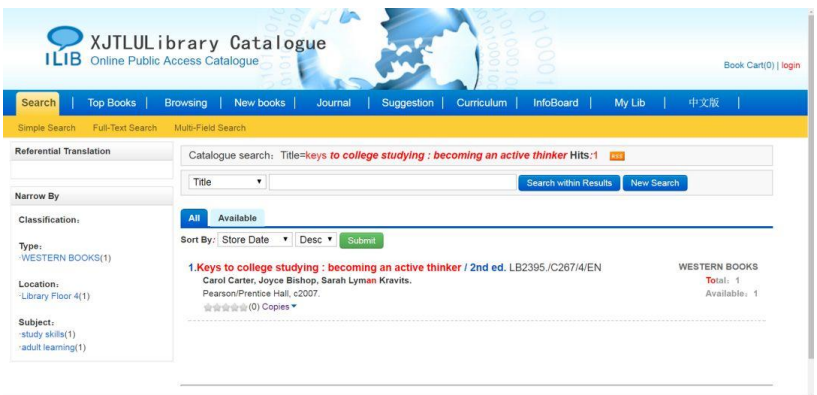

Figure 2: XJTLUL Library OPAC

- OPACs provide detailed bibliographic information about library materials, including summaries, tables of contents, publication information, and subject headings. This helps users make informed decisions about the materials they want to borrow.
- Library Users can check the availability of materials in real-time, including whether items are currently checked out, on hold, or available for loan. This saves time and helps users plan their library visits more efficiently.
- OPACs allow users to manage their library accounts online, including renewing materials, placing holds, viewing borrowing history, and paying fines or fees. This enhances user autonomy and convenience.
- OPACs are integrated with other library services and resources, such as digital collections, online databases, interlibrary loan systems, and electronic resource management platforms. This provides users with seamless access to a wide range of library resources.
- Libraries can customize the appearance and functionality of their OPACs to meet the needs of their users. This includes customizing search interfaces, adding library branding, and integrating additional features or services.

6.1. Following are Disadvantage OPACs

- OPACs can be complex systems to manage and operate, requiring technical expertise to set up, maintain, and troubleshoot. Libraries may need dedicated IT staff or resources to ensure the system runs smoothly.
- Not all users may have access to computers or the internet, limiting their ability to use OPACs effectively. This can create a digital divide, disadvantaging individuals who lack access to technology or digital literacy skills.

- While OPACs offer search functionalities, users may encounter limitations in search capabilities, including difficulty in refining searches, understanding Boolean operators, or navigating complex search interfaces.
- OPACs rely on accurate cataloging and metadata practices to ensure the quality and completeness of records. Inaccurate or incomplete metadata can lead to difficulties in retrieving relevant materials and frustrate users.
- OPACs may return overwhelming amounts of search results, making it challenging for users to find relevant materials. Users may need to refine their search criteria or navigate through numerous records to identify the information they seek.
- OPACs rely on internet connectivity to function effectively. In libraries with unreliable internet connections or during internet outages, users may experience difficulties accessing the catalogue or retrieving information.
- OPACs collect user data, including search history and borrowing behaviour, raising privacy concerns among users. Libraries must implement robust privacy policies and security measures to protect user information from unauthorized access or misuse.
- Implementing and maintaining OPAC systems can be costly for libraries, especially smaller institutions with limited budgets. Expenses may include software licensing fees, hardware upgrades, staff training, and on-going technical support.
- Some users, particularly older patrons or those accustomed to traditional card catalogues, may resist transitioning to OPACs due to unfamiliarity with technology or preference for traditional methods of information retrieval.

7. CONCLUSION

OPACs serves to advance knowledge and understanding of library information systems, improve user experiences, and inform the design, development, and implementation of effective digital library services in support of research, teaching, and learning objectives.

Catalogue cards are typically arranged alphabetically within the library catalogue according to various access points, including author, title, and subject. Users can browse through the catalogue cards to identify materials of interest and obtain the necessary information to locate them within the library.

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The Psychological Effects of Library Services on Student Development

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ABSTRACT

In today's rapidly changing world, the field of psychology has grown significantly, and researchers are increasingly exploring the intersections between psychology and other disciplines. This paper aims to investigate the connection between library services (such as librarian conduct, building conditions and environmental factors) and various psychological traits of students. Among the attributes that are recognized are motivation, academic success, personality growth, physical fitness, mental focus, and other factors. This paper examines existing research through a comprehensive literature review to clarify the impact of library science on students' psychological well-being. The results show that library services play a crucial role in shaping students' psychological well-being and academic success. The implications of these findings are important for educators, librarians, policy makers, and other stakeholders involved in the planning and delivery of library services. Recognizing the impact of library science on the psychological characteristics of students emphasizes the importance of investing in quality library resources, infrastructure, and staff. By creating supportive and enriching library environments, educational institutions can promote the holistic development and academic success of students.

Keywords: *Psychology, Library services, Psychological attributes*

1. INTRODUCTION

In today's rapidly evolving world, the field of psychology is experiencing exponential growth, prompting a heightened necessity to delve into its depths to comprehend intricate mental processes and human behaviors. Researchers exhibit a keen interest in unraveling the intricate interplay between psychology and various other disciplines. Among these interdisciplinary connections, library science emerges as a particularly compelling domain, encompassing elements such as librarian conduct, building conditions, and environmental factors. These factors collectively exert a profound influence on a myriad of psychological attributes among students, including academic success, motivation, mental acuity, and overall well-being.

Educational institutions serve as pivotal hubs for nurturing student development across multiple dimensions, spanning cognitive, emotional, physical, and social domains. Within this educational ecosystem, library services emerge as a crucial facet contributing significantly to holistic student growth and flourishing. Whether through fostering a conducive learning environment, providing access to diverse resources, or cultivating a sense of community and belonging, library services play an indispensable role in shaping the educational journey and fostering the holistic development of students. Libraries serve as indispensable resources that profoundly impact academic

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achievement. By exploring the intricate relationship between library services and academic success uncovers a nuanced dynamic crucial for scholarly advancement.

The primary objective of this study is to delve into the intricate relationship between library services and holistic well-being in terms of academic success exhibited by students.

2. REVIEW OF LITERATURE

The realm of library services extends far beyond the mere dissemination of information; it acts as a cornerstone for student development, fostering not only academic growth but also nurturing psychological well-being. As educational institutions increasingly recognize the holistic needs of their students, understanding the psychological effects of library services emerges as a crucial area of inquiry. This review delves into the multifaceted dimensions of how library services intersect with student development, exploring the intricate interplay between libraries and the psychological facets of learning, cognition, social interaction, and overall mental health. By examining existing literature, this review seeks to illuminate the profound impact that library services can have on shaping the psychological landscape of students, offering insights into their cognitive processes, emotional experiences, and overall personal growth within the educational environment. Through this exploration, we aim to provide a comprehensive understanding of the psychological dynamics inherent in library services and their implications for student development.

2.1. Librarian Engagement

By observing how library utilization influences student performance metrics, we shed light on the pivotal role libraries play in fostering knowledge acquisition, critical thinking, and overall academic success. Sharif et.al (2021) investigated the impact of librarian behaviors on students' academic performance and students' personality development in higher education institutions (HEIs). The study was conducted on the sample of 351 students. This result showed that 85.3% of students believed that the positive behavior of the librarian has a positive effect on the students' personality development, and 75.3 percent of students considered that the librarians' good behavior had improved their performance. Participants reported that negative behavior of librarian had affected negatively students' performance in 76.7 percent of cases and negative behavior of librarian had affected negatively students' personality in 76.7 percent of cases. Noori (2024) aimed to examine library anxiety among students at Kabul University, identify the contributing factors, and examine its relationship with library usage and academic performance. The study used a quantitative survey design. The findings revealed that students experienced an elevated level of library anxiety. Mechanical barriers emerged as the primary contributor, followed by affective barriers and staff barriers. Significant correlations were observed between library anxiety, library use, and students' academic performance. Furthermore, the study identified notable associations between library anxiety and demographic factors such as gender, age, year of study program of study, and mode of study.

Samo and Agcito (2024) examined the association between library support on students well-being. The study was conducted on the sample of 303 students from a private institution in Cagayan de Oro City. The study revealed that the participants assessment of library support across physical, intellectual, social, and environmental dimensions was generally high, reflecting satisfaction with resources, assistance, social environments, and the library's ambiance. They also reported high well-being levels in physical, cognitive, and social aspects, indicating a positive overall self-assessment. The participants library support assessment significantly influenced their well-being levels.

2.2. Library Ambiance

Libraries, traditionally regarded as repositories of knowledge, are increasingly recognized as pivotal spaces that contribute to the overall wellness of students. From fostering mental health to promoting social connectedness and nurturing lifelong learning habits, libraries play a vital role in nurturing the holistic development of students. Jantzen et. al (2015) investigated in their study the

impact of the quiet study area with the comfortable seats in the library on the students' stress level and focus (concentration). They conducted surveys to the students in the library to obtain information about the stress levels and focus while reading before and after the introduction of these changes. This research found out that the transformations were actually in line with students' experiences because they saw an improvement. Students indicated their lower levels of stress and higher ability to focus on their coursework was the primary driver of this effect.

Students are likely to take advantage of the libraries that provide a quiet space for reading and relaxation if there are such libraries where they can study comfortably. Such outcomes show that endeavour in libraries towards scholastic environment is key. Through giving students places that relax and concentrate, libraries can play an important function enhancing the emotional health of students and academic success.

Augustina (2012) examined the role of school library (library scholastic materials, school library environment, role of library staff) on academic performance of secondary school students in Bushenyi Ishaka Municipality in western Uganda. The study was conducted on the sample of 383 participants out of which 288 were students, 85 were teachers and 10 were head teachers. Mixed method was used to carry out research and the data was analyzed with the help of SPSS. The findings of the study revealed that library scholastic material including text books, internet and journals have influence on academic perfomance of secondary school students. The study showed that library environment (space, atmosphere, ventilation, lightening, and odour) have influence on academic performance of students. The results of the study revealed that library staff such as librarians and library assistants have a great influence on academic performance.

2.3. Intellectual Advancement

In addition to offering traditional library facilities, libraries also serve as catalysts for motivating students to perform at their best by providing resources essential for their holistic well-being and academic success. Beyond merely housing books and study spaces, libraries have evolved into dynamic hubs that offer a myriad of services and amenities tailored to support students in various aspects of their lives. From quiet study areas conducive to concentration to collaborative spaces that encourage teamwork and innovation, libraries create environments that foster academic engagement and personal growth. Moreover, through initiatives such as mental health resources, wellness programs, and access to recreational materials, libraries address the multifaceted needs of students, promoting their overall well-being. By recognizing the symbiotic relationship between academic achievement and holistic wellness, libraries play a vital role in empowering students to thrive both academically and personally. Through these diverse offerings, libraries not only equip students with the tools they need to excel in their studies but also nurture their development into well-rounded individuals poised for success in all facets of life. Harisanty (2019) determined the motivation of high school students in Surabaya in utilizing their school library. The method used is descriptive quantitative approach. The sample of this research is high school students in Surabaya selected using multistage random sampling with a total of 200 respondents. The data were collected through questionnaires. The results of this study indicates that the main motivation of high school students in Surabaya in using school libraries is the comfortable space, invitations from friends, completing schoolwork, love for reading, recommendations from teachers, prestige, and spare time. Based on these findings, the school library can provide services that go in accordance with the expectations of the users.

In a study by Asiedu et.al (2022) undergraduate students' were assessed on the 24-hour library service at the C.K. Tedam university of technology and applied sciences, Navrongo, Ghana, using the survey approach, 168 students were randomly selected from three faculties of the University to participate in the study. The findings of this study revealed that students need to use the library 24 hours all the time and not only during examination periods. The findings further indicated that this

would help the students to utilize the library's facilities and resources to the fullest and at their own pace. The study, therefore, recommends that academic libraries must be given the maximum support to render such service to students since the continuous existence of every university or college depends on them.

In essence, the intricate dance between library atmosphere and librarian behavior profoundly shapes students' intellectual development. Through conducive environments and supportive interactions, libraries serve as crucibles for nurturing curiosity and critical thinking. This highlights the importance of optimizing library spaces and fostering positive relationships with librarians to empower students on their intellectual odysseys that transcend traditional academic boundaries.

3. CONCLUSION

The findings of this research paper underscore the significant psychological effects of library services on student development. Through an extensive review of literature, it becomes evident that libraries serve as more than just repositories of books; they are dynamic spaces that foster cognitive, emotional, and social growth among students. Libraries provide a conducive environment for learning, promoting concentration, critical thinking, and information literacy skills. Additionally, the availability of diverse resources caters to students' varied interests and learning styles, enhancing their academic performance and intellectual development. Moreover, libraries play a crucial role in supporting students' psychological well-being by offering spaces for relaxation, stress relief, and social interaction. These spaces serve as sanctuaries where students can find solace, seek support, and build connections with peers, thereby contributing to their overall mental health and sense of belonging within the academic community.

4. IMPLICATIONS

This research has implications for enhancing the holistic development and well-being of students by leveraging library services as valuable assets within educational institutions.

i) Educators and Administrators: Understanding the psychological effects of library services can help educators and administrators in designing curriculum and programs that integrate library resources effectively. It can also inform decisions about resource allocation and staffing within libraries to enhance student support.
ii) Librarians: Librarians can gain insights into their roles as facilitators of student development beyond providing information. They can tailor their services to better meet the psychological needs of students, fostering an environment conducive to learning and personal growth.
iii) Students: Awareness of the psychological effects of library services can empower students to utilize library resources more effectively for their academic and personal development. It can also encourage them to seek out support from librarians for their diverse needs beyond information retrieval.
iv) Research Community: This research contributes to the broader understanding of the impact of environmental factors on student development. It can inspire further investigation into the intersection of psychological principles and library services, leading to the development of evidence-based practices for promoting student well-being.
v) Policy Makers: Insights into the psychological effects of library services can inform policies related to education and library funding. It underscores the importance of investing in library resources and services as integral components of student support systems

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Understanding the Ethical Dimensions of Modern Librarianship: The Lakshman Rekha

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ABSTRACT

The proliferation of digital technologies has revolutionized the way information is accessed, disseminated, and preserved. In today's digital age, librarians play a crucial role in navigating the complex and ever-expanding landscape of information. Even though, they continue to serve as custodians, facilitators, and educators in the quest for reliable and equitable access to knowledge, their present role brings forth complex ethical dilemmas. Librarians are tasked with balancing the tension between providing unrestricted access to information and safeguarding user privacy in an era of pervasive surveillance and data collection. This paper explores the ethical dimensions inherent in modern librarianship, focusing on the challenges and responsibilities faced by librarians as they strive to uphold principles of access, privacy, intellectual freedom, and equity. Additionally, it discusses the implications of emerging technologies, such as artificial intelligence and data analytics, on librarians' ethical obligations. Moreover, through a critical analysis of case study and ethical frameworks, this paper provides insights into how librarians can come over these challenges emphasizing the need for ongoing professional development and ethical decision- making frameworks. In conclusion, through a comprehensive exploration of modern librarianship and ethics, this paper also seeks to provide insights and suggestions for librarians, educators, and policymakers grappling with the ethical dimensions of information management.

Keywords: *Ethical dimensions, Modern librarianship, Professional ethics, Moral boundaries*

1. INTRODUCTION

Librarianship has long been regarded as a noble profession, one entrusted with the stewardship of knowledge and information. Yet, within this seemingly straightforward domain lies a complex web of ethical considerations that demand attention and careful navigation especially in this Gen Z world. In an era defined by rapid technological advancement, evolving social norms, and heightened concerns over privacy and intellectual freedom, the ethical dimensions of modern librarianship have assumed a newfound significance.

Central to the ethical framework of librarianship is the concept of the “Lakshman Rekha,” a metaphorical boundary delineating the responsibilities and limitations of librarians in their quest to serve the public good while upholding professional integrity. Additionally, this paper also seeks to explore the ethical complexities of modern librarianship through the lens of the Lakshman Rekha, shedding light on the challenges and tasks faced by librarians in upholding ethical standards while serving diverse communities in an increasingly digital world.

2. THEORETICAL FRAMEWORK

This section provides a theoretical foundation for understanding the ethical dimensions of modern librarianship. Drawing upon ethical theories such as consequentialism, deontology, and virtue

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ethics, it examines how these frameworks inform librarians' decision-making processes and professional conduct. While Consequentialist theories focus on the ends justifying the means, meaning that the morality of an action is determined solely by its consequences, not by the intentions behind the action, Deontology, or deontological ethics, is an ethical theory that judges the morality of actions based on principles or rules rather than their consequences, it often prioritizes concepts like justice, rights, and human dignity. They typically reject the idea that the ends justify the means and emphasize the inherent value of certain actions or rules. These two approaches often lead to different moral judgments in specific situations and continue to be widely debated in philosophical and ethical discourse.

3. THE ROLE OF THE MODERN LIBRARIAN

In today's digital age, librarians wear many hats beyond the traditional custodians of books. They serve as information navigators, educators, advocates for intellectual freedom, and guardians of privacy. Their role extends beyond merely providing access to information; they are tasked with ensuring that such access is equitable, unbiased, and respectful of individual rights.

4. THE LAKSHMAN REKHA: ETHICAL BOUNDARIES IN LIBRARIANSHIP

The term "Lakshman Rekha" originates from the Indian epic, Ramayana, where it signifies a boundary that must not be crossed. In the context of modern librarianship, it represents the ethical boundaries that guide professional conduct and decision-making. These boundaries encompass various ethical principles, including:

4.1. Intellectual Freedom and Access to Information:

Intellectual freedom refers to the right of individuals to seek, receive, and impart information and ideas without interference or censorship. It encompasses the freedom of thought, expression, inquiry, and creativity, allowing individuals to explore diverse perspectives, challenge prevailing beliefs, and engage in critical discourse. Librarians champion intellectual freedom, advocating for the unrestricted access to information and the freedom to explore diverse viewpoints. However, they must also navigate ethical dilemmas surrounding censorship, confidentiality, and the dissemination of potentially harmful content.

4.2. Privacy and Confidentiality:

Respecting user privacy and confidentiality is paramount in librarianship. Librarians must uphold the confidentiality of patron records and protect user data from unauthorized access. Balancing this commitment to privacy with legal obligations and security concerns presents an ongoing ethical challenge.

4.3. Equity and Diversity:

Libraries strive to be inclusive spaces that cater to the needs of diverse communities. Librarians must actively promote equity and diversity in their collections, programs, and services, while also confronting biases and barriers to access.

4.4. Professional Integrity:

Maintaining professional integrity is the paramount virtue that requires to be upheld by each and every librarian. It requires librarians to act ethically and transparently in all their interactions with the patrons as well as the public. This includes avoiding conflicts of interest, providing accurate information, and adhering to established codes of conduct and professional standards.

5. NAVIGATING ETHICAL CHALLENGES IN THE MODERN WORLD

In the digital age, librarians face a myriad of ethical challenges that test the boundaries of the Lakshman Rekha. These may include:

i) **Internet Filtering**: Librarians play a critical role in internet filtering, particularly in environments such as schools, public libraries, and other educational institutions. Their responsibilities can vary depending on the specific context and policies in place, but generally, librarians are tasked with managing access to online resources in a way that aligns with the organization's mission and values. Some key aspects of the librarian's role in internet filtering includes Policy Development, Selection of filtering tools, Customization and configuration, User Education, Monitoring and enforcement, review and adjustment, balancing access and security

ii) **Data Privacy**: Librarians play a pivotal role in protecting the privacy of library users' data by developing policies, educating users, managing data collection, implementing security measures, ensuring compliance with regulations, advocating for privacy rights, and upholding ethical standards. Their efforts help create a safe and respectful environment where users can access information freely without compromising their privacy. It helps in safeguarding patrons' data in an age of increasing surveillance and data breaches.

iii) **Collection Development**: Selecting materials that reflect diverse perspectives while avoiding censorship and bias.

iv) **Information Literacy**: Teaching users to critically evaluate information sources in an era of misinformation and disinformation. Librarians play a vital role in promoting information literacy by providing instruction and training, integrating information literacy into the curriculum, offering research assistance, selecting and curating resources, promoting digital and media literacy, fostering critical thinking, supporting lifelong learning, and engaging with their communities. Their efforts help empower users to navigate the complex information landscape effectively and become informed, critical, and engaged citizens.

6. HOW TO EMBRACE ETHICAL LEADERSHIP?

Librarians can embrace ethical leadership by integrating ethical principles into their decision-making processes, fostering a culture of integrity and accountability within their organizations, and advocating for ethical practices in the profession. Here are some strategies for librarians to embrace ethical leadership:

i) Uphold Professional Ethics:

- Familiarize yourself with the professional codes of ethics
- Adhere to these ethical guidelines in your daily work, ensuring that your actions align with principles such as intellectual freedom, privacy, access to information, and equitable service provision.

ii) Lead by Example:

- Demonstrate ethical behavior in your interactions with colleagues, patrons, and stakeholders.
- Model integrity, honesty, respect, and fairness in all aspects of your work, including decision-making, communication, and conflict resolution.

iii) Promote Ethical Decision-Making:

- Encourage open dialogue and critical reflection on ethical issues within your organization.
- Provide training and resources to help colleagues develop their ethical reasoning skills and navigate complex ethical dilemmas.
- Foster a supportive environment where individuals feel comfortable seeking guidance and support when faced with ethical challenges.

iv) Advocate for Ethical Practices:

- Advocate for policies and procedures that promote ethical conduct and uphold the values of the profession.
- Participate in professional associations and committees focused on ethics and intellectual freedom, and actively contribute to discussions and initiatives aimed at advancing ethical standards in the field.
- Engage with stakeholders, policymakers, and the broader community to raise awareness of ethical issues and advocate for the protection of intellectual freedom, privacy rights, and access to information.

v) Embrace Diversity and Inclusion:

- Recognize the importance of diversity, equity, and inclusion in ethical leadership.
- Advocate for inclusive practices that value and respect the perspectives, experiences, and identities of all individuals, including those from marginalized or underrepresented communities.
- Work to identify and address systemic barriers to access and participation within your organization and profession, promoting a culture of belonging and equity for all.

vi) Foster Ethical Organizational Culture:

- Create policies, procedures, and organizational structures that support ethical behavior and decision-making.
- Cultivate a culture of transparency, trust, and accountability, where ethical considerations are integrated into strategic planning, governance processes, and day-to-day operations.
- Encourage feedback and input from colleagues and stakeholders, and be responsive to concerns or issues related to ethics and integrity within the organization.

By embracing ethical leadership, librarians can uphold the values of the profession, promote the public good, and contribute to the advancement of a more just and equitable society. This also entails fostering a culture of ethical reflection and dialogue within the profession, as well as advocating for policies and practices that uphold the values of librarianship.

7. CONCLUSION

Overall, modern libraries grapple with a range of ethical challenges as they seek to uphold their core values of intellectual freedom, privacy, equity, and access to information in a rapidly changing information landscape. Addressing these challenges requires thoughtful consideration of ethical principles, professional standards, and the diverse needs of library users and communities, Therefore, understanding the ethical dimensions of modern librarianship is essential for ensuring that libraries remain trusted institutions that serve the public good. By embracing the concept of the Lakshman Rekha and adhering to ethical principles, librarians can navigate the complexities of their profession with integrity and purpose, safeguarding the rights and dignity of all who seek knowledge within their walls.

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Digital Transformation: Rethinking Collection Development Policies

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ABSTRACT

In the rapidly evolving landscape of libraries, digital transformation is reshaping collection development practices. This abstract explores the shift from traditional to digital resources, highlighting opportunities and challenges for information professionals. Libraries, once repositories of physical materials, now embrace digital assets like e-books and online databases. This paradigm shift demands reevaluation of collection development strategies to ensure relevance and accessibility. The exponential growth of digital content poses challenges in selection, acquisition, and preservation. Librarians navigate this landscape to maintain comprehensive, curated collections. Additionally, digital transformation revolutionizes scholarly communication, with open-access initiatives reshaping research dissemination. Librarians play a crucial role in advocating for open access and integrating digital resources. Despite challenges, digital transformation offers opportunities for innovation, with technologies like AI enhancing collection development processes and facilitating user engagement.

Keywords: *Collection Development Policies, Digital Transformation, Digital Collections*

1. INTRODUCTION

In today's digital age, libraries are no longer confined to physical spaces filled with rows of books. The emergence of digital technologies has revolutionized the way information is accessed, shared, and preserved. As libraries navigate this digital landscape, they must rethink about the collection development policies that effectively meet the increasing requirements of patrons. This article delves into the complexities of digital transformation in collection development, exploring strategies for optimizing digital collections while preserving the core mission of libraries.

Moreover, digital transformation has blurred the boundaries between traditional library collections and external sources of information. Information is increasingly decentralized and fragmented with the explosion of online platforms, social media, and user-generated content. Librarians are faced with the task of not only curating their collections but also facilitating access to external resources that integrate them effortlessly with their services. This requires collaboration with content creators, publishers, vendors, and other stakeholders to negotiate licenses, agreements, and access arrangements.

2. LITERATURE REVIEW

The body of research on collection development and digital transformation highlights the significant shifts taking place in libraries across the globe. Prioritizing the acquisition of tangible goods like books, journals, and multimedia resources was the traditional focus of collection development policies. But the abundance of digital resources—e-books, databases, online journals, and multimedia content, among others—has forced a paradigm change in collection management techniques.

According to academics like Fieldhouse & Marshall [1] (2011), the digital revolution has broadened the scope of collection development beyond conventional forms, necessitating the adoption of adaptable and dynamic ways by libraries for the administration and acquisition of resources. In addition, the shift to digital has brought up significant issues about sustainability, accessibility, and preservation, forcing libraries to reevaluate their function as information stewards in the digital era.

Libraries have to deal with changing user expectations and information-seeking behaviors in addition to technological difficulties. According to (Panda and Kaur) [2] 2023 studies, there is an

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increasing need for individualized services, platform-neutral integration, and distant access to digital resources. This calls for the development of collections using a user-centric approach, where libraries actively interact with their communities to learn about their needs and preferences.

Fridyani & Iqbal [3] (2022) in their paper indicate that users are ready for the library collection center's digital transformation. However, the digital library collection center necessitates more careful planning, particularly in terms of socialization.

3. COLLECTION DEVELOPMENT

Library collection [4] development is the process of systematically building the collection of a particular library that satisfies the needs of library users on time using information resources locally held as well as resources from other institutions. According to (Evans & Saponaro [5]) is a dynamic self-perpetuation cycle or process that is made up of six definable stages namely, community analysis, selection policies, selection, acquisition, weeding, and evaluation.

4. COLLECTION DEVELOPMENT POLICIES

Creating a robust collection of documents within a library requires clear guidelines outlined in a policy. This policy should be documented in written form. Having a written collection development policy is crucial for any library as it shows a framework for selectors to consistently work towards specific goals. It promotes stability and continuity in the library's operations. Feng emphasizes that a policy is key to ensuring a steady and balanced expansion of library resources.

Magrill and Hickey [6] concisely outlined the benefits of implementing a collection development policy for libraries. Now, let's dig into each point they presented.

i) **Expressing Relationship with Library Objectives**: The policy explicitly outlines how the collection aligns with the overarching goals and mission of the library. This ensures that the materials selected are in line with the library's purpose and intended audience.

ii) **Basis for Planning**: By establishing a clear policy, libraries can strategically plan the development of their collections. This involves identifying areas of focus, target audiences, and desired formats, helping to shape the library's future acquisitions.

iii) **Practical Guidance in Selection**: The policy serves as a reference point for librarians when making decisions about which materials to acquire. It emphasizes the importance of impartiality, ensuring that selections are made based on criteria outlined in the policy rather than personal preferences.

iv) **Determining Acquisition Methods**: Different materials may require different acquisition methods, such as purchasing, donation, or interlibrary loan. The policy helps in determining the most appropriate method for acquiring materials based on factors like availability, cost, and relevance.

v) **Supporting Selection Justification**: Having a documented policy justifies the selection of certain materials over others. This can be especially important when faced with challenges or inquiries regarding the library's collection decisions.

vi) **Rational Guide for Budget Allocation**: Budgeting is a crucial aspect of library management. A collection development policy helps in allocating funds efficiently by prioritizing areas of collection growth and development based on outlined goals and priorities.

vii) **Long-Range Budget Planning**: By outlining growth and development goals, the policy assists in long-term budget planning. It helps in setting priorities for future acquisitions and ensures that resources are allocated appropriately to support the library's objectives.

viii) **Optimizing Resource Utilization**: Lastly, the policy aids in maximizing the use of available resources by providing an outline for decision-making. It contains not only the financial resources but the staff time and expertise too, ensuring that they are utilized effectively.

ix) **Facilitating Cooperative Programs**: The policy promotes collaboration and resource-sharing initiatives among libraries. By participating in programs like inter-library loans, sharing union catalogs, and networking with other institutions, libraries can expand their collections and provide patrons that access broader range of resources.

x) **Establishing Review Methods**: The policy helps in establishing systematic methods for reviewing materials before purchasing. This ensures that items added to the collection meet quality standards, are relevant to the library's objectives, and align with the needs of its users.

xi) **Suggestions on Material Management**: The policy offers guidance on several aspects of material management, including storage, weeding, and discarding. It provides recommendations on how to sustain a stable and relevant collection by regularly assessing items for retention, removal, or replacement.

So, a collection development policy aids as a comprehensive framework for managing a library's collection, guiding decision-making processes, ensuring alignment with institutional objectives, optimizing resource utilization, and fostering collaboration within the library community.

5. UNDERSTANDING DIGITAL TRANSFORMATION

Understanding digital transformation is pivotal before discussing its implications for collection development policies, particularly in the library context. Digital transformation denotes the assimilation of digital technologies across an organization, reshaping its operations and value delivery mechanisms. For libraries, this entails embracing digital tools, resources, and services to enrich information accessibility and streamline operational efficiency. Libraries undergoing digital transformation prioritize digitizing collections, implementing online catalogues, and offering e-resources, thereby catering to diverse user needs in an increasingly digital landscape. This transformation extends beyond mere technological integration; it necessitates a cultural shift towards embracing innovation and adaptability to meet evolving patron demands. By embracing digital transformation, libraries can transcend physical constraints, expand their reach, and foster inclusivity by catering to diverse user needs. Ultimately, understanding and embracing digital transformation is fundamental for libraries to remain pertinent and effectively serve their communities in this digital era.

6. THE IMPRESSION OF DIGITAL TRANSFORMATION ON COLLECTION DEVELOPMENT

The evolution spurred by digital transformation significantly alters collection development strategies, redefining the very essence of library collections. The surge of e-books, e-journals, online databases, and digital archives liberates libraries from spatial confines in material acquisition. Nevertheless, this newfound wealth of digital assets introduces fresh hurdles in the realms of curation, procurement, and conservation. Traditional paradigms governing library acquisitions are under scrutiny, as the digital realm offers unparalleled opportunities for diversification and accessibility. Libraries must navigate the digital resources, balancing inclusivity with relevance, and ensuring long-term sustainability amidst rapid technological shifts. Consequently, collection development policies undergo a profound metamorphosis, adapting to accommodate the dynamic demands of an increasingly digital-centric society. As libraries embrace the digital phase, they embark on a journey of innovation and adaptation, striving to uphold their fundamental mission of information dissemination while embracing the limitless possibilities afforded by digitalization.

7. CHALLENGES AND OPPORTUNITIES FACED DURING DIGITAL TRANSFORMATION

Libraries face a pivotal juncture in this digital era, with a richness of content at their fingertips. The task of curating digital collections is intricate, requiring strategies aligned with patrons' needs. However, this endeavor is fraught with challenges such as digital rights management, licensing complexities, and preservation concerns.

Yet, amidst these hurdles lie opportunities for libraries to revolutionize collection development. Digital resources offer unparalleled diversity and depth, empowering libraries to cater to varied interests. Leveraging technologies like information analytics and artificial intelligence provides invaluable insights into patron preferences, guiding collection decisions. Some of them are as follows:

7.1. Challenges:

i) **Cost Management**: While digital collections offer advantages like accessibility and scalability, they often come with significant costs, including subscription fees, licensing agreements, and technology infrastructure expenses.

ii) **Access and Equity**: Digital collections can exacerbate existing disparities in access to information. Not everyone has reliable internet access or the necessary devices to use digital resources, leading to the potential exclusion of certain demographics.
iii) **Copyright and Licensing Issues**: Managing digital rights, copyright compliance, and licensing agreements can be complex and time-consuming. Libraries need to navigate these legal frameworks while ensuring broad access to their collections.
iv) **Technical Infrastructure**: Maintaining robust technical infrastructure to support digital collections, including storage, security, and access systems, requires ongoing investment and expertise.
v) **Preservation**: Digital materials are susceptible to technological obsolescence and format decay. Libraries must actively manage digital preservation efforts to ensure long-term access to their collections.

7.2. Opportunities:

i) **Expanded Access**: Digital collections enable libraries to reach broader audiences beyond their physical locations. Remote access allows users to engage with library resources from anywhere, enhancing inclusivity and convenience.
ii) **Enhanced Discoverability**: Digital platforms offer powerful search and discovery tools that facilitate exploration and serendipitous discovery of library materials. Metadata standards and linked data initiatives can further improve discoverability.
iii) **Customization and Personalization**: Digital collections enable libraries to tailor their offerings to individual user preferences and needs through features like personalized recommendations and curated content lists.
iv) **Collaboration and Resource Sharing**: Digital transformation encourages libraries to collaborate on collection development efforts, sharing resources and expertise to build comprehensive collections that serve diverse user communities.
v) **Data Analytics**: Digital platforms generate valuable usage data that libraries can analyze to understand user behaviour, inform collection development decisions, and optimize resource allocation.
vi) **Innovation and Experimentation**: Digital platforms provide a fertile ground for experimentation with new formats, delivery mechanisms, and interactive experiences that enrich the user experiences.
vii) **Sustainability**: Digital collections offer opportunities for environmentally sustainable practices by decreasing the physical storage space and minimizing the environmental impact of distribution and preservation efforts.

`By addressing these challenges and capitalizing on these opportunities, libraries can adopt [7] updated collection development policies to thrive in the digital age while continuing to fulfill their mission of providing equitable access to knowledge.

8. STRATEGIES FOR RETHINKING COLLECTION DEVELOPMENT POLICIES

In response to the challenges and opportunities presented by digital transformation, libraries must rethink about their policies that ensure they remain relevant and responsive to the requirements of users. Several strategies can help libraries optimize their digital collections while preserving the core values of librarianship:

i) **Needs Assessment**: Conduct regular needs assessments to identify gaps in the digital collection and prioritize acquisitions based on patron demand and usage patterns.
ii) **Collaborative Acquisition**: Collaborating with other libraries, consortia, and vendors to pool resources and acquire digital materials more cost-effectively.
iii) **Licensing and Rights Management**: Developing clear policies and procedures for licensing digital content and managing digital rights to ensure compliance with copyright laws and licensing agreements.
iv) **Preservation and Long-Term Access**: Implementing robust preservation strategies to ensure the convenience and long-term accessibility of digital materials, including the creation of digital archives and repositories.

v) **User-Centered Design**: Adopting a user-centered approach to collection development, soliciting feedback from patrons and stakeholders to inform acquisition decisions and improve the usability of digital collections.
vi) **Data-Driven Decision Making**: Leveraging data analytics and usage statistics to evaluate the digital collections and inform future acquisition decisions.
vii) **Open Access and Open Educational Resources (OER)**: Embracing open access and OER initiatives to expand access to knowledge and reduce barriers to information for patrons.

9. CONCLUSION

In summary, the rapid evolution of technology has significantly impacted the realm of libraries and necessitates a heightened focus on digital transformation within collection development policies. While this shift poses challenges in areas like selection, acquisition, and preservation, it also opens avenues for libraries to enrich their collections and effectively furnish the evolving needs of patrons. To effectively navigate this digital transformation, libraries must prioritize strategies such as rigorous needs assessment, collaborative acquisition initiatives, and the addition of user-centered design principles into their policies. For that reason, libraries can successfully navigate the intricate landscape of digital transformation, ensuring that their collections stay pertinent and readily accessible in this digitized age. Embracing these strategies not only equips libraries to be in line with the changing technological landscape but also empowers them to proactively shape their collections to meet the diverse demands of their user base. Thus, a concerted emphasis on digital transformation within collection development policies is very important for libraries to thrive and remain indispensable pillars of knowledge dissemination in this digital time.

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Transforming Libraries into Happening Spaces

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1. PREFACE

Libraries for a common man is the place of books, for silent reading, hub of knowledge, efforts are to be made to know which book has the information/knowledge one needs, thanks to the librarians who are always there to help, guide and provide support for getting the relevant information/book at the right time when one is in the library.

Millions have studied in the library, especially in Universities and Colleges, and Schools. The scenario is not the same everywhere. There is vast difference between the libraries in the Western World than in India. The Libraries in India are made for a particular segment of population, that myth is made by people, not the rules. This mindset needs to be changed. People think that libraries are only with books, digital tools and one librarian is there who is the service provider. In fact, public libraries are the hub of knowledge and the librarians are the mentors, who not only guide but also follow the five laws of Prof Ranganathan, which are relevant even today. The Public Libraries are not meant only for providing the services. The Librarians are the experts who have so much of expertise, knowledge, wisdom and they can contribute a lot in making these libraries as happening spaces.

There is a need to create a mindset and advocate about the need of a library in everyone's life. These are to be promoted in general public to get access to what is required by them at an appropriate time and their information/knowledge needs are addressed well in time. These libraries should also create the space for people to interact with each other on a regular basis as with technology (mobile in hand) people are responsible for creating the distance among themselves and human interaction is affected in a big way. It is a big society loss when even in the family, the members are not talking to each other as they are fascinated by the mobile content so much. That is their world in the present time.

2. READ WORKS ON THE BASIS OF SOME CORE VALUES

- We believe in human potential. We unconditionally trust in human potential, and communities' ability to discover the solutions to the challenges they face.
- We have faith in community action. Inclusive community ownership, sustainable economic investment, and meaningful participation are essential ingredients for lasting change.
- Compassion and respect are at our core. We genuinely seek out partner communities' perspectives to understand their needs and create the conditions for shared learning and decision-making.

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- Inclusivity is at the essence of our approach. We help to create an environment and spaces where any individual or group feels welcomed, respected, and valued, and can fully engage.
- Equity-driven thinking is key. We strive for equitable systems and programs for all communities to thrive.

READ India is also known for setting up Community Library and Resource Centers, normally known as Knowledge Centers, with the objective of creating opportunities for rural India.

3. LIBRARIES WITH COMMUNITY FIRST APPROACH

Community First, is the thought which resonates now with national and international stakeholders. We are conscious of the fact that policy decisions are made without those for whom the policies are made. These are all perception driven and on secondary data. Though the primary or the secondary data is available, but the real time one to one conversation, understanding, realization of their challenges are normally ignored. We know that our strongest influencers are family and friends -our social networks- whether we are rich or poor. The people that surround us and that we listen to, play a huge role in shaping our future. This is "Peer-driven Change,". The need is to look for positive people, it does not matter whether they are rich, high-caste or low-caste, holds a position or not. And unlike the stereotype, positive influencers exist in every community, even those economically poor. Those positive efforts act as role models of what can be accomplished by those facing obstacles. **Recognizing and amplifying such embedded positive efforts can "infect" the entire community, scaling change peer to peer.** And, focus on peer learning and become the social change agenda or building a social capital.

Though we talk of collaborations and partnerships, collective action is tough because organizations are already overwhelmed with urgent tasks and resource constraints, and collective work can take more time. However, if we wish to achieve impact in communities at scale on promoting reading habits and inculcating the habit of visiting the nearby library, we need collective leadership. We need to bring leaders of diversity with different experiences and belief systems together with commitment for a common cause. With these diverse groups, we then need to create safe and brave spaces where diverse conversations take place for building a common understanding and create a tool of humanity to connect with one another.

There is no safe and appropriate space for this other than public libraries

READ India expanded in the Country in various geographical locations keeping in view the collective action keeping the community at the first stage and how the holistic development could be addressed with individual transformation. READ India needed the partners who were willing to join hands with us for setting up Community Library and Resource Centers. The purpose was strong ties with the local community who believe in the READ Model and would like to contribute in a manner that the READ Community Library is for them to manage and own. With the model of having Library Management Committee, collective contributions were the main agenda.

This process helped us to consult the important stakeholders in the community, who collectively took a decision to donate the land, provide local experts to construct the building and also contribute as "Shramdaan" which was measured as a very kind contribution but also monetised in relation to the infrastructure and labour support provided by them.

When READ India selected these kind of communities in different geographies and shared with READ Global, they helped in raising funds from individual donors, dedicating these libraries in their family names and also establish these libraries in poor of the poorest communities, who otherwise were deprived of having access to libraries. This was a great learning experience on connecting

communities and empowering people for the National Agenda of propagating the importance of libraries.

From West Bengal to Manipur, Rajasthan, Uttar Pradesh, Haryana, Delhi, Maharashtra, Karnataka, Andhra Pradesh, Punjab and Bihar, the agenda was to reach to one individual, one family, one village and the web of communities to be created for engagement, empowerment, education and enhancing their level of thinking and provide skills at their doorsteps with focus on how education and skills come at par. READ India constructed READ Libraries in West Bengal, Manipur, Rajasthan, Maharashtra and Karnataka. Partially renovated at free space in Bihar, Rajasthan, Haryana and Uttar Pradesh, provided requisite infrastructure of establishing the Community Library and Resource Centers, creating opportunities for qualified people with passion to manage these libraries with consistent capacity building and hand-holding from READ India.

While CSR came in 2014, the Libraries were established on rental accommodation in Delhi, Haryana, Andhra Pradesh, Tamil Nadu and Uttar Pradesh. READ India tried to expand in the existing States in order to show more strength in community engagement, empowerment and socio-economic development.

With Bill & Melinda Gates Foundation grant through READ Global, from 2012-14, the existing Libraries in 6 States were given IT infrastructure, namely, computers, free access to internet, solar panels to mitigate the consistent power supply at the READ Libraries. With this grant, the communities were empowered on using technology tools for empowerment, employability and partially self-sustaining the READ Libraries.

With the CSR Policy invoked in 2014, READ India started writing proposals and establishing partnerships with Corporates for setting up Community Library and Resource Centers keeping intact the READ Model. Corporates appreciated the Model and started supporting READ India. READ India established Community Libraries.

When the pandemic hit in 2019 till 2021, these Libraries played a very crucial role in providing health information, connect with the doctors online, food and masks distribution and workshops on mental health with experts online. These efforts helped us to build more trust not only with communities but with the Corporates supporting us because they promptly re-proportioned their grants which otherwise could have not been utilised, to convert and provide needed services and food for the people. As free access to internet was available, connecting communities and peer support through libraries was done in a big way.

Based on the learning READ India also understood that with strong partners at the rural level, READ India has made the libraries as happening places by extending library services and programmes to :

- Library to Literacy and Education
- Library to Women Empowerment and Livelihood
- Library to Youth Development
- Library to Health
- Library to ICTs
- Library to building resilient communities for the holistic development.

Libraries are human centric. Though a common man has an understanding the library has books, those who are educated can only enter this domain, rest just feel pride of having a library in their vicinity. But, no one thinks what Libraries can do to change their mindset, social life, academic career and provide direction to individual's life. Being a common and open space for everyone, the library could be a source of information, knowledge, centre for support of any kind and human encyclopaedia of a better life.

With changing time, with time-testing situations and need of the humankind for humanity as such, these libraries can play a pivotal role but the thought process has to be streamlined in this

direction. Libraries should take this as an opportunity and train all on use of mobile technology, digital learning, online banking, online business and reaching out to masses instead of one to one meeting.

I remember, the first training was organised on zoom was to understand leadership traits and how rural women can become the leaders in their own vicinity. This training was combined with entrepreneur skills, cyber safety and security, technology empowering girls, keeping in view the interest level, basic qualifications and access to mobile. Constant handholding made them confident complemented with the workshops on mental health, life skills, confidence building, and connection with the online doctors who could provide them timely consultations for their family members. I also recall that ration distribution, availability of sanitizers, soaps, masks etc. was also done by the community volunteers through libraries. Instruments like oximeters, sugar testing machine with strips, blood pressure testing digital machines were made available at the libraries for free service. The changing needs were addressed in changing time by Libraries.

READ India adopted a hybrid model of delivering the community development programmes at the grassroot level. As the mobility in reaching out to the beneficiaries was greatly compromised, READ India team present in the community efficiently stayed connected with the learners through technology mediums. Wherever possible, team on ground conducted the capacity building trainings in small groups at common community spaces taking all precautions. This was only possible through their indomitable spirit and selflessness to serve the community. Trainers carried training equipment to these common community spaces and reached to the beneficiaries who were not able move beyond their households.

4. IMPACT OF THE PANDEMIC

With COVID, the priorities changed, the food and medicines were the priorities and education took the back step. READ realised the need of the community and introduced the hard skills trainings such as Stitching and Handicrafts were conducted with the help of Master Trainers, who trained women beneficiaries at multiple locations, opening satellite training centers dedicated to a respective village. This enabled women to gain confidence that they can help their families and gave commitment that they not only continue their higher education but also continue the education of their children.

READ libraries, in 2020 trained 1100 rural young women and girls by experienced doctors at multiple locations where the centers are located. Trainees integrated under this training are now well equipped to measure Blood Pressure, Blood Glucose, Temperature, Pulse Rate, Oxygen level and measure other body parameters using different devices. During the training CHWs were also educated on the Standard Operating Procedures to follow in case of accompanying seriously ill patients to the hospital. The community was also introduced to the concept of entrepreneurship (Barefoot Nurse), wherein they could charge a nominal fee from an individual who is approaching to get his/her body vitals measured. These young, motivated, educated, and well-aware women in rural areas now form a strong shield of protection in their respective villages.

Children in all age groups suffered a lot during this period. Restricted movement outside the house led to depletion of both cognitive growth and interpersonal communication skills. Isolation and feeling of uncertainty affected the emotional state to a great degree. Educational institutions being shut and no effective learning, further deteriorated the situation. Rural communities where READ India witnessed the dearth of amenities and resources that were available to children in urban areas. In order to bridge the gap, READ India created e-content with focussed and refined video lessons for children in the age groups of 7-11 years, 12-16 years, 16 and above. These video lessons were

uploaded on a portal and each student accessing this content online was given a dedicated username and password free of any charge with no limit on content access. Content on preparing for competitive examinations and dedicated sessions with youth members of the community through experts, reinvigorated the spirit of learning among students in these tough times. E-content was also recorded by READ India team and teachers for the age group of 3-6 years on all subjects. This content was regularly shared with parents by the teachers. Online sessions daily with these students helped bridging the gap of learning during this time. Some of the students who did not had access to the smart phones were reached by READ India team, who went to their homes and took classes on individual basis.

Extending support to these underprivileged children in rural communities, READ India strived to fill the gap of education and learning in the villages during the tough times when schools were completely closed.

Within two years, March 2020-June 2021, READ libraries reached to maximum people using online platform for building their capacities:

Table 1

Interventions	Outreach
Number of masks distributed (total since COVID)	**182807**
Number of food rations distributed (total since COVID)	**10799**
Number of people reached with information related to COVID (or to help them cope with the situation- i.e., mental health training, livelihood skills training etc)	**12403**
# of Vaccinations/pre-natal check-ups and other medical clinics/checks since COVID (please specify if not vaccination or pre-natal check)	**10**
Content developed by READ or participants (i.e. TAG) that provide information related to COVID or how to cope with the hardship caused by the pandemic)	**271**
# of local partners who we have worked with on COVID response (this could be READ Centers, local governments, local NGOs, etc)	**81**
# of schools with whom we have collaborated since the start of COVID (Schools are closed in India, till date the classes are open only for class 10 th and 12 th on voluntary basis.	**35**
# of education service provided to school students since the start of COVID	**4767**
# of education service provided to kids under 5 years since the start of COVID	**1279**
# of people who now have livelihood options due to READ Center activities (specifically during COVID period)	**799**
# of volunteers mobilized (including CMC/subcommittees/youth volunteers) to address community challenges brought by COVID	**268**
Number of people who have received literacy training (for as far back as you have data if possible. This will be a good figure to present for the literacy awards)	**633**
Kind and if possible number of education service provided to adult (post literacy) (both before and after COVID)	**1533**
# of financial/business literacy provided (both before and after COVID)	**714**

READ India undertook strategic decisions to make READ Community Library and Resource Centers dynamic standpoint in the village, wherein the resources offered through could be harnessed for the best of its use and making the communities more resilient.

Short term programmes were introduced through libraries:

- Sharing audio programmes made by READ India designated staff based on the certified information by the Government sources being actively shared through WhatsApp groups – Some examples are:

- Sessions made on precautions to be taken during COVID 19
- Hygiene practice
- How to make home-made cloth masks
- How to make home-made hand wash solution.

Long-term programes for scale through libraries :

- Reading and writing keeping age-appropriate curriculum for 2 – 6 years; 6- 10 years and 10 – 15 years. Self-evaluation forms are being added before and after each session to generate effectiveness.
- Pre-school teachers training
- Improving reading and writing skills for children
- Visiting nearby government schools and working with teachers
- Life skills for adolescent girls and boys
- Career Guidance for youth
- Livelihood trainings
- Health awareness videos and care of the family
- Basic of Computer trainings – Technology Empowering Girls, cyber safety.

Figure 1

5. ADDRESSING SUSTAINABLE DEVELOPMENT GOALS (SDGS)

a) Communities of Practice (CoPs) : READ India developed CoPs in addressing Sustainable Development Goals by integrating the programmes in the libraries and how the communities are understanding the contribution they are making in addressing the SDGs and making them the reality.

This could only be possible if we **create knowledge networking** for collaboration between diverse stakeholders including academia, government agencies, non for profit organisations and private sector to bridge knowledge gaps and support evidence based-decision making in realising SDGs on the ground.

Figure 2

b) **Cultural challenges and Ethical considerations:** While working in rural communities, one has to be careful in protecting the local culture and seeking their full participation with understanding and innovating best practices for sharing. Inclusivity is the main outcome while working with communities of different religion, caste and creed. READ libraries of conscious of this practice on the ground and have set many examples on the ground.

One should be careful for not allowing working in silos and fragmentation as the new dynamic time demands working together and achieving results for common causes addressed by multi-stakeholders.

Data management and integration is important but at the same time confidentiality and privacy is also important getting informed consent from all.

6. IMPACT ON THE GROUND

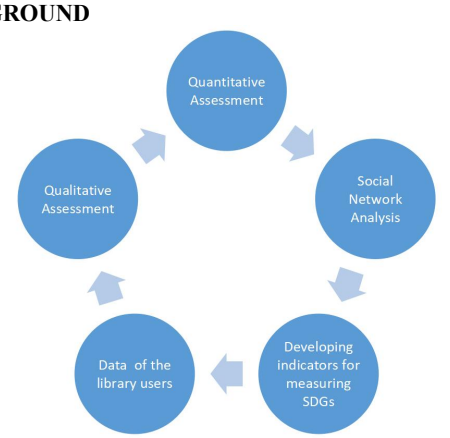

Figure 3

As READ India has been working with the CSR grants on the ground, it has created a robust platform for measure the impact.

While the ground team is conscious of all the aspects of registrations for the library usage, various programmes organised in the library are measured through pre and post assessments.

READ tries to get the 100 per cent response on the specific programmes and follow-up with the stakeholders on a regular basis, the use of library is measured with usage of books, the visitors profile and the age group visits the library.

7. READ LIBRARIES AS ON 2024

READ has a network of 65 libraries across 16 States in India covering more than 300 villages. 20 libraries are in the aspirational districts/blocks where the needs is the most. READ India has served in the past 17 years more than 6,50,000 rural/semi-rural communities with books, services, skills and in general motivating them for higher education. READ has provided almost 100,000 books across India, not a big number as compared to the government libraries as books are provided after assessing the needs and the interest of the users.

Almost 50,000 youth have been reached and skilled on multiple skills in the Library and connected them for suitable employability.

Almost 50,000 women have been skilled for decent earning and starting their micro-enterprise across India, with self-dignity and respect, contributing positively to their families.

500 government schools have been reached motivating children to visit the library and enabled them for better reading and writing schools under the National Mission on Reading and Writing, by joining hands with like-mind organisation with the blessings of Niti Ayog.

We have senior Library Professionals in our Trust, Advisory Board and Regional Advisers across India, under whose guidance we work on establishing and promoting rural libraries in India.

READ Global initiated the process of setting up the Libraries in Nepal in 1991, replicated the model in India and Bhutan in 2007. This mission is carried forward with a mission of reaching the unreached; connecting communities and empowering people; one book one person one village.

8. ENVISIONING THE FUTURE LIBRARIES WITH COMMUNITY FIRST APPROACH

- With one village, one library is a must as the base of the children in education till 8 years has to be made.
- Girls who are deprived of access to quality education should be given appropriate opportunity for higher education and grow in their lives.
- Universities should design a short-term course for librarians to be trained to create a web of trained libraries in the country.
- People's approach to be defined. READ Model is based on the same modalities which need to be advocated.
- Financial resources should be made available at the local level.
- The educated community should make a think tank to take this mission ahead.
- Women should be part of the decision making so that they could take the lead and develop an understanding of giving equal opportunities to all children.
- Youth should come forward to avail the opportunity of taking the responsibility of helping those who need the help in quality education.
- Senior citizens should play a role of mentorship, guidance and ensure the environment of collective learning in a systematic manner.
- Support from the local government should be envisaged.
- People's advocacy and people's movement in spreading the message of one child one book at a time for reading is a must.

- Teachers should join hands in making this a reality.
- Outcomes should be well-defined and focussed upon rather than waiting for the funds to come first and then start the mission.
- Collaborations, cooperation, consistent efforts, conscious decisions, concrete action is the way forward.

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Exploring Internet Self-Efficacy and Internet Anxiety among Undergraduate Students: A Gender and Locale Perspectives

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ABSTRACT

The main purpose of the study is to explore gender differences in internet self-efficacy and anxiety among undergraduate students. The study utilized a descriptive survey approach and employed a purposive sampling method to gather data from 70 undergraduate students at Akal University Talwandi Sabo. The Internet Self-Efficacy Scale by Kim and Glassman and the Internet Anxiety Scale by Kalwar, et. al. is used to collect the data. Statistical analyses revealed significant variations in internet self-efficacy and internet anxiety between male and female participants. The findings indicate no significant differences in Internet self-efficacy or anxiety based on gender or locale among undergraduate students. This suggests a need for holistic support programs promoting digital literacy and mental health services for all students, regardless of gender or geographic background.

Keywords: *Internet self-efficacy, Internet anxiety, Undergraduate students*

1. INTRODUCTION

In the contemporary digital era, the internet serves as an indispensable tool for communication, information access, and academic pursuits among undergraduate students. However, individuals' experiences with the internet can vary significantly based on factors such as self-efficacy and anxiety related to its use. Self-efficacy refers to one's belief in their ability to successfully perform specific tasks, while internet anxiety encompasses feelings of apprehension or discomfort associated with online activities.

2. INTERNET SELF-EFFICACY

Bandura (1977) introduced the concept of self-efficacy within his social cognitive theory, emphasizing its profound influence on individuals' willingness and ability to adopt new information technologies (Glassman & Kang, 2012). Self-efficacy serves as a pivotal construct for researchers, aiding in the comprehension of how individuals swiftly embrace new technologies and acquire proficiency in utilizing them (Hsu & Huang, 2006; Torkzadeh & Van Dyke, 2002). Defined as an individual's perceived confidence in their capabilities to accomplish specific tasks and activities (Bandura, 1996), self-efficacy significantly influences behaviors and emotions (Compeau & Higgins, 1995). Those harboring strong self-efficacy beliefs demonstrate heightened perseverance and effort in task completion, persisting even in the face of obstacles or challenges (Kim & Glassman, 2013; Liu & Wilson, 2010; Ren, 2000). Moreover, self-efficacy and performance share a reciprocal relationship, with increased effort and persistence leading to greater task success, thereby reinforcing self-efficacy beliefs (Ren, 2000).

Internet self-efficacy, often defined as individuals' confidence in their ability to utilize the internet, significantly influences academic performance in modern educational settings where online resources are extensively employed (Chuang, Lin, & Tsai, 2015; Kao, Tsai, & Shih, 2014; Wu, & Tsai, 2006). Research indicates that learners with higher levels of internet self-efficacy tend to outperform those with lower levels, particularly in internet-based learning environments (Chang et al., 2014; Liang, & Tsai, 2008; Peng et al., 2006). For instance, Tsai and Tsai (2003) found that students with greater confidence in their internet abilities demonstrated superior performance in web-based learning tasks, particularly in employing search strategies.

Moreover, individuals who perceive themselves as highly proficient in internet tasks are more inclined to explore new internet applications, such as search engines, wikis, and blogs, to address encountered challenges (Kim, & Glassman, 2013). Several studies have also highlighted the

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correlation between learners' internet self-efficacy and their motivation and attitudes toward web-based continuing education (Chen, & Tseng, 2012; Kao, Wu, & Tsai, 2011; Liang, & Wu, 2008; Liang, Wu, & Tsai, 2011). Teachers displayed notably high levels of internet self-efficacy. Furthermore, there were no discernible gender disparities across any subcategories of the Internet Self-Efficacy Scale (ISS), encompassing reactive/generative, differentiation, organization, communication, and search. (Kahraman &Yilmaz; 2018) Integrating internet-based tools with face-to-face classroom activities presents various complexities at institutional, classroom, and individual levels. At the individual level, differences in internet self-efficacy—how confident students feel in using the internet effectively—are crucial (Glassman & Kang, 2012). Researchers view internet self-efficacy as a multifaceted concept influenced by user experiences (Tsai et al., 2011). Additionally, internet anxiety, the fear of using the internet for learning, is an important yet less discussed factor. Studies have shown that internet self-efficacy and internet anxiety are inversely related (Kim & Glassman, 2013). Internet anxiety can hinder students' educational experiences, especially in environments where web-based tasks are essential. Understanding how these differences impact internet-infused education, particularly in constructivist approaches, is vital. As online course management systems become more prevalent in higher education (Charlton & Morahan-Martin, 2012), identifying factors predicting internet anxiety is crucial for promoting active participation in web-assisted learning. Since internet self-efficacy typically correlates negatively with internet anxiety (Compeau & Higgins, 1995; Eastin & La Rose, 2000), one strategy to alleviate anxiety is to enhance students' internet self-efficacy. This study aimed to determine the importance of different elements of internet self-efficacy in predicting internet anxiety in a blog-centric course, contributing to our understanding of their impact.

3. INTERNET ANXIETY

Internet anxiety, as defined by Presno (1998), refers to the fear or apprehension individuals experience when using online platforms such as e-mail, instant messaging, or online databases. This anxiety can hinder individuals' ability to utilize various Internet tools effectively and must be addressed to ensure broader access and benefits from online resources. Spielberger, Gorsuch, and Lushene (1970) characterize anxiety as an unpleasant emotional state marked by tension, apprehension, and worry. Joiner et al. (2007) specify Internet anxiety as a situation-specific anxiety arising from the fear of danger and helplessness in online interactions.With technological advancements, problematic internet use has emerged as a significant issue in contemporary society. Individuals' internet usage patterns can lead to various psychological challenges, including anxiety.

Previous research (Zhang, 2005) has found a negative association between Internet anxiety and perceived applicability, joy, and efficiency in using the Internet. Thatcher et al. (2007) suggest that perceptions of supportive resources and trust in technology can mitigate Internet anxiety. Macaulay (2003) describes Internet anxiety as stemming from the need to learn new terminology and navigate unfamiliar applications, as well as the potential risks associated with online activities such as infections, malware, and privacy breaches.

Although related, Internet anxiety differs from computer anxiety (Thatcher & Perrewe, 2002), with the former based on recent interactions with Internet technology rather than a lifetime of computer experience. Tsao & Sibley (2004) note that this anxiety may lead individuals to avoid online transactions, despite the increasing availability and variety of web-enabled services offered by businesses due to advancements in Internet technology. The excessive and unchecked utilization of swiftly advancing technology leads to various addictions in individuals. Among these addiction forms, internet addiction is closely linked with anxiety (Li et al., 2019; Laconi et al., 2014; Ostovar et al., 2016; Younes et al., 2016). Panda (2020) investigated the anxiety or mental pressure caused by working with multiple and rapidly changing computer systems, as well as mediating between these systems and the demands of the organization, users, and personal life. Romdhane et al. (2023) found that intense usage of digital tools and problematic internet use were correlated with anxiety.

Despite the widespread availability of Internet access, some individuals remain hesitant to fully utilize its features, highlighting the need to address Internet anxiety to ensure equitable access to online resources and services.

Previous studies have overlooked gender differences in internet self-efficacy and anxiety among undergraduate students, neglecting the nuanced interplay between gender, socio-cultural

factors, and internet-related outcomes. Additionally, existing research often examines self-efficacy and anxiety separately, missing the opportunity to understand their interconnected nature. This study aims to fill these gaps by investigating gender disparities in both internet self-efficacy and anxiety simultaneously, providing a comprehensive understanding of undergraduate students' internet experiences.

4. OBJECTIVES OF THE STUDY

i) To Explore gender variation in Internet self-efficacy and Internet anxiety among undergraduate students.
ii) To analyze differences in internet self-efficacy and Internet anxiety based on locale among undergraduate students.

5. HYPOTHESES OF THE STUDY

i) There will be no significant gender-based differences in internet self-efficacy and internet anxiety among undergraduate students.
ii) There will be no significant locale-based differences in internet self-efficacy and internet anxiety among undergraduate students.

6. METHODOLOGY

6.1. Research Background

In this research paper, a descriptive survey methodology is utilized. The study population comprised undergraduate students pursuing graduation in Indian universities.

6.2. Sample

Data from 100 undergraduate students pursuing their degrees at Akal University Talwandi Sabo were collected by using purposive random sampling. Participants were provided with detailed information regarding the study's objectives and assured that their data would be kept confidential and used solely for research purposes. Their participation in the research was secured through informal consent. Research instruments were disseminated to participants via Google Forms, accompanied by clear instructions for completion.

Table 1. Demographic detail of the Undergraduate students

Variables	Options	N	%
Gender	**Male**	8	11.4%
	Female	62	88.6%
Locale	**Urban**	17	24.3%
	Rural	53	75.7%

Table 1 displays demographic details of undergraduate students, categorizing them by gender and locale. Of the total student population, 11.4% are male and 88.6% are female. Regarding locale, 24.3% of students hail from urban areas, while 75.7% come from rural backgrounds.

6.3. Data Collection Tools

i) **The Internet Self-efficacy Scale (ISS) :** The Internet Self-efficacy Scale (ISS) created by Kim and Glassman (2013) assesses undergraduate students' confidence in using the Internet. It consists of 17 items measured on a 7-point Likert scale, ranging from 1 (not at all confident) to 7 (very confident). The Cronbach Alpha internal consistency coefficient for the scale was determined to be .92. A higher score on the Internet Self-efficacy scale indicates greater confidence in internet use by the student.
ii) **Modified Internet Anxiety Scale:** The Modified Internet Anxiety Scale, created by Kalwar et al. (2013), evaluates the level of internet anxiety among undergraduate students. It comprises 13 items measured on a 5-point Likert scale, with responses ranging from "never" (1) to "very often" (5). Lower scores indicate lower levels of anxiety, while higher scores indicate higher levels of anxiety.

7. DATA ANALYSIS AND RESULTS

Table 2:
The t-Values Testing Significance of Gender and Locale wise Mean Differences in relation to Internet Self-efficacy among undergraduate students

Internet Self-efficacy	Male (N=08)		Female (N=62)		Total (N=70)
	Mean	SD	Mean	SD	t-value
Gender	80	32.88	81.58	16.04	0.16^{NS}
	Urban (N=17)		Rural (N=53)		
Locale	82.11	22.57	81.16	17.05	0.238^{NS}

^{NS} Not significant at 0.05 level.

Table 2 presents t-values indicating the significance of mean differences in Internet self-efficacy among undergraduate students concerning their gender and locale. For gender, the mean Internet self-efficacy score for males (M = 80, SD = 32.88) compared to females (M = 81.58, SD = 16.45) resulted in a t-value of 0.16, indicating non-significance (NS). Regarding locale, urban students (M = 82.11, SD = 22.57) versus rural students (M = 81.16, SD = 17.05) yielded a t-value of 0.238, also showing non-significance (NS). These results suggest that there are no statistically significant differences in Internet self-efficacy scores between genders or between students from urban and rural backgrounds among the undergraduate population studied.

Table 3:
The t-Values Testing Significance of Gender and Locale wise Mean Differences in relation to Internet Anxiety among undergraduate students

Internet Anxiety	Male (N=08)		Female (N=62)		Total (N=70)
	Mean	SD	Mean	SD	t-value
Gender	37.12	10.56	40.24	6.57	0.18^{NS}
	Urban (N=17)		Rural (N=53)		
Locale	40.82	8.06	39.58	6.83	0.46^{NS}

^{NS} Not significant at 0.05 level.

Table 3 displays t-values assessing the significance of mean differences in Internet anxiety among undergraduate students based on their gender and locale. Concerning gender, the mean Internet anxiety score for males (M = 37.12, SD = 10.56) compared to females (M = 40.24, SD = 6.57) yielded a t-value of 0.18, indicating non-significance (NS) at the 0.05 level. Similarly, for locale, urban students (M = 40.82, SD = 8.06) versus rural students (M = 39.58, SD = 6.83) resulted in a t-value of 0.46, also indicating non-significance (NS) at the 0.05 level. These findings suggest that there are no statistically significant differences in Internet anxiety scores between genders or between students from urban and rural backgrounds within the undergraduate student population studied, as indicated by the specified significance level of 0.05.

8. CONCLUSION

The study indicates that Internet self-efficacy and Internet anxiety among undergraduate students reveals non-significant differences in both variables based on gender and locale. For Internet self-efficacy, neither gender nor locale demonstrated statistically significant variations in mean scores, indicating that male and female students, as well as those from urban and rural backgrounds, possess similar levels of confidence in their internet-related abilities. Similarly, in terms of Internet anxiety, there were no significant differences observed based on gender or locale, suggesting that both male and female students, regardless of their urban or rural upbringing, experience comparable levels of anxiety related to internet use.

9. EDUCATION IMPLICATIONS

The findings highlight the importance of developing tailored support programs and promoting digital literacy education in educational settings. With non-significant differences observed in Internet self-efficacy and anxiety based on gender and locale among undergraduate students, educational institutions can focus on providing holistic support to the entire student population. This approach involves integrating digital literacy skills into the curriculum, offering mental health support services, and ensuring equitable access to internet resources and technology. By fostering a supportive and inclusive learning environment, institutions can empower all students to navigate the digital landscape

confidently while also addressing their mental health needs, thus enhancing overall academic success and well-being.

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Author Index