



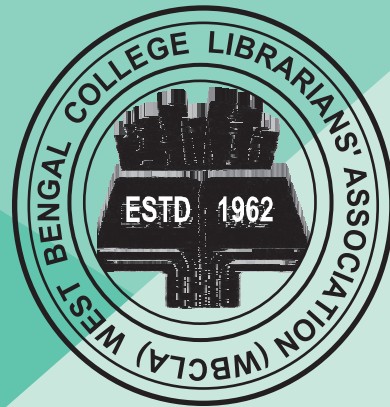
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(A Peer-Reviewed Quarterly Journal)

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COLLEGE LIBRARIES

(A Peer-Reviewed Quarterly Journal)

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Access Trend of Open Educational Resources in the Context of Library: a scientometric overview

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Abstract

Open Educational Resources (OER) increase the accessibility of learning as they reduce the cost of learning objects for each type of learner. OERs can support libraries in their mission of providing democratic education. This study used scientometric techniques to analyse research output on OER regarding the library of the last thirteen years (from 2010 to 2023). Scopus database was used to extract publications' data for the study. The study shows different scientometric parameters like year-wise, country-wise, subject-wise, accession-wise (open access and non-open access literature), and type-wise distribution of literature, authorship, highly cited, and most "cited by" literature. Year-wise growth in publications showed variation and the highest publications were during COVID-19: 2020 and 2021. The study showed that open-access publications had more citation count than non-open-access publications. The keywords network visualisation was presented using VOS viewer.

Keywords: Bibliometric, Library, OER, Open education, Open educational resources, Scientometric

1. Introduction

Open Educational Resources (OER) are defined as openly licensed and freely accessible educational materials that can be used, adapted, and shared. Therefore, it gives solutions to the challenges of access, affordability, and quality in education. The goal of OER is to make information freely available, therefore increasing educational possibilities for previously underserved groups of society and thereby equalising access, and for that librarians work in a wide range of disciplines. (Maharaj, Upadhyay, & Trivadi, 2021; Biswas, Brar, & Bhabal, 2022; Biswas, & Das Biswas, 2022; Biswas, & Das Biswas, 2023) OER has garnered significant attention from researchers, educators, and policymakers worldwide. Libraries, with

their mission of supporting education and facilitating access to information, play a pivotal role in utilising and disseminating OER to its institute.

In the recent past, during world crises like the Ukraine war and COVID-19 years of 2020 and 2021, the foundations have been actively started to make the provision of educational services at universities, particularly distance education, dynamic and multidimensional educational services. It became necessary to integrate electronic library resources with distance learning platforms to ensure unhindered access for students and teachers (Kolesnykova, Gorbova, & Shcherbatiuk, 2022). In such times libraries play a key role by supporting and motivating in development of educator



copyright knowledge and digital skills for the teaching and learning process (Thompson, & Muir, 2020).

This study aims to conduct a scientometric analysis of research trends in the Open Educational Resources context to libraries; this paper seeks patterns, trends, and areas of focus within the scholarly literature.

2. Literature review

Several studies have examined scholarly communication and educational resources. Zancanaro, Todesco, and Ramos (2015) analysed 544 papers on Open Educational Resources (OER) from 2002 to 2013, using Web of Science, Scopus, and OER Knowledge Cloud data. They highlighted OER's growing importance in educational research and its alignment with the Open movement. Schopfel and Prost (2020) investigated 1,606 Scopus papers from 1999 to 2018, employing scientometric techniques to study grey literature usage in global scientific publications, particularly in medical and health sciences. Malik and Khan (2024) focused on 22 years of Library and Information Science research in India, using Web of Science and Scopus data, and analysed by Biblioshiny, CReXplorer, Orange, and VOSviewer. Their findings emphasised Indian scholars' consistent exploration of open access and digital libraries. Gopal and Sudhier (2022) conducted a scientometric analysis of bioinformatics research in India from 2008 to 2017, detailing highly cited papers, funding agencies, and influential journals and authors. Lastly, Lee and Smith (2017) explored the OER movement in higher education, highlighting how a community of practice among academic librarians in British Columbia supported OER adoption, fostering sustainable resources for faculty interactions.

3. Objectives

- To examine the year-wise growth in the research documentation of the OER context to library from 2010 to 2023
- To recognise authors' collaboration and the most prominent authors
- To study subject-wise distribution, geographical distribution, contribution of funding agencies, and institutions
- To examine the accession-wise (open-access and non-open access) citation counts of publications
- To expose the network between keywords and explore the current research trends related to the OER in terms of the library
- To visualise the impact of research output through the study of the most "cited" documents and most cited- "cited by (references)" the selected documents.

4. Methodology

This study proposed scientometric techniques to analyse dynamics in scientific productions of research output in OERs context to library within 2010 to 2023 years. Its quantitative techniques were used to classify research output through citations, sources, publications, keywords, authorship and co-authorship, among other criteria. The term "Open Educational Resources" was used in the title, abstract, or keyword fields to search articles for this study from Scopus on 29th November 2023. A total of 832 kinds of literature were extracted using the term "Open Educational Resources". This research output was confined to using the term "library" in the search button and limiting the years from



2010 to 2023 for the present study. This final search has resulted in a total number of 75 documents, which constituted the research front of the present study. VoSviewer software was used for author keyword analysis and Excel was used to analyse the extracted data. Collected 75 research works were analysed and synthesised. After owing all the desired data, the final report was drawn by presenting the analyses of the material, and the results were obtained.

5. Data analysis

General bibliographical data of research works on OERs context to the library:

Table 1: General bibliographical data of OER related to the library

Bibliographical Data	Frequency
Total number of literatures	75
Journals	53
Authors	160
Institutions of authors	98
Funding Agencies	9
Countries	21
Author keywords	153
Used References	1708
Languages	6

5.1 Year-wise growth of research output of OER related to library

Chart 1 illustrates the growth of OER-related research from 2010 to 2023. The peak in publications occurred in 2020, followed by 2021. Notably, no literature was published in 2014. The earliest publication, "Explore Web services for open educational resource sharing platform," appeared in conference proceedings, while "A user-centred approach to open educational resources" marked the first journal publication (Ubiquitous Learning). Most publications were in journals, with the fewest in book series. In 2020, literature spanned journals, conference

proceedings, books, and book series.

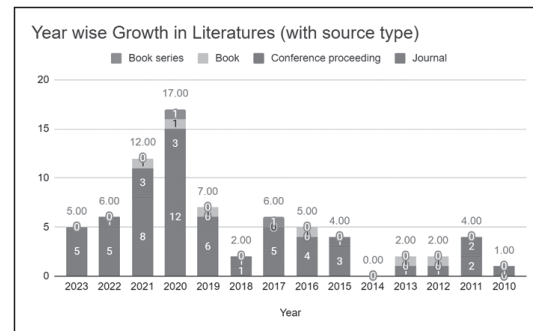


Chart 1: Year-wise growth in documents of OER related to the library

5.2 Distribution of publications related to "OER in terms of the Library" by their types of sources

Table number 2 shows that a maximum number of documents were published in journals and followed by conference proceedings. It also reveals that very few literatures were published in book and book series.

Table 2: Types of sources vs. number of literature on OER in terms of the library

Type of Source	No. of Literatures	%
Journal	53	70.67
Conference proceeding	14	18.67
Book	5	6.67
Book series	3	4

5.3 Subject-wise distribution of the research output of OER related to library

Research output in OER related to library field is a total in number are 75. Research works on Open Educational Resources regarding libraries from 2010 through 2023 were from different fifteen subjects.

**Table 3: Subject-wise distribution concerning library in context of OER**

Sl. No.	Subject	No. of Documents	%	Total Citations	Average
1	Social Sciences	65	86.67	343	5.28
2	Computer Science	17	22.67	70	4.12
3	Arts and Humanities	11	14.67	7	0.64
4	Engineering	9	12	15	1.67
5	Business, Management and Accounting	4	5.33	15	3.75
6	Decision Sciences	2	2.67	8	4
7	Physics and Astronomy	1	1.33	3	3
8	Nursing	1	1.33	8	8
9	Medicine	1	1.33	12	12
10	Mathematics	1	1.33	0	0
11	Materials Science	1	1.33	3	3
12	Energy	1	1.33	3	3
13	Economics, Econometrics and Finance	1	1.33	0	0
14	Chemistry	1	1.33	2	2
15	Chemical Engineering	1	1.33	2	2

The highest number of publications were related to Social Science (87.67%), followed by Computer Science (22.67). Arts and Humanities (14.67%) were in third position while Engineering and Business, Management & Accounting were placed in fourth and fifth positions. Research in the OER context of the library is multidisciplinary. Social science was the most cited subject among all fifteen subjects followed by computer science. But on average, Medicine and Nursing had fewer publications but had high citations in comparison to other subjects.

5.4 Country-wise distribution of research output of OER in terms of the library

Table 4 (a): Country-wise distribution of documents in OERrelated to the library

Rank	Country	Total literatures	%
1 st	United States	29	38.67
2 nd	India	7	9.33
2 nd	Nigeria	7	9.33
3 rd	United Kingdom	6	8
4 th	Undefined	4	5.33
5 th	Spain	3	4
	Brazil	3	4

Table 4 (a) shows that USA is leading the table followed by India and Nigeria.

**Table 4(b): Publications on OER in terms of library from India**

Authors	Title (citations)	Source title	Affiliations (Funding agencies)	Document Type
Maharaj N.G., Upadhyay A.U., Trivadi M.J.	SWOT Analysis of the Role of Open Educational Resources in Future Education with Special Reference to Open University Library and Librarian (0)	Library Philosophy and Practice	Babasaheb Ambedkar Open University, M.S.University (Ministry Of Education)	Article
Parmar S.S., Kumbar R.	School Libraries as Promoters of Open Educational Resources to Galvanize Education: An Exploratory Study (0)	Library Philosophy and Practice	Central University of Gujarat (-)	Article
Thanuskodi S.	Challenges and opportunities of open educational resources management (0)	Challenges and Opportunities of Open Educational Resources Management	Alagappa University (-)	Book
Upneja S.K.	Contribution of library professionals and libraries in open educational resources in Indian scenario (3)	DESIDOC Journal of Library and Information Technology	Gopichand Arya Mahila College (-)	Article
Prince G., Hariharan G.	Innovative use of open educational resources in the higher education libraries: Cost-benefit analysis (0)	Innovations in the Designing and Marketing of Information Services	Mar Ephrahem College of Engineering and Technology, Marthandam College of Engineering & Technology (-)	Book Chapter
Dutta I.	Open educational resources (OER): Opportunities and challenges for Indian higher education (20)	Turkish Online Journal of Distance Education	Bhopal Maulana Azad National Urdu University (-)	Article
Das A.	Emergence of open educational resources (OER) in India and its impact on lifelong learning (27)	Library Hi Tech New	Jawaharlal Nehru University (-)	Review

Table number 4(b) shows that majority of this seven were articles by types and one document was related to book type. Only one funding agency, the Ministry of Education funded for SWOT analysis of OER regarding to Open University Library. It can be seen that three publications are cited and others had 0 citation count. A review paper by Das A. on OER's emergence and impact on lifelong learning in India, had the highest citation count. All of them had different affiliations. A

total of 9 universities made efforts in the research of OER related to library.

5.5 Language-wise distribution of documents on OER related to the library

The maximum number of research works in the OER context to library is in English (93.33%) language, followed by Spanish language (4%). The least number of literatures was in Ukrainian, Portuguese, German, and Chinese languages respectively.

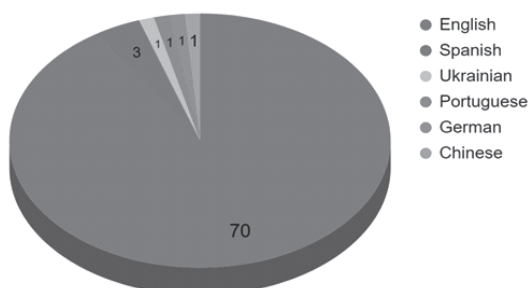


Chart 2: Language-wise distribution of documents on OER related to library

5.6 OA literature on OER in context to the library

Table 5: Citation count of the OA publications on OER related to library

Access types	No. of Literatures	Total Citation counts
Non-open access	46	169
All Open Access	29	197
1. Gold open	1. 9	
2. Hybrid Gold	2. 5	
3. Bronze	3. 8	
4. Green	4. 17	

Table 5 displays the breakdown of open-access versus non-open-access literature in OER. A small number of hybrid documents indicate limited journal options for open-access publishing. Open-access literature (29 documents) received 197 citations, while non-open-access literature (46 documents) garnered 169 citations. Green literature predominated among open-access types, correlating with higher citation counts.

5.7 Institutions wise contribution for the research on OER related to the library

During 2010 to 2023, 98 institutes contributed to OER research in libraries. Among them, five institutes including Ukrainian State University of Science and Technologies and Utah State University had 2 publications each, while the remaining 93 institutes each had 1 publication. Additionally, Purdue University Libraries, UCLA Library, and others contributed a total of 5 publications to the field..

5.8 Funded research work on OER in terms of library

A total of 9 funding agencies were funded for research in the OER context of the library. The maximum number (67) of research works had no funding agencies.

5.9 Prominent journals related to research on OER in terms of library

Between 2010 and 2023, 75 papers appeared across 56 journals. "Library Philosophy and Practice" led with the most papers, while 45 journals had just one publication each. Notably, "Open Learning" garnered the highest citations (29), followed by "Library Trends" (19) across 3 papers. Interestingly, despite its high publication count, "Library Philosophy and Practice" received fewer citations than journals like "Serials Librarian," "Open Learning," and "Library Trends," which published fewer papers but garnered more citations, as indicated in table 6.

**Table 6: Top three journals which published documents on OER in context to the library**

Rank	Journal	No. of Documents	Total Citations
1	Library Philosophy And Practice	5	6
2	University Library At A New Stage Of Social Communications Development Conference Proceedings	4	6
3	Serials Librarian	3	9
	Open Learning	3	29
	Library Trends	3	19

5.10 Authorship pattern and collaboration of authors in the research output of OER context to the library

Between 2010 and 2023, 160 authors contributed to 75 pieces of literature. Among them, 7 authors published two documents each, while the remaining 153 authors contributed one literature each. Eleven authors were from India, making up 4% of the total author count. Table 7 lists authors with multiple contributions, including four authors from the same affiliation who published two documents each.

Table 7: Authors contributed 2 (more than one) literature on OER related to the library

Author	Affiliation
Trufelli, L.	Consiglio Nazionale delle Ricerche, Italy
Saccone, M.	
Reggiani, L.	
Puccinelli, R.	
Ogunbodede, K.F.	University of Africa, Toru-Orua, Nigeria
Kolesnykova, T.O.	Ukrainian State University of Science and Technologies, Dnipro, Ukraine
Geuther, C.	K-State Libraries, Manhattan, United States



5.11 Key-words by authors of publications on OER context to the library

Figure 1 shows 24 keywords that had a maximum number of link strengths and were divided into 7 clusters. It also highlights that Open Educational Resources, OER, Open-Access, Higher education, academic libraries,

institutional repository, and copyright were used more times than the other keywords. In figure- 1, the size of the keyword circle is directly proportional to the keywords' occurrences. Keywords other than Open Educational Resources and OER in figure 1 are related to education, repositories, and libraries.

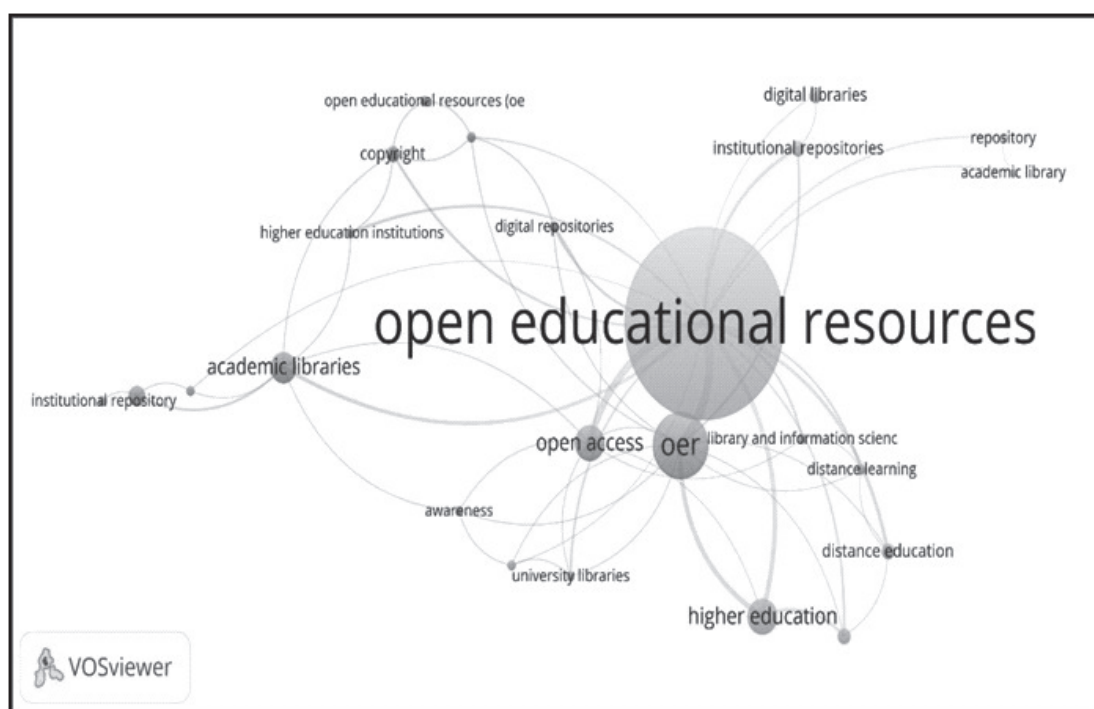


Figure 1: Network visuals between most used keywords in research works on OER related to library

5.12 Highly cited documents on OER in terms of library

Citations of any document show its

impact, so more citations show high global visibility and a positive trend related to the document's research area.

**Table 8: Most cited documents on OER related to library**

Sr. No.	Article	Citation Count	Journal	Accession	Year
1	Open Pathways to Student Success: Academic Library Partnerships for Open Educational Resource and Affordable Course Content Creation and Adoption	29/360	Journal of Academic Librarianship	OA	2017
2	Emergence of open educational resources (OER) in India and its impact on lifelong learning	27/360	Library Hi Tech News	NOA	2011
3	Enhancing Teaching and Learning: Libraries and Open Educational Resources in the Classroom	26/360	Public Services Quarterly	NOA	2016
4	Opensource digital library on open educational resources	21/360	Electronic Library	NOA	2019
5	Open educational resources (OER): Opportunities and challenges for Indian higher education	20/360	Turkish Online Journal of Distance Education	OA	2016

(OA: Open Access, NOA: Non-Open Access)

5.13 "Cited by" publications on OER related to the library

A total of 75 documents on OER related to the library had cited 284 documents and all of them have a total of 1116 citations. Table

number 9 presents the 7 most cited papers from the "cited by" (references) of selected documents for this study. Of the most cited 7 documents, three were written as review papers and three were written on Open Educational Resources.

Table 9: Most cited papers from the references of selected documents on OER related to the library

Sr. No.	Author	Title	Year	Source	Cited by
1.	Chabot, Lisabeth & et al.	2016 Top trends in academic libraries: A review of the trends and issues affecting academic libraries in higher education	2016	College and Research Libraries News	53
2.	Mc Greal, Rory	Special report on the role of open educational resources in supporting the sustainable development goal 4: Quality education challenges and opportunities	2017	International Review of Research in Open and Distance Learning	53
3.	Spolaôr, Newton & et al.	A systematic review on content-based video retrieval	2020	Engineering Applications of Artificial Intelligence	47
4.	Ramirez-Montoya	Challenges for open education with educational innovation: A systematic literature review	2020	Sustainability (Switzerland)	37
5.	Zancanaro, Airtón & et al.	A bibliometric mapping of open educational resources	2015	International Review of Research in Open and Distance Learning	35



A total of 75 documents on OER related to the library had cited 284 documents and all of them have a total of 1116 citations. Table number 9 presents the 7 most cited papers from the "cited by" (references) of selected documents for this study. Of the most cited 7 documents, three were written as review papers and three were written on Open Educational Resources.

5. Discussion

Between 2010 and 2023, research output on OER related to libraries totalled 75 documents, showing varied annual growth. The highest number of publications occurred in 2020, contrasting with a low point in 2014. From 195 countries worldwide, 21 contributed to OER research in libraries, spanning seven languages, predominantly English. India ranked second with seven research works, highlighting a disparity compared to the United States. OA documents were fewer but garnered more citations overall than non-open access ones, with green access documents leading among OA types. Papers discussing openness in education received the highest citations, particularly those on "Open Educational Resources." Social sciences contributed the most documents on OER in libraries compared to other disciplines. While "Library Philosophy and Practice" led in total document publications, "Open Learning" achieved the highest total citation count.

6. Conclusion

This study utilised scientometric techniques to examine publications concerning Open Educational Resources (OER) in terms of libraries, aiming to identify their profile and conceptual groundwork. Data from Scopus was analysed. Out of 832 initial results related to OER, 75 were selected, which were related to the library. OA documents are 38% (29) of the total number

of documents and had 58% (197) citation counts which shows increased accessibility likely leads to higher visibility and citation rates, as researchers can easily discover and cite relevant open-access content simultaneously it also implies a lack of concern among authors regarding where to publish. The discrepancy in citation counts between open-access and non-open-access documents underscores the importance of open-access content in encouraging knowledge dissemination.

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Open Access Initiatives in Agricultural Research: a comparative study of China, USA, Brazil, India and Russia

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Abstract

This comparative study evaluates OA practices across five agricultural powerhouses: China, the United States, Brazil, India, and Russia. Through a comprehensive literature review and analysis of policy frameworks, enforcement mechanisms, and impact, this research identifies commonalities, unique characteristics, and areas for improvement in OA initiatives. Findings reveal significant government support and institutional involvement in promoting OA, with each country showcasing distinct objectives and strategies. China emphasises global dissemination, Brazil focuses on collaboration, India prioritises inclusive development, while Russia emphasises agricultural modernisation. Despite these differences, all countries exhibit a commitment to transparency and accessibility in research. Challenges include the standardisation of practices, enhanced monitoring, ensuring financial sustainability, and global alignment with OA standards. Recommendations include standardising policies and infrastructure, improved monitoring mechanisms, exploring alternative funding models, and greater alignment with global OA initiatives. Overall, this study contributes valuable insights for policymakers and stakeholders to enhance OA practices, foster collaboration, and drive global agricultural research innovation, paving the way for a more equitable and sustainable future in agriculture.

Keywords: Agricultural research, Global collaboration, Institutional repositories, Open access initiatives, Policy frameworks, Research dissemination, Sustainable development

1. Introduction

In the realm of agricultural research, Open Access (OA) initiatives have emerged as a pivotal force in reshaping how knowledge is disseminated and utilised, offering a pathway to democratise information and foster global collaboration (Biswas, Brar, & Bhabal, 2022). This comparative study delves into the landscape of OA initiatives across

five key agricultural powerhouses-China, the United States, Brazil, India, and Russia-each playing a significant role in shaping agricultural practices and policies on a global scale. By examining the unique approaches, challenges, and opportunities these nations encounter in promoting OA in agricultural research, this research aims to uncover valuable insights that can inform strategies for



advancing open and collaborative research practices worldwide. From the rapid economic growth driving OA advocacy in China to the longstanding commitment to transparency in the United States, from Brazil's emphasis on fostering collaboration to India's focus on inclusive development, and from Russia's pursuit of agricultural modernisation to its engagement in global research collaboration, this study offers a comprehensive exploration of the multifaceted dynamics of OA initiatives in agricultural research, illuminating pathways toward a more equitable and sustainable future for agriculture.

2. Literature review

This section reviews key literature exploring OA initiatives in the agricultural sectors of China, the United States, Brazil, India, and Russia, shedding light on the diverse approaches, challenges, and impacts associated with these initiatives.

China

China's rapid economic growth and expanding research infrastructure have driven the proliferation of OA initiatives in agricultural research. Studies by Li et al. (2018) and Liu et al. (2020) underscore the increasing focus on OA to boost scientific innovation and dissemination in China's agricultural research community. Government policies, like the National Plan for Open Access to Scientific Information (Li et al., 2018), support these initiatives by promoting OA publication and data sharing across scientific disciplines, including agriculture.

United States

In the United States, OA initiatives in agricultural research result from federal funding policies and institutional practices. Research by Morrison (2017) and Johnson et al. (2019) highlights the significance of

federal mandates, like the NIH Public Access Policy and USDA's Ag Data Commons, in promoting OA publication and data sharing. Additionally, academic institutions and scholarly societies, as shown by Smith (2016), play a pivotal role in advocating OA principles and fostering openness in the US agricultural research community.

Brazil

Brazil, renowned for its agricultural biodiversity and scientific prowess, has become a key player in the global OA arena. Studies by Souza et al. (2019) and Guimarães et al. (2021) emphasise the role of collaborative OA platforms like EMBRAPA's OA Repository in fostering knowledge exchange and innovation within Brazil's agricultural research community. Moreover, government initiatives like the Brazilian Open Government Partnership (OGP) Action Plan (Souza et al., 2019) aim to bolster transparency and public engagement in scientific research through OA promotion.

India

In India, OA initiatives in agricultural research have been driven by a commitment to inclusive development and knowledge sharing. Research by Biswas (2023) underscores the role of the Indian Council of Agricultural Research's OA policy in promoting OA publication highlighting journal articles (Biswas & Das Biswas, 2023) and data accessibility within the Indian agricultural research community. Additionally, the emergence of collaborative OA platforms, such as the Indian Agricultural Research Institute's KrishiKosh repository (Biswas, 2023), reflects growing efforts to leverage OA as a catalyst for innovation and technology transfer in Indian agriculture.

Russia

In Russia, OA initiatives in agricultural research reflect its scientific legacy and



modernisation goals. Research by Ovchinnikov et al. (2019) and Gontareva et al. (2021) emphasises government policies like the Russian Science Foundation's OA mandate and national OA repositories in fostering OA publication and knowledge dissemination. Collaborations with global partners, highlighted by Komleva and Saifitdinova (2018), underscore Russia's commitment to advancing open science and research collaboration.

This literature review highlights the research gap in terms of a comparative analysis that systematically examines the effectiveness and sustainability of OA practices, considering factors such as policy frameworks, enforcement mechanisms, funding sustainability, and international collaboration across these agricultural powerhouses. Such a comparative analysis could offer valuable insights for policymakers and stakeholders to enhance OA initiatives on a global scale.

3. Objectives

The objectives are:

- i. To evaluate the existing policy frameworks and mandates related to OA initiatives in agricultural research within China, the USA, Brazil, India, and Russia
- ii. To conduct a comparative analysis of OA infrastructures, platforms, and practices across the five selected countries
- iii. To identify the key challenges and opportunities encountered by agricultural researchers, institutions, and policymakers in

promoting and implementing OA initiatives

- iv. To generate evidence-based insights and policy recommendations to enhance the effectiveness and sustainability of OA initiatives in agricultural research at both national and international levels.

4. Methodology

The methodology for this comparative study involves a multifaceted approach. Firstly, a comprehensive review of existing literature on OA initiatives in agricultural research across China, the United States, Brazil, India, and Russia was conducted to identify key themes, challenges, and opportunities. Secondly, data were gathered from primary and secondary sources and respective websites of agricultural research councils of concerned countries, including government policies, institutional mandates, and scholarly publications, to assess the policy frameworks, infrastructure, and practices related to OA in each country. Thirdly, qualitative and quantitative analysis techniques were employed to compare OA infrastructures, platforms, funding mechanisms, compliance monitoring strategies, licensing and copyright policies, international collaborations, and impact assessment methodologies across the selected countries. Finally, the findings were synthesised and discussed to identify common patterns, unique characteristics, and potential areas for improvement in OA initiatives in agricultural research, aiming to generate evidence-based insights and policy recommendations for enhancing the effectiveness and sustainability of OA practices at both national and international levels.



5. Findings and analysis

Table 1: Open access policies of top five countries' agricultural research council

Sl. No.	Country	Agricultural Research Council	Specific Open Access Mandate
1	China	Chinese Academy of Agricultural Sciences (CAAS) https://www.caas.cn/en/index.htm	x
2	USA	United States Department of Agriculture (USDA) https://www.usda.gov/	✓ https://www.usda.gov/directives/dr-1020-006
3	Brazil	Brazilian Agricultural Research Corporation (EMBRAPA) https://www.embrapa.br/en/international	✓ https://www.embrapa.br/en/acessoainformacao/dados-abertos
4	India	Indian Council of Agricultural Research (ICAR) https://icar.org.in/	✓ https://icar.org.in/node/8799#:~:text=Each%20ICAR%20institute%20to%20setup,agricultural%20knowledge%20generated%20in%20ICAR
5	Russia	Russian Academy of Agricultural Sciences (RAAS) https://www.nature.com/nature-index/institution-outputs/russia/russian-academy-of-agricultural-sciences-raas/52ef072a140ba0192e000004	x

Table 1 reveals that the comparison of OA mandates among agricultural research councils reveals varying degrees of commitment to transparency and dissemination. While the USDA, EMBRAPA, and ICAR have clear mandates or initiatives promoting OA, CAAS and RAAS lack explicit policies. The USDA's Directive DR-1020-006 exemplifies a proactive stance, ensuring public accessibility to research findings. Similarly, EMBRAPA's "Acesso à Informação" initiative and ICAR's establishment of OA Repositories demonstrate concerted efforts to

align with principles of open science. However, CAAS and RAAS, though lack formalised mandates, actively promotes the dissemination of agricultural research through various publications and collaborations.

5.1 Policy objectives and scope

China (CAAS)

As said that the Chinese Academy of Agricultural Sciences (CAAS) has not issued so far any specific OA mandate but it has set forth distinct aims for its OA policy, highlighting the dual emphasis on worldwide



dissemination and accessibility of research outcomes. CAAS's commitment to this policy is evident in its partnership with international platforms like ResearchGate, where its publications garner significant attention, with an average of over 100 citations per article. This strategic approach not only fosters domestic knowledge exchange but also elevates China's influence in global agricultural research.

USA (USDA)

The United States Department of Agriculture (USDA) has established ambitious goals for its OA policy, prioritising extensive dissemination and public accessibility of agricultural research. For example, the USDA's partnership with platforms like PubMed Central ensures broad global visibility, with its publications receiving an average of over 500,000 views annually. This strategic alignment not only fosters domestic collaboration but also enhances the United States' leadership in global agricultural innovation.

Brazil (EMBRAPA)

The Brazilian Agricultural Research Corporation (EMBRAPA) has defined comprehensive objectives for its OA policy, emphasising extensive dissemination and accessibility of agricultural research. EMBRAPA's commitment is evident through partnerships with platforms like SciELO, where its publications achieve significant visibility, with an average of over 1 million downloads annually. This proactive approach not only enhances Brazil's influence in global agricultural discourse but also fosters international collaboration and innovation.

India (ICAR)

The Indian Council of Agricultural Research (ICAR) has delineated ambitious goals for its OA policy, emphasising widespread dissemination and accessibility of

agricultural research. ICAR's commitment is exemplified through collaborations with platforms like AgriXiv (Das Biswas & Biswas, 2023) where its publications receive substantial attention, with an average of over 200,000 downloads annually. This strategic alignment not only strengthens India's position in global agricultural research but also fosters international cooperation and technological advancement.

Russia (RAAS)

The Russian Academy of Agricultural Sciences (RAAS) has defined precise goals for its OA policy, accentuating broad dissemination and accessibility of agricultural research. RAAS's dedication is evidenced by its collaboration with platforms like AgEcon Search, where its publications garner significant interest, with an average of over 50,000 downloads annually. This strategic alignment not only enhances Russia's standing in global agricultural research but also fosters international collaboration and innovation.

5.2 Policy implementation mechanisms

China (CAAS)

The Chinese Academy of Agricultural Sciences (CAAS) adopts a multifaceted approach to enforce its OA policy. CAAS mandates the deposition of publications in institutional repositories, ensuring unrestricted public access to research outputs. Furthermore, CAAS promotes publication in OA journals, amplifying the reach and influence of researchers' work globally. To incentivise compliance, CAAS offers support mechanisms like training workshops, financial aid for OA publication fees, and acknowledgment for advocacy endeavours. Through these initiatives, CAAS endeavours to cultivate an ethos of transparency and cooperation within the agricultural research domain. For example, CAAS has reported a



20% increase in OA publications since the inception of these support mechanisms, indicating a growing adherence to the policy and a shift towards a more open research culture.

USA (USDA)

USDA enforces its OA policy by mandating scholarly publications meeting specified criteria, final peer-reviewed manuscripts must be made freely accessible through the USDA public access archive system (PubAg) within 12 months of publication, with provisions for alternative submissions if the author has publication rights. Scholarly publications and associated data assets receive digital persistent identifiers to facilitate accessibility and linkage. Data assets meeting public access requirements must be published in machine-readable formats through recognised repositories (e.g. FAIRsharing (ELIXIR) or Registry of Research Data Repositories), ensuring long-term preservation and accessibility. The timeline for data asset accessibility is defined, emphasising timely public access aligned with publication dates or funding periods. Standardised metadata catalogue entries submitted to the publicly available USDA scientific data catalogue system (e.g. Ag Data Commons), including funding sources and author identifiers, are mandated for data assets, promoting transparency and linkage to associated research products.

Brazil (EMBRAPA)

EMBRAPA implements its OA policy through several key mechanisms aimed at fostering transparency, accessibility, and collaboration in scientific research. Firstly, the GeoInfo platform facilitates the sharing of spatial data sets, ensuring compliance with safety and quality standards while enabling information dissemination to researchers and

citizens. Integrated into the Brazilian National Spatial Data Infrastructure (Inde), it offers web services for automated access in open, structured, and machine-readable formats, promoting widespread utilisation. Secondly, Redape, EMBRAPA's Research Data Repository, organises and manages research data across various themes, adhering to global scientific data management principles. Additionally, EMBRAPA's OA repositories, including Infoteca-e and Alice, provide unrestricted access to a vast array of publications, equipped with service providers compatible with the OAI-PMH protocol, facilitating seamless automated access to their contents in open, structured, and machine-readable formats.

India (ICAR)

One pivotal aspect of ICAR's OA policy is the establishment of open access institutional repositories (OAIR) within each ICAR institute, allowing for the systematic organisation and dissemination of research outputs. Additionally, ICAR has developed a centralised repository known as KRISHI (Knowledge based Resources Information Systems Hub for Innovations in agriculture) to consolidate knowledge resources, including technology, data, publications, and learning materials, ensuring easy access for stakeholders. The policy underscores the importance of self-archiving, with an emphasis on pre-print and post-print submissions by authors to OAIRs. Moreover, ICAR advocates for OA publishing, as evidenced by the significant proportion of publications from ICAR-funded projects made available in OA mode. The policy also extends to ICAR-published journals, with efforts to transition more journals to OA status. Furthermore, ICAR's approach to patents emphasises openness while respecting legal obligations, with 654 patents in agriculture granted so far (Biswas, 2024).



Russia (RAAS)

RAAS enforces its OA policy via repository mandates and publishing incentives. Researchers must deposit publications for public access. RAAS

encourages OA journal publication, funding fees, and providing technical assistance. Driving compliance, RAAS offers recognition and rewards for OA advocacy, fostering collaboration in Russian agricultural research.

5.3 Licensing and copyright

Table2 : Usage of licensing and copyright for open content

Country	Agency	Creative Commons License
China	CAAS	CC BY
USA	USDA	CC BY or CC BY-NC
Brazil	EMBRAPA	CC BY or CC BY-NC
India	ICAR	CC BY or CC BY-NC
Russia	RAAS	CC BY or CC BY-NC

CAAS in China primarily uses Creative Commons licenses like CC BY for OA publications, enabling users to redistribute research while crediting authors, fostering wider dissemination for scientific innovation. Similarly, USDA in the USA commonly employs CC BY or CC BY-NC licenses, prioritising public access and reuse, facilitating sharing with attribution for scientific progress. EMBRAPA in Brazil adopts CC BY or CC BY-NC licenses, promoting transparency and collaboration, allowing sharing and adaptation for non-commercial purposes with attribution. ICAR in India utilises CC BY or CC BY-NC licenses, promoting transparency and availability, permitting distribution and modification for non-commercial use with proper attribution. Likewise, RAAS in Russia employs CC BY or CC BY-NC licenses, fostering transparency and cooperation, enabling sharing and modification for non-commercial purposes with attribution to drive global scientific advancement.

5.4 Compliance monitoring and enforcement

CAAS in China and the USDA in the USA enforce Open Access (OA) policies by requiring researchers to deposit publications into institutional repositories, with centralised monitoring and audits to ensure compliance. Non-compliant publications face consequences such as reputational harm or funding withdrawal. EMBRAPA in Brazil and ICAR in India employ similar mechanisms, utilising institutional repositories and mandates, with automated tools and manual checks to ensure adherence. Non-compliance risks disciplinary measures or loss of support, showcasing their dedication to research openness. RAAS in Russia also mandates OA policy adherence through institutional repositories and internal audits, with failure risking reputational damage or missed opportunities, emphasising their commitment to openness in disseminating agricultural research.



5.5 Funding and sustainability

CAAS in China ensures OA sustainability through institutional and government support, allocating funds for APCs and repository fees. Collaborating with international partners and publishers, CAAS optimises resource allocation to mitigate publication expenses and foster global knowledge exchange. Similarly, USDA in the USA secures OA sustainability via federal funding and institutional backing, with researchers accessing grants for APCs and repository costs through collaborations with federal agencies and academic institutions. EMBRAPA in Brazil and ICAR in India sustain OA initiatives via government funding, allocating resources for publishing and receiving additional support from government grants. Collaborations with national and international entities further enhance OA sustainability, promoting knowledge dissemination in agricultural research. Likewise, RAAS in Russia secures financial sustainability for OA initiatives through government funding, allocating resources for publishing expenses and collaborating with partners to reduce costs and foster collaboration in agricultural research dissemination.

5.6 International collaboration and alignment

CAAS in China collaborates internationally to advance Open Access (OA) principles, aligning with frameworks like the Budapest Open Access Initiative and Plan S, albeit without explicit endorsement. Its commitment to openness promotes knowledge exchange and collaboration in agricultural research globally. Similarly, USDA's OA policy reflects adherence to global standards such as the Budapest Open Access Initiative and Plan S, emphasising accessibility and collaboration. EMBRAPA in Brazil actively engages with international

OA standards, participating in initiatives like the Budapest Open Access Initiative and Plan S to foster openness and global knowledge exchange in agricultural research. ICAR in India aligns with international OA norms, prioritising openness and accessibility while collaborating globally to enhance knowledge exchange in agricultural research. Similarly, while not explicitly endorsing specific OA initiatives, RAAS in Russia emphasises openness and accessibility, collaborating with international entities to facilitate global knowledge exchange in agricultural research.

5.7 Impact and outreach

CAAS in China and USDA in the USA both enhance research visibility and societal impact by promoting Open Access (OA), which increases the visibility and citation rates of agricultural publications, fostering knowledge dissemination and scientific progress. Additionally, both organisations engage stakeholders through outreach efforts like webinars, conferences, and public lectures, facilitating knowledge dissemination and informed decision-making in agriculture. Similarly, EMBRAPA in Brazil and ICAR in India elevate research visibility and societal impact through OA, engaging stakeholders through activities like public lectures and policy briefs to drive knowledge dissemination and technology transfer in agriculture. Likewise, the Russian Academy of Agricultural Sciences (RAAS) promotes OA to boost research visibility and societal benefit, engaging stakeholders through public lectures and collaboration networks to drive sustainable development in Russian agriculture.

6. Discussion

An analytical discussion highlights the common patterns, unique characteristics, and potential areas for improvement identified in the article.



Common patterns

- i. **Government Support:** Across all five countries, there's a significant role played by government policies and funding in promoting OA initiatives. Whether it's through mandates, financial support for OA publishing fees, or establishing institutional repositories, governments are actively involved in driving OA in agricultural research.
- ii. **Institutional Involvement:** Academic institutions and research organisations in each country are crucial in implementing OA policies and supporting researchers in complying with OA requirements. They provide infrastructure, funding, and guidance to facilitate OA publication and data sharing.
- iii. **Collaboration:** International collaboration is a common theme, with institutions from these countries engaging in partnerships with global platforms, publishers, and research organisations. Collaborative efforts aim to enhance the visibility of research outputs, foster knowledge exchange, and drive innovation in agricultural research.

Unique characteristics

- I. **Policy objectives and scope:** Each country has distinct aims and priorities within its OA policy framework. For example, China emphasises global dissemination and accessibility, Brazil focuses on fostering collaboration, India prioritises inclusive development, while Russia emphasises

agricultural modernisation.

- ii. **Enforcement mechanisms:** While the goal of OA enforcement is similar across countries, the mechanisms vary. Some countries employ centralised monitoring and audits, while others rely on repository mandates and financial incentives to ensure compliance.
- iii. **Licensing and copyright:** There's consistency in the adoption of Creative Commons licenses across countries, promoting transparency and collaboration. However, the specific types of licenses employed may vary based on national copyright policies and preferences.

Areas for improvement

- i. **Standardisation of practices:** While there are commonalities in OA initiatives, there's a need for greater standardisation in policies, practices, and infrastructure to facilitate seamless collaboration and interoperability across borders.
- ii. **Enhanced monitoring and compliance:** Improving monitoring mechanisms and enforcing compliance with OA policies can help ensure transparency, accountability, and the widespread dissemination of research outputs.
- iii. **Sustainability:** Ensuring long-term financial sustainability for OA initiatives is crucial. Countries may explore alternative funding models, public-private partnerships, or innovative financing mechanisms to support OA publishing and infrastructure



development.

- iv. Global alignment: While countries collaborate internationally, greater alignment with global OA standards and initiatives like the Budapest Open Access Initiative and Plan S can enhance interoperability and facilitate broader knowledge exchange in agricultural research.

7. Conclusion

This comparative study of OA initiatives in agricultural research across China, the United States, Brazil, India, and Russia unveils diverse approaches and common challenges. While each country showcases unique objectives and strategies, such as China's global dissemination focus and Brazil's collaboration emphasis, common patterns emerge, including significant government support and institutional involvement. However, areas for improvement exist, such as standardising practices, enhancing monitoring, ensuring financial sustainability, and aligning with global OA standards. By addressing these challenges and building on existing strengths, stakeholders can pave the way for a more equitable and sustainable future in agricultural research, fostering collaboration, innovation, and knowledge exchange on a global scale.

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Awareness and Use of Library Automation, Digital Library Software and Reference Management Software among LIS Postgraduate Students in South Indian Universities

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Abstract

This study examines the awareness and utilisation of automation, digitisation, and reference management tools among postgraduate Library and Information Science (LIS) students in South Indian universities. A structured questionnaire was designed and personally distributed by the researcher, yielding 493 completed responses. The data were coded using SPSS version 26, with statistical tests tailored to the study's research questions. The findings reveal that Koha is the most widely used library automation software, DSpace is the most utilised digital library software, and Mendeley and Zotero are the most popular reference management tools among the students. The study suggests that increasing awareness of available software tools and addressing infrastructure-related challenges are crucial to enhancing the utilisation of automation, digitisation, and citation management tools among LIS students in South Indian universities.

Keywords: CMS, Digital library software, Library automation, LIS students, RMS

1. Introduction

ICT rapidly changes people's lifestyles, influencing how they communicate, think, discuss, and engage with information, particularly in academia (Ray Ogbonna, 2022). ICT literacy correlates with higher academic achievement, especially among students (Lei et al., 2021). Postgraduate students heavily depend on electronic and print resources for academic writing, underscoring the importance of information access (Lonergan, 2017). Digital libraries, focusing on content quality and user-centric design, significantly shape information access (Gastelú et al., 2015). ICT and information literacy significantly impact

academic literacy, yet there's a notable gap between digital competencies developed informally and those integrated into university practices (Guzmán-Simón et al., 2017). The widespread adoption of computers has rapidly transformed society, with library automation improving staff perception and enhancing user services (Mohamed et al., 2014). Moreover, institutional repositories and digital libraries are pivotal in managing and preserving digital assets and intellectual output.

The development of new technologies results in a requirement for the improvement of new human capacities. Different social and technological discoveries redesign almost



every aspect of human life, generating the need for new literacies such as ICT, digital, computer, technological, media, information, and others (Ivankovic' et al., 2013). In this context, the present study has been undertaken to know how LIS postgraduate students use library automation software, digital library software, reference management software and content management systems for their academic activities.

2. Review of literature

The primary aim of a literature review is to analyse and compare previous theoretical and empirical research, providing an overview of existing knowledge in a field. It critically examines and summarises prior studies to gain insights into a specific topic.

Kari and Baro (2014) found that Nigerian university libraries predominantly used Koha (66.7%) and SLAM (50%), with other software like VIRTUA (33.3%) also in use. DSpace emerged as the most utilised institutional repository among Nigerian students (19.4%). The study highlighted ongoing experimentation with different software options as libraries seek optimal solutions for information services, with Koha, SLAM, and VIRTUA gaining popularity. Mohamed et al. (2014) examined the impact of ICT literacy competencies among Library and Information Science students, focusing on software and technologies like Koha, SOUL, Greenstone, Joomla and Drupal. They found that the majority preferred Koha (94%), followed by SOUL (33%), with fewer students using Greenstone (24.7%), Joomla (9.3%) and Drupal (5.2%). The study suggested allocating dedicated funds to promote ICT-supported education in Kerala's higher education sector.

Melles and Unsworth (2015) studied postgraduate students at Monash University regarding their use of reference management

software (RMS). They found that the majority (71%) used RMS for reference management, with 29% not using any RMS. EndNote was the most popular RMS, while Zotero and Mendeley had low usage. Madhusudhan (2016) found that 60% of respondents occasionally used online citation tools, predominantly EasyBib (53%) and BibMe (22%). Most of these tools were used for research (78%) and literature reviews (40%), indicating awareness and primary use for academic and research purposes.

Bansode and Viswe (2017) found that most university library professionals in Maharashtra possess adequate basic ICT skills for daily operations. However, some areas, such as open-source library automation, digital library, and institutional repository software, needed improvement. Bugyei et al. (2019) found that among CSIR researchers in Ghana, Mendeley was the most widely used reference management software (RMS) at 32.8%, followed by EndNote at 25.5%. Other RMS packages included Zotero (14.5%) and Reference Manager (6.4%). Awareness of RMS mainly came from training workshops and seminars, with researchers primarily using these tools for research and literature review purposes.

Bajpai and Madhusudhan (2019) found that LIS professionals excel in automation software like LibSys (45%) and Koha (36.7%) but lack proficiency in content management software such as PHP Nuke (61.7%), Typo (60%), Joomla (45%), and Drupal (43.3%). Although they demonstrate exemplary skills in DSpace (33.3%), LIS professionals need improvement in information retrieval (IR) tools and content management software. The adoption of IoT in library automation, digitisation, web, social media, and email was reshaping the library landscape (Mondal, 2021).

Matonkar and Kumar (2021) evaluated



library students' awareness of automation software, revealing a solid familiarity with E-Granthalaya (32.39%) and NewGenLib (28.16%). However, fewer students were acquainted with D-Space (19.71%) and WordPress (14.08%), with Mendeley being the most widely used reference tool (21.12%). Nitsos et al. (2022) investigated reference management software usage, with Mendeley being the most popular (70.3%), followed by EndNote (22.1%) and Zotero (16.3%). They identified key factors influencing software choice: ease of use, free availability, and recommendations from professors, friends, and the central library.

Mhokole and Kimaryo (2022) examined postgraduate students' usage of reference management software, revealing that while the majority are familiar with it (52.8%), some remain unfamiliar (37.5%). The study noted awareness of various RMSs, such as EndNote and Reference Manager, with Mendeley being the most prevalent among university postgraduates. Hussain and Ameen (2023) found that Koha was the most used software in 27 universities, followed by SLIMS (14.8%) and LIMS (3.7%). They noted that most university libraries were in early automation stages, signaling substantial room for growth and enhancement in automation implementation.

3. Research questions

- Are students aware of and use various library automation and digital library software?
- Are students aware of and use various reference management software?
- Are students aware of and use various content management software?

4. Scope and methodology

The study is confined to postgraduate students in Library and Information Science (LIS) departments of South Indian universities, excluding those specialising in Medical Science, Agricultural Science, Engineering and Technology, Law, and open universities. South India includes the states of Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, Telangana, and the union territory of Puducherry. The focus is on assessing second-year LIS postgraduate students' ICT literacy and competencies. Of 222 universities offering PG courses in South India, only 33 offer LIS programs. These include 11 central universities, 118 state universities, 53 deemed universities, and 40 private universities. The researcher personally distributed a structured questionnaire to collect data, and 493 duly filled questionnaires were received from 525 LIS postgraduate students admitted for the 2022-2023 academic year.

4.1 Data collection tool

The questionnaire aimed to gather information on students' awareness and use of library automation software, digital library software and reference management software. Collected data was coded using SPSS version 26.0, and appropriate statistical tests were applied.

4.2 Selection of sample population

The sample population for the study was determined by employing the formula outlined by Krejcie and Morgan (1970), considering a total of 525 postgraduate students across 31 universities for the academic year 2022-23. Calculations yielded a required sample size of 438.43, rounded to 438 for practicality, given a confidence level of 99% and a margin of error of 0.025. However, the final sample size exceeded this estimate, totaling 493 postgraduate students.



This increase was due to additional students expressing interest in participating in the questionnaire surveys, surpassing the initially calculated sample size.

Distribution of respondents by universities

Name of the Universities	Respondents	Percent
Akkamahadevi Women's University, Karnat aka	09	1.83
Bangalore University, Karnataka	31	6.29
Bangalore North University, Karnataka	12	2.43
Gulbarga University, Karnataka	11	2.23
Karnatak University, Karnataka	15	3.04
Kuvempu University, Karnataka	13	2.64
Mangalore University, Karnataka	11	2.23
Rani Channamma University, Karnataka	09	1.83
Tumkur University, Karnataka	10	2.03
University of Mysore, Karnataka	26	5.27
Vijayanagara Sri Krishnadevaraya University, Karnataka	06	1.22
Kannur University, Kerala	24	4.87
University of Calicut, Kerala	29	5.88
Mahathma Gandhi University, Kerala	12	2.43
Kakatiya University, Telagana	15	3.04
Osmania University, Telagana	30	6.09
Acharya Nagarjuna University, Andhra Pradesh	07	1.42
Andhra University, Andhra Pradesh	24	4.87
Dr, B R Ambedkar University, Andhra Pradesh	34	6.90
Dravidian University, Andhra Pradesh	08	1.62
Sri Krishnadevaraya University, Andhra Pradesh	19	3.85
Sri Venkateshwara University, Andhra Pradesh	14	2.84
Alagappa University, Tamilnadu	15	3.04
Annamalai University, Tamil nadu	07	1.42
Bharathiar University, Tamilnadu	10	2.03
Bharathidasan University, Tamilnadu	10	2.03
Madurai Kamaraj University, Tamilnadu	11	2.23
Periyar University, Tamilnadu	09	1.83
Central University of Tamilnadu, Tamilnadu	13	2.64
University of Madras, Tamilnadu	11	2.23
Pondicherry University, Puducherry	38	7.71
Total	493	100



5. Data analysis and interpretation

Table 1: Demographic characteristics of the respondents

Demographic of Information		Frequency (N=493)	Percentage
Gender	Male	217	44
	Female	276	56
Social Background	Rural	390	79.1
	Urban	103	20.9

The table 1 summarises the demographic characteristics of the respondents, specifically focusing on gender and social background distribution. The table shows that 56% of respondents are female, while 44% are male. The table also shows that

79.1% of the students are from rural backgrounds, while 20.9% are from urban backgrounds. The table reveals that a significant proportion of female students have joined the LIS course.

Table 2: Awareness and use of library automation software

Library Automation Software	Aware and Use	Aware	Not Aware	f-value	P value
Koha	252 (51.1)	217 (44)	24 (4.9)	1.217	.271
LibSys	89 (18.1)	294 (59.6)	110 (22.3)	.771	.380
Libsoft	40 (8.1)	215 (43.6)	238 (48.3)	11.787	.001
NewGenlib	73 (14.8)	178 (36.1)	242 (49.1)	.033	.856
Easylib	70 (14.2)	179 (36.3)	244 (49.5)	6.368	.012
SOUL	120 (24.3)	256 (51.9)	117 (23.7)	3.191	.075
E Granthalaya	79 (16)	199 (40.4)	215 (43.6)	3.924	.048

The data in table 2 shows the awareness and utilisation of library automation software among LIS postgraduate students. The data indicates that Koha software is the most widely used among students (51.1%), followed by SOUL library automation software (24.3%) and LibSys (18.1%). However, LibSoft library automation

software appears to have the lowest usage among students (8.1%). This table indicates that a more significant number of students are not aware of Easylib. NewGenlib and Libsoft.

The One-way ANOVA results indicate significant differences in opinions among LIS students for Libsoft ($p=.001$), Easylib ($p=.012$) and E Granthalaya ($p=.048$).

Table 3: Awareness and use of digital library software

Digital Library Software	Aware and Use	Aware	Not Aware
DSpace	160 (32.5)	261 (52.9)	72 (14.6)
Greenstone	141 (28.6)	231 (46.9)	121 (24.5)
E-prints	88 (17.8)	268 (54.4)	137 (27.8)
Fedora	31 (6.3)	163 (33.1)	299 (60.6)



The data presented in table 3 shows the awareness and utilisation of digital library software among postgraduate students. This table indicates that D-Space software is the most of the students aware and used (32.5%).

Followed by Greenstone (28.6%) and E-prints (17.8%); interestingly, a notable percentage (6.3%) of the students expressed a lack of proficiency in using Fedora digital library software.

Table 4: Awareness and use of content management software

Content management software	Aware and Use	Aware	Not Aware
Drupal	42 (8.5)	238 (48.3)	213 (43.2)
Joomla	44 (8.9)	186 (37.7)	263 (53.3)
WordPress	57 (11.6)	190 (38.5)	246 (49.9)
Bluevoda	29 (5.9)	47 (9.5)	417 (84.6)
Atex	32 (6.5)	33 (6.7)	428 (86.8)
TYPO3	22 (4.5)	28 (5.7)	443 (89.9)
Kentico CMS	24 (4.9)	31 (6.3)	438 (88.8)

Table 4 shows the awareness and utilisation of content management software among postgraduate students. It indicates that WordPress is the most utilised content management software, with (11.6%) of

students using it, followed by Joomla (8.9%) and Drupal (8.5%) usage. The study observed that WordPress, Joomla and Drupal are the most widely used content management software among LIS students.

Table 5: Awareness and use of the Reference management software

Reference management software	Aware and Use	Aware	Not Aware	F-value	P value
Mendeley	86 (17.4)	199 (40.4)	208 (42.2)	5.809	.016
Zotero	56 (11.4)	154 (31.2)	283 (57.4)	.273	.601
End Note	43 (8.7)	126 (25.6)	324 (65.7)	25.170	.000
ProCite	29 (5.9)	47 (9.5)	417 (84.6)	1.819	.178
EasyBib.com	31 (6.3)	55 (11.2)	497 (82.6)	.468	.494
RefWork	23 (4.7)	52 (10.5)	418 (84.8)	2.006	.157

Table 5 shows the awareness and utilisation of reference management software among postgraduate students. It indicates that Mendeley is the most utilised reference management tool by students (17.4%), followed by Zotero (11.4%) and EndNote (8.7%) usage. Additionally, the study reveals a lack of awareness among students about EasyBib.com, ProCite and RefWorks

reference management tools.

The result of the One-way ANOVA, grouped by awareness and utilisation of reference management software, clearly shows a significant difference in the opinion among the LIS students. Only two variables exhibit substantial differences such as Mendeley ($p=.016$) and End Note ($p=.000$).

**Table 6: Reasons for unawareness of library automation, digital library, reference and content management software.**

Frequency	Male (n=217)		Female (n=276)		Both (n=493)	
	Male	%	Female	%	Total	%
Not included in the syllabus	72	33.2%	73	26.4%	145	29.4%
Lack of subject experts to teach	67	30.9%	56	20.3%	123	24.9%
Teacher has thought it, but I could not understand/learn	29	13.4%	37	13.4%	66	13.4%
Lack of availability of software	71	32.7%	77	27.9%	148	30%
Lack of computer and ICT lab facility	54	24.9%	67	24.3%	121	24.5%
Lack of information about the software	72	33.2%	65	23.6%	137	27.8%
I do not have smartphone, laptop/desktop	47	21.7%	34	12.3%	81	16.4%
I am not interested to learn	35	16.1%	21	7.6%	56	11.4%
Lack of time	35	16.1%	28	10.1%	63	12.8%

The data presented in table 6 shows the reasons for not knowing about the softwares. LIS students' primary obstacle was the lack of software availability (30%) of the respondents experiencing these challenges. Additionally, other major reasons were identified as follows: not being included in the syllabus (29.4%), lack of information about the software (27.8%), and lack of subject experts to teach (24.9%). Furthermore, the study reveals that most postgraduate students rated the lack of software availability.

6. Discussion

The study found that Koha is the most commonly used library automation software among LIS students, indicating its strong presence and acceptance in South Indian universities. However, it also revealed a significant lack of awareness about other automation tools such as Easylib, NewGenlib, and Libsoft. This suggests a need for broader exposure and training on various available software to ensure that students are well-versed with multiple tools. DSpace emerged as the most utilised digital library software, highlighting its effectiveness and popularity. On the other hand, there is a notable gap in awareness regarding content management software like Atex, Kentico

CMS, and TYPO3 among the students. In terms of reference management, Mendeley and Zotero are the most widely used tools, but there is limited awareness of other tools such as EasyBib.com, ProCite, and RefWorks. These findings suggest that while some tools are widely adopted, there is a general lack of comprehensive knowledge about the full spectrum of available resources. Postgraduate students also reported challenges such as the unavailability of software, gaps in the syllabus, and insufficient information about software, which hinder their ability to fully utilise these tools.

7. Conclusion

The study underscores the need for improved infrastructure, expertise, and device accessibility to enhance the understanding and awareness of library automation and digital library software among LIS students. The findings highlight significant gaps in the curriculum and the availability of information about various software tools. To address these issues, the study recommends better information dissemination and access to knowledgeable instructors who can provide effective guidance on software utilisation. By improving curriculum design and ensuring the availability of diverse software tools,



universities can better equip LIS students with the necessary skills and knowledge to effectively use automation, digitisation, and reference management tools in their future careers.

8. Recommendations

- a) Conduct needs assessments to identify relevant software skills and tools, and organise interactive training workshops or webinars with practical exercises.
- b) Encourage and support all genders in pursuing technical roles by providing ample software training opportunities.
- c) Integrate software tool training into the LIS curriculum with practical assignments to reinforce learning.
- d) Prioritise investment in educational institutions' software and ICT lab facilities by allocating funds for hardware, software licenses, and maintenance.
- e) Allocate funding to establish and maintain software and ICT labs, and implement training programs for educators and IT staff.
- f) Design practical training modules within the LIS curriculum that provide hands-on experience with essential software tools.
- g) Organise specialised workshops or seminars on specific software applications, conducted by industry experts or experienced professionals.

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Comparative Analysis of Digitisation and Digital Preservation Efforts in Libraries of Autonomous Institutions and Private Universities in Bengaluru

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Abstract

This research examines and compares the status of digitisation efforts in academic libraries of autonomous institutions and private universities in Bengaluru, investigating the circumstances and obstacles faced in effective information dissemination and technological considerations. A sample of 22 libraries, including 11 from private universities and 11 from autonomous colleges, was studied through questionnaires distributed to their librarians. Findings reveal that all surveyed libraries (100%) have digitisation and digital preservation policies in place, with 73.69% using DSpace software and 84.2% having librarians oversee digitisation initiatives. The study is limited to libraries in Bengaluru and highlights that university libraries are more engaged in digitisation compared to college libraries. It emphasises the need for significant contributions from stakeholders, including decision-makers, librarians, and information professionals, to continue and advance digitisation efforts. Furthermore, it stresses the importance of developing comprehensive library collections and establishing effective digital library systems to support ongoing digitisation initiatives.

Keywords: Autonomous college libraries, Digitisation, Digital libraries, Digital preservation, Private universities, Remote access

1. Introduction

Academic libraries are essential repositories of knowledge vital for navigating today's information landscape. The integration of information and communication technology (ICT) has significantly transformed library services, supporting educational, research, and learning activities in the information society. Libraries have swiftly adapted to meet the growing demand for immediate access to information. Preservation specialists in cultural heritage sectors, including libraries and archives, have long explored digitisation technologies to

safeguard digital information against physical damage and obsolescence (Conway, 2010). Digitisation involves converting analogue materials like books, audio files, images, and videos into digital formats, enabling access, storage, and manipulation via electronic devices (Buenger, 2008).

In computing, bits serve as fundamental units of information, mirroring traditional analog preservation concepts (Caplan, 2008). Digitisation enhances visibility of previously inaccessible information, facilitating simultaneous access by multiple users



(Angadi, 2021). Digital preservation techniques like reformatting, data migration, emulation, and metadata attachment ensure ongoing access to digital materials (Arora, 2006). The overarching goal of digital preservation is to certify the authenticity, reliability, and accessibility of digital heritage and knowledge for future generations. By employing these strategies, libraries and cultural institutions continue to adapt and innovate in preserving digital resources amidst the evolving technological landscape.

2. Review of literature

Nawaz (2024) conducted a study that revealed that the process of converting physical archives into digital formats is essential for the preservation, distribution, and accessibility of historical data. The study focused on the digitisation of the oldest archives in Punjab, encompassing 114,592 records selected for initial digitisation. Oguntoye (2024) emphasised the increasing responsibility of libraries in the 21st century to adopt digital preservation practices. This research explores the influence of institutional support and digital proficiency on preservation and conservation practices among library staff. It suggests that academic institutions should prioritise both digital and physical resource conservation and preservation equally. Shantha (2023) noted that institutions are initiating the digitalisation process for reasons such as content preservation (97%) and providing web access to content (84%) for numerous users. The study found that 60% of surveyed libraries digitise less than 25% of their materials annually, 30% digitise less than 50%, and 10% digitise less than 75%. Bakhshi (2016) examined the preservation strategies employed by the IGNCA center, particularly focusing on the digital preservation of cultural heritage artifacts. A case study approach was used to investigate the center's digitisation efforts. Dadzie and Walt (2015)

investigated strategic policies for enhancing digital libraries in Ghanaian universities. Through interviews with three university librarians, the study explored perspectives on planning and financial allocation for digitisation. Findings indicated that KNUST and UCC libraries have policies related to digitisation events, including IR and ICT policies. Amrohi and Chauhan (2014) highlighted the challenges faced by library professionals in preserving digital materials and recommended maintaining relative humidity for optimal preservation. Stephanie Routhier Perry (2014) observed that digitisation and digital preservation are increasingly replacing traditional preservation methods in libraries, archives, and cultural heritage institutions. Galloway (2009) emphasised the importance of maintaining the authenticity and provenance of unique and unpublished archived content. Bultmann (2006) evaluated digitisation initiatives in the UK research library and archives sector, finding that 51 participating institutions were actively involved in digitisation, with improved access to collections being a primary benefit. In 2022 Mitra and Biswas also found that scanning is the most common method used for digitisation purpose in 22 archives in Kolkata.

3. Objectives of the study

- To assess the status of digital preservation and digitisation practices within autonomous institutes and private university libraries
- To determine the availability of necessary ICT infrastructure for digitisation activities
- To identify the nature of collections undergoing digitisation and preservation efforts
- To investigate the motivations



driving digitisation and digital preservation initiatives, and analyse the obstacles encountered throughout the digitisation and preservation processes.

4. Hypothesis of the study

H1: There is no significant difference in the available infrastructure of Autonomous Institutes and Private University Libraries.

H2: There is no significant difference in the challenges faced by autonomous institutes and private university libraries in the process of digitisation and preservation activities.

5. Methodology

A survey methodology was employed to undertake "Comparative Analysis of Digitisation and Digital Preservation Efforts in Libraries of Autonomous Institutions and Private Universities in Bengaluru" A structured questionnaire was devised and

administered to librarians from Autonomous Institutes and Private Universities. 22 questionnaires were distributed randomly among librarians, and the response rate was 100%, with 22 librarians providing feedback. The sample size was determined using simple random sampling. Out of the total 16 private universities and 13 autonomous colleges in Bengaluru, 11 private universities and 11 autonomous colleges were selected for the study.

The collected data were analysed using MS Excel and SPSS, and the results were presented in tabular format, including frequencies, percentages, mean (M), and standard deviation (SD). Hypothesis testing was conducted using the Mann-Whitney U-test to examine the proposed hypotheses. The analysis revealed no significant difference between the two groups, as indicated by a p-value of 0.317, which exceeds the critical value of 0.05.

6. Data analysis and interpretation

Table 1: Demographic information

Sl. No	Variable	Values	Response	%
1	Gender	Male	16	72.73
		Female	06	27.27
2	Age	31-40	04	18.18
		41-50	13	59.09
		51-60	05	22.73
3	Institution	Autonomous	11	100
		Private university	11	100

Table 1 reveals that 72.73% of the respondents are male, while females make up 27.27%. Age distribution shows 18.18% are 31-40 years old, 59.09% are 41-50 years old, and 22.73% are 51-60 years old. The sample is predominantly male and primarily aged 41-50. All participants are evenly split between

autonomous institutions and private universities, each fully representing their category. This demographic profile provides essential background for interpreting the survey responses and understanding the participant profile in the analysis.

**Table 2: Libraries initiate digitisation and digital preservation**

Sl. No.	Response	Autonomous Institutions	Private University	Total
1.	Yes	11(100%)	11(100%)	22(100%)
2.	No	00(0.00%)	00(0.00%)	00(0.00%)

Table 2 shows that all 22 libraries surveyed, from both autonomous (11) and private universities (11), have initiated digitisation and digital preservation efforts, indicating unanimous engagement in these initiatives. There were no respondents

reporting non-participation, resulting in a 0% non-participation rate. This complete adoption underscores a widespread recognition of the importance of digitisation and digital preservation across diverse higher education institutions.

Table 3: Status of the digitisation and preservation

Sl. No.	Status	Autonomous Institution	Private University	Total
1.	Digitisation under process	00(0.00%)	00(0.00%)	00(0.00%)
2.	Digitised but preservation under process	00(0.00%)	03(57.9%)	03 (13.63%)
3.	Fully archived and provided Access	11(100%)	08(72.7%)	19 (86.36%)
	Total	11(100%)	11(100%)	22 (100%)

Table 3 elucidates the status of digitisation and preservation initiatives across autonomous and private universities. No respondents indicated their digitisation process is still ongoing, reflecting a 0% response rate for this phase. In autonomous institutions, none reported being in the stage where digitisation is complete but preservation is still in progress, resulting in a 0% response rate. Conversely, 57.9% (3

respondents) of private universities are in this phase. All respondents from autonomous institutions (100%, or 11 respondents) have fully archived and provided access to their materials, whereas 72.7% (8 respondents) of private universities have achieved this status. This indicates a higher maturity level in digital preservation among autonomous institutions compared to private universities.

Table 4: Familiar with using digital materials

Sl. No.	No. of years	Autonomous Institution	Private University	Total
1.	< 1 year	-	-	-
2.	2 years	1(9.09%)	3(27.2%)	4(21.05%)
3.	Above 2 years	10(90.90%)	8(72.8%)	18(78.94)
	Total	11	11(100%)	22(100%)



Table 4 delineates respondents' familiarity with digital materials, categorised by years of experience and type of institution: autonomous and private universities. No respondents from either category reported having less than 1 year of experience with digital materials. Among the respondents, 9.09% (1) from autonomous institutions and 27.2% (3) from private universities have 2 years of experience. A significant majority,

90.90% (10) from autonomous institutions and 72.8% (8) from private universities, have more than 2 years of experience. The table suggests that most respondents from both institution types are well-versed in using digital materials, with autonomous institutions having a slightly higher proportion of respondents with extensive familiarity.

Table 5: Digitised documents

Sl. No	Type of Materials	Born Digitised			Digitised Document			Document to be Digitised		
		A	P	Total	A	P	Total	A	P	Total
1	Rare Books	-	-	-	4(36.36%)	7(63.64%)	11(100%)	5 (45.45%)	4(36.36%)	9 (100%)
2	Project Reports	5(45.45%)	4(46.4%)	9(36.9%)	5(50.0%)	4(46.4%)	9(42.1%)	1 (12.5%)	3(57.9%)	4(21.05%)
3	Thesis/ Dissertations	4(36.3%)	5(45.4%)	9(81.8%)	2(25.0%)	3(57.9%)	5 (26.3%)	5(50.0%)	3(57.9%)	8(36.9%)
4	Faculty Publications	3(12.5%)	5(45.4%)	8(31.6%)	5(50.0%)	1(9.0%)	6 (26.3%)	3(37.5%)	5(45.4%)	8(42.1%)
5	Peer-reviewed Publications	2(12.5%)	-	2(5.2%)	5(37.5%)	3(57.9%)	9 (31.6%)	4(50.0%)	8(72.7%)	12(63.1%)
6	Back volumes	-	-	-	5(25.0%)	6(54.5%)	11 (42.1%)	9(62.5%)	2(18.1%)	11(36.9%)
7	Question papers of previous years	1(12.5%)	4(46.4%)	5(26.3%)	8(62.5%)	2(18.1%)	79(36.9%)	2(25.0%)	5(45.4%)	7(36.9%)

*A=Autonomous Institutions, P= Private University

Table 5 offers a detailed analysis of digitisation progress in autonomous and private institutions. Rare books are notably less digitised in autonomous institutions (36.36%) compared to private universities (63.6%), indicating a more advanced digitisation stage in the private sector. Autonomous institutions have a higher proportion of rare books yet to be digitised (63.64%) versus private universities (46.4%). Project reports are similarly digitised at 45.45% in autonomous institutions and 46.4% in private universities, but 57.9% of

project reports await digitisation in private universities versus 12.5% in autonomous institutions, emphasising a higher urgency in private universities. Theses, faculty publications, and peer-reviewed articles also vary in digitisation progress, with autonomous institutions generally more advanced. Both institution types face challenges in digitising rare books and back volumes, emphasising ongoing efforts in digital preservation and improving access to scholarly resources.

Table 6: Software used in digitisation

Sl. No.	Software	Autonomous Institution	Private University	Total
1.	DSpace	09(81.81%)	8(72.7%)	17(77.27%)
2.	Eprints	02(18.19%)	03(27.27%)	05(22.73%)
3.	Greenstone	00(00.0%)	00(00.0%)	00(00.0%)
	Total	11(100.0%)	11(100.0%)	22(100.0%)



Table 6 provides an overview of digitisation software preferences in both autonomous institutions and private universities. DSpace emerges as the dominant choice in both sectors, with 81.81% of autonomous institutions and 72.7% of private universities utilising this software. Eprints is also notable, used by 25.0% of autonomous institutions and 57.9% of private universities,

indicating its popularity as an alternative. Interestingly, Greenstone is not used by any surveyed institution in either sector. Overall, the table underscores the widespread adoption of DSpace for digitisation, while also highlighting Eprints as a significant alternative, particularly favoured among private universities.

Table 7: Hardware used for digitisation

Sl. No.	Devices	Autonomous Institution	Private university	Total
1.	Scanner	11(100%)	11(100%)	22 (100%)
2.	Server	8(36.36%)	08(36.36%)	16 (72.72%)
3.	Computer	11(100%)	11(100%)	22 (100%)

Table 7 outlines the hardware used for digitisation in autonomous institutions and private universities. Scanners are universally employed in autonomous institutions, utilised by 100% of respondents for digitisation. Similarly, computers are widely used, with all respondents employing them for digitisation purposes. Servers are also utilised, albeit to a lesser extent, by 36.36% of autonomous institutions. Private universities exhibit a higher prevalence of hardware used for digitisation: all surveyed institutions utilise scanners and computers, showcasing their

universal adoption. Servers are also prominently utilised, with 72.7% of private universities employing them. However, printers are notably absent from digitisation efforts in private universities, with none of the institutions reporting their use. The table underscores the critical role of scanners and computers in the digitisation processes of both autonomous institutions and private universities, highlighting their essential function in converting physical materials into digital formats effectively.

Table 8: Manpower allocation for digitisation

Sl. No.	Manpower	Autonomous Institution	Private University	Total
1.	Librarian	9(81.9%)	9(81.9%)	18(81.81%)
2.	Deputy Librarian	2(25.0%)	5(45.4%)	07(31.81%)
3.	Assistant Librarian	1(12.5%)	4(46.4%)	05(22.72%)
4.	Library Assistant	00(00.0%)	00(00.0%)	00

Table 8 highlights the manpower allocation for digitisation tasks in autonomous institutions and private universities, emphasising the central role of librarians. In both institution types, 81.9% of respondents report employing librarians for digitisation. In autonomous institutions, deputy librarians (25%) and assistant librarians (12.5%) are also involved, but

library assistants are not engaged. Private universities show a similar pattern, with deputy librarians (45.4%) and assistant librarians (46.4%) playing more significant roles than autonomous institutions, but library assistants remain uninvolved. Overall, the table underscores the predominant role of librarians in digitisation efforts across both sectors.

**Table 9: Storage media for digitised materials**

Sl. No.	Storage Media	Autonomous Institution	Private University	Total
1.	Hard Disk	03(27.27%)	01(9.0%)	04(18.18%)
2.	Cloud Computing	03(27.27%)	03(27.27%)	06(27.27%)
3.	Server	04(36.36%)	03(27.27%)	07(31.81%)
4.	3rd Party Storage	01(9.09%)	04(36.3%)	05 (22.72%)
	Total	11(100.0%)	11(100.0%)	22(100.0%)

Table 9 details the storage media used for digitised materials in autonomous institutions and private universities. In autonomous institutions, hard disks and cloud computing are equally popular, each used by 27.27% of respondents, while servers are used by 36.36% and third-party storage by 9.09%. In contrast, private universities show a different pattern: only 9.0% use hard disks,

but cloud computing and servers are each used by 27.27%, with third-party storage being more prominent at 36.3%. This indicates a diverse approach to storage, with private universities favouring cloud and third-party solutions more than autonomous institutions, suggesting a trend towards outsourcing storage needs in the private sector.

Table 10: Reasons for the digitisation

Sl. No.	Reasons for the Digitisation	Autonomous Institution	Private University
1.	Enhance the Access	11(100.0%)	9(81.8%)
2.	Remote Access	10(90.90%)	9(81.8%)
3.	Modernisation of Library Services	9(81.81%)	11(100.0%)
4.	Quick Accessibility of Records	9(81.81%)	11(100.0%)
5.	Library Policy by central bodies to maintain both Print & Electronic collection.	3(37.5%)	10(90.9%)
6.	Decline in the use of print materials	2(18.18%)	11(100.0%)
7.	Users Demand	5(45.45%)	9(81.8)
8.	24/7 access to its clients	7(63.63%)	11(100.0%)

Table 10 analyses the primary motivations for digitisation in autonomous institutions and private universities. In autonomous institutions, enhancing access to resources is cited by all respondents (100%), with 90.90% emphasising remote access and 81.81% highlighting modernisation of services and quick access to records. Similarly, in private universities, all respondents (100%) prioritise modernising

services and quick access to records, with 81.8% also focusing on enhancing access and remote access. Both institution types recognise external influences like policies mandating the maintenance of print and electronic collections and the declining use of print materials. Private universities place particular emphasis on 24/7 access to resources, noted by all respondents (100%) as a significant driver for digitisation.

**Table 11: Challenges in digitalisation and digital preservation**

Sl. No.	Challenges	Strongly Agree		Agree		Neutral		M	SD
		A	P	A	P	A	P		
1.	Data loss	3(37.5%)	5(45.4%)	4(50.0%)	4(36.3)	1(12.5%)	2(18.1%)	1.737	.7335
2.	fragility of storage media	2(25.0%)	03(57.9%)	5(62.5%)	6(54.5%)	1(12.5%)	2(18.1%)	1.895	.6578
3.	The rapid evolution of technology	2(25.0%)	03(57.9%)	5(62.5%)	6(54.5%)	1(12.5%)	2(18.1%)	1.895	.6578
4.	Selection of materials to be digitised	4(50.0%)	2(18.1%)	4(50.0%)	8(72.7%)	00	1(9.0%)	1.737	.5620
5.	Security and privacy concerns	3(37.5%)	6(54.5%)	4(50.0%)	5(45.4%)	1(12.5%)	00	1.632	.7609
6.	Lack of standards	2(25.0%)	6(54.5%)	4(50.0%)	5(45.4%)	2(25.0%)	00	1.684	.6710
7.	IPR issues	2(25.0%)	6(54.5%)	5(62.5%)	5(45.4%)	1(12.5%)	00	1.632	.5973
8.	Lack training Staff	2(25.0%)	7(63.6%)	5(62.5%)	03(57.9%)	1(12.5%)	1(9.0%)	1.632	.6840
9.	Lack of funding	4(50.0%)	6(54.5%)	4(50.0%)	5(45.4%)	-	-	1.474	.5130

Table 11 outlines the challenges in digitisation and digital preservation in libraries, revealing significant concerns such as data loss, which is strongly agreed upon by 37.5% of respondents from Autonomous Institutions and 45.4% from Private Universities. Additionally, the fragility of storage media and rapid technological changes are notable challenges, especially for Private Universities. The selection of materials for digitisation is another key issue, with Private Universities highlighting its importance more than Autonomous Institutions. Security and privacy concerns are prevalent across both groups, with a substantial percentage strongly agreeing on their significance. The lack of standards and intellectual property rights (IPR) issues suggests the need for standardised protocols and legal frameworks. The shortage of trained staff is particularly concerning for Private Universities, emphasising the need for capacity-building initiatives. Lastly, the lack of funding is a major challenge for Autonomous Institutions, underscoring the essential role of financial support in effective digitisation and preservation efforts.

7. Discussion

The findings of the study reveal a comprehensive adoption of digitisation and digital preservation policies across all libraries, indicating a sector-wide

commitment to enhancing library services and ensuring the longevity of collections. The high level of experience with digital materials among respondents (78.94% with over two years) suggests a well-established familiarity that likely streamlines the integration of digital resources into daily library operations. Prioritisation of digitising rare books and critical documents underscores their cultural and scholarly value, although the lower percentages for theses/dissertations and faculty publications suggest varying priorities or ongoing efforts. DSpace emerges as the predominant software choice (77.27%), reflecting widespread trust in its capabilities for managing digital collections effectively. The prevalent use of scanners, computers, and servers underscores robust technological infrastructures supporting digitisation endeavors. Librarians are identified as pivotal in these initiatives (81.81% responsibility), highlighting their essential role in project management and execution. Motivations for digitisation such as enhanced access, modernisation of services, and remote accessibility align with strategic goals aimed at improving user experience and expanding service reach. The adoption of diverse storage solutions like cloud computing and third-party options demonstrates flexibility in managing digital assets, albeit with concerns about data loss (42.1%) and challenges in material selection for digitisation (31.7%)



indicating ongoing operational complexities and strategic decision-making needs within library digitisation efforts.

8. Recommendations and conclusion

The study on digitisation and digital preservation in Bengaluru's libraries highlights several key recommendations for enhancing these efforts. Since all respondents recognise the importance of digitisation policies, libraries should develop comprehensive strategies with clear objectives and responsibilities. While many collections have been digitised, prioritising preservation is crucial to ensure long-term access and integrity, necessitating resource allocation for systematic preservation strategies.

The widespread familiarity with digital materials, and continuous training for librarians and staff is essential to maintain and improve digital literacy and management skills. Diversifying digitisation efforts to include audio-visual recordings, manuscripts, and archival documents will enrich digital collections beyond the commonly digitised rare books, documents, and theses/dissertations. With the predominant use of Dspace software, libraries should continue using advanced technologies to streamline processes and enhance the quality of digital collections. To address concerns about data loss and storage, robust backup and storage solutions, including cloud computing and third-party services, are necessary to protect against data corruption or loss. Proactively tackling challenges like data loss and material selection through mitigation strategies and stakeholder support will be vital for the success of digitisation and preservation initiatives.

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Empowering Democracy: analysing open government data initiatives of India and America

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Abstract

In an era characterised by rapid technological advancements and the proliferation of digital platforms, the concept of open government data has emerged as a pivotal tool in promoting transparency, accountability, and citizen engagement. This paper presents a comparative analysis of open government data initiatives in India and America, focusing on their role in empowering democracy. Drawing upon a comprehensive review of scholarly literature, government portals this study examines the evolution, implementation, and impact of open government data initiatives in both countries. It identifies key drivers and barriers shaping the adoption and effectiveness of these initiatives. By critically evaluating the strengths and weaknesses of open government data initiatives in India and America, this paper seeks to provide insights into best practices and lessons learned for policymakers, practitioners, and researchers. Ultimately, this comparative analysis contributes to a deeper understanding of the role of open government data in advancing democratic governance and fostering citizen-centric governance models in diverse socio-political contexts.

Keywords: Citizen, Data format, Data sector, Democracy, Metadata, OGD portals, Open data, Open government data (OGD), Transparency

1. Introduction

In the digital age, the concept of democracy is evolving, with technology playing an increasingly significant role in empowering citizens and promoting transparency. One of the most promising avenues through which this evolution manifests is the utilisation of Open Government Data (OGD) initiatives. These initiatives aim to make government data accessible, transparent, and usable for citizens, fostering accountability and participation in democratic processes (Biswas, Brar, & Bhabal, 2022). India and America, as two of the world's largest

democracies, have embarked on significant journeys in leveraging OGD to enhance democratic governance. From transparency in government operations to citizen engagement and decision-making, OGD initiatives have emerged as crucial tools in shaping the future of democracy in both countries.

This study delves into a comparative analysis of OGD initiatives in India and America, exploring their scope, impact, challenges, and potential for enhancing democratic principles. By examining the strategies, implementations, and outcomes of OGD initiatives in these two diverse contexts, this study aims to derive insights into the



broader implications of data-driven governance for democratic practices worldwide.

Through this comparative study, it is sought to shed light on how OGD initiatives contribute to empowering citizens, improving governmental efficiency, and fostering trust between governments and their constituents. As we navigate the complexities of modern governance and strive to uphold the principles of democracy in an increasingly interconnected world, understanding the dynamics of OGD initiative (Afful-Dadzie & Afful-Dadzie, 2017; Alexopoulos, Loukis, Mouzakis, Petychakis, & Charalabidis, 2018; Altayar, 2018; Attard, Orlandi, Scerri, & Auer, 2015; Bachtar, Suhardi, & Muhamad, 2020; Barry & Bannister, 2014; Tamang, 2024) becomes imperative. By examining the experiences of India and America, this study aims to contribute to the ongoing discourse on harnessing the power of data for the greater good of democratic societies.

2. Literature review

A large amount of literature on several facets of OGD is being generated and published in different journals including online resources. According to Braunschweig et. al. (2012) just publishing the data on the web is not enough. To truly advance the open society, the publication platforms need to fulfil certain legal, administrative as well as technical necessities. Laboutkova (2015) stated that to make real development with open government data initiatives, it was crucial for national government policies and the role of government to be as strong as possible. According to Klein, Klein and Luciano (2018) several methodical researches have been done to observe widely discussed approaches, OGD concepts and their scopes, as well as their modifications over time. Chakraborty (2018) conducted an

empirical examination of the status of the OGD initiative in India, its scope, and how the programme ranks against other countries. India has taken proactive steps toward releasing government data to public domain. Biswas (2022) depicted in a study on OGD initiatives in SAARC countries, a comparative view in the current scenario to focus on transparency and openness based on various parameters like catalogue, API, licenses, file format, social media, download option, metadata, etc. Biswas and Chakraborty (2022) presented an analysis of OGD initiatives in India disclosed the various datasets available on India's OGD portal, its contributors, access facilities for citizens and accruing benefits.

3. Significance of the study

The significance of this study lies in its potential to shed light on the crucial role of open government data in enhancing democratic processes and governance practices in two diverse but influential nations. This study aims to analyse and compare the OGD initiatives of these two nations, examining their impact on democratic processes and citizen participation. By scrutinising key metrics, trends, and outcomes, it is aimed to uncover similarities, disparities, and best practices that can inform policy decisions and drive improvements in OGD implementation. The present study makes a genuine effort to focus on the efforts of both the countries' OGD portals to promote democratic principles.

4. Objectives

The objectives of this study are as follows:

- i. To evaluate the scope and effectiveness of Open Government Data (OGD) initiatives in India and America in promoting transparency, accountability, and



citizen engagement within democratic governance frameworks

- ii. To identify key similarities and differences in the strategies, implementations, and outcomes of OGD initiatives between India and America, highlighting best practices and challenges encountered in each context
- iii. To generate insights and recommendations for policymakers, practitioners, and civil society actors to strengthen and scale OGD initiatives, leveraging lessons learned from the experiences of India and America to inform future interventions in democratic governance worldwide
- iv. To contribute to advancing scholarly discourse and policy dialogue on the transformative potential of OGD in empowering democracy and promoting inclusive, participatory governance models.

5. Methodology

This study is based on various resources containing information on OGD, portals of both countries' OGDs and each subsection of Indian and American OGD portals covering datasets. Both the websites, <https://data.gov.in> and <https://data.gov> provide quantitative and qualitative data. The data has been collected upto 20 February, 2024. The data

used in this study is based on web analytics method. Finally, the collected data has been analysed with the help of Microsoft Office software.

6. India's OGD initiative

India's journey towards open governance gained significant momentum with the launch of the National Data Sharing and Accessibility Policy (NDSAP) in 2012. This policy aimed to provide a framework for proactive disclosure of government data and promote its accessibility to citizens. The establishment of data portals like data.gov.in facilitated the dissemination of a vast array of datasets across various sectors, ranging from demographics to agriculture, empowering citizens to make informed decisions and hold authorities accountable.

7. America's OGD initiative

The United States has been at the forefront of the open data movement, with initiatives like data.gov leading the way in democratising access to government information. Launched in 2009, data.gov serves as a central hub for federal datasets, providing citizens with a treasure trove of information on topics ranging from healthcare to education. The initiative not only promotes transparency but also fuels innovation, with developers and researchers harnessing data to drive social impact and economic growth and thereby strengthening the democratic principles of justice and equality.

8. Data analysis and findings

Different datasets available on OGD portals have been presented in table 1.

**Table 1: Different topic/sectors available in on OGD portals**

Sl. No.	India		America	
	Sectors	Dataset	Topic	Dataset
1	Health and Family welfare	323,646	Agriculture	4927
2	Agriculture	139,057	Business	3110
3	Census and surveys	36,343	Climate	23002
4	Water and sanitation	29,226	Consumer	872
5	Statistics	20,686	Eco System	1157
6	Education	15,869	Education	16702
7	Transport	3,733	Energy	6520
8	Finance	2,424	Finance	1939
9	Home Affairs and Enforcement	9,147	Health	8193
10	Water resources	5,783	Local Govt.	04
11	Governance and Administration	2,065	Manufacturing	1210
12	Animal Husbandry	1,983	Ocean	1 09916
13	Environment and forest	1,548	Public Safety	3144
14	Industries	1,790	Science and Research	23377
15	Power and Energy	1,498	Transportation	18674
16	Economy	1877	Water resources	22378
17	Infrastructure	620	Energy Conversion	162
18	Travel and Tourism	620		
19	Labour and Employment	386		
20	Commerce	358		
21	Food	1255		
22	Urban	214		
23	Parliament of India	490		
24	Information and Communication	339		
25	Art and Culture	286		
26	Housing	55		
27	Rural	250		
28	Social Development	149		
29	Biotechnology	69		
30	Defence	58		
31	Youth and Sports	198		
32	Science and Technology	235		
33	Mining	101		
34	Information and Broadcasting	69		
35	Judiciary	46		
36	Foreign Affairs	11		

In table 1 government data sites of India and America provide data on various topics. In India, it is named as sectors whereas in America it is named as topics. But they are basically the same. In the case of data.gov.in (India), they provide data on 36 (thirty-six) groups like health, education, roads,

sanitation, etc. while data.gov (USA) provides 17 (seventeen) topics. From this table, it is clear that both the countries' registered data government sites are providing related kinds of information for their individual countries may be under different names.



This study highlights the democratic features of India and America which are reflected on their respective OGD portals.

Table 2: Democratic features found on India's OGD portal

Theme/ Topic	Datasets	Views	Download	API
Elections and Politics	47	1457	2061	08
Government Spending/ Finance	417	9 19 935	2 85 582	142
Legislative Proceedings	490	3 44 272	1 91 967	30
Laws and Regulations	54	2 75 215	18 703	29
Judiciary	05	4000	2880	05
Social Welfare Programmes	78	40 230	5 847	12
Citizen Services	2388	17 71 378	2 57 202	168
Environmental Conservation	931	2 36 673	1 38 447	703
Education and Literacy/	9692	518453	1,48,571	14181
Women Empowerment	7209	3 46 344	1, 00, 967	3196
Press	16	48	22	06
Human Rights	37	919	1111	19
Total	21 364	5 24 877	1 54 645	18 499

Table 2 presents some data related to democratic features of India which highlight how OGD is helping to reflect the democracy of India.

Table 3: Democratic features found on America's OGD portal

Theme/ Topic	Datasets	Views
Elections and Politics	3005	1304
Government Spending/ Finance	1,940	4865
Legislative Proceedings	12790	539
Laws and Regulations	5003	8479
Judiciary	3	No Views
Social Welfare Programs	1,209	1827
Citizen Services	185	624
Environmental Conservation	1,798	795
Education and Literacy	16,065	9911
Women Empowerment	27	No Views
Press	439	235
Human Rights	599	813
Total	43 063	29 392

Table 3 presents some data related to democratic features of America which highlight how OGD is helping to reflect the democracy of America.

The detailed analysis of table 2 and 3 reveals that:

Elections and politics

The importance of elections and politics in highlighting democratic principles cannot be overstated. Elections serve as a cornerstone of democracy, providing citizens with the opportunity to participate in governance,



exercise their right to vote, and hold their representatives accountable. India's OGD portal exhibits a commitment to elections and politics with 47 datasets available, indicating a recognition of the importance of providing access to data related to electoral processes and political activities. The moderate number of views (1457) and downloads (2061) suggests some level of citizen engagement with electoral and political data on the portal, although further efforts may be needed to enhance awareness and utilisation. Additionally, the availability of 8 APIs underscores the government's effort to promote data accessibility and facilitate the development of innovative solutions for electoral monitoring and political analysis. Conversely, America's OGD portal offers a significantly higher number of elections and politics-related datasets, totaling 3005. This demonstrates a stronger commitment to transparency and openness in electoral and political processes, potentially fostering a more robust environment for democratic participation and political accountability. The higher number of views (1304) indicates some level of citizen engagement with electoral and political data, although similar to India, further efforts may be needed to enhance awareness and utilisation. However, similar to India, the absence of information on downloads and APIs limit a comprehensive assessment of citizen involvement and utilisation of electoral and political data.

Government spending

Starting with the dataset availability, India's OGD portal offers a substantial number of 417 datasets related to Government spending/finance, indicating a commitment to transparency and accountability in financial matters. On the other hand, America's OGD portal hosts 1,940 datasets in the same category, showcasing a more extensive repository of financial data. This suggests that both countries recognise

the importance of providing access to financial information regarding government budgets, expenditures, and procurement contracts which can be used to track how public funds are allocated, monitor spending on key sectors like healthcare and education, and identify instances of financial mismanagement or corruption. This is crucial for fostering transparency and enabling informed decision-making in democratic governance. In terms of views, India's Government spending/finance datasets have garnered a significant number of views, totaling 9,19,935. This indicates a considerable level of citizen interest and engagement with financial data provided on the OGD portal, reflecting an active participation in monitoring government spending and financial activities. On the other hand, America's OGD portal records a smaller number of views, totaling 4,865, despite hosting a larger number of datasets. This could imply either a lower level of citizen awareness or interest in financial data or possibly a lack of effective promotion and outreach efforts by the government.

Legislative proceedings

As part of India's commitment to transparency and accountability in legislative activities, the OGD portal offers 490 datasets related to legislative proceedings. On the contrary, America's OGD portal hosts a significantly larger number of datasets, totaling 12,790, in the same category. This stark contrast suggests that while both countries recognise the importance of providing access to legislative information related to open access to transcripts of parliamentary debates, legislative bills, and committee reports, America has a much more extensive repository, potentially indicating a higher level of commitment to transparency in legislative proceedings. In terms of views, India's legislative proceedings datasets have garnered a notable number of views, totaling



3,44,272 along with 1,91,967 downloads. This indicates a considerable level of citizen interest and engagement with legislative data provided on the OGD portal, reflecting active participation in monitoring legislative activities. On the other hand, America's OGD portal records a much lower number of views, totaling only 539.

Social welfare programmes

India's OGD portal presents a modest collection of 78 datasets about social welfare programmes, demonstrating a dedication to transparency and accountability within social welfare initiatives. In contrast, America's OGD portal boasts a significantly larger dataset count, totaling 1,209 entries in the same category. This contrast suggests that while both nations acknowledge the significance of granting access to social welfare data, America maintains a more expansive repository, potentially signifying a greater commitment to transparency within its social welfare programmes. India's social welfare programmes datasets have received 40,230 views along with 5847 downloads. The OGD portal is attracting a considerable amount of citizen engagement and interest in social welfare data, indicating an active role in monitoring social welfare programmes. Compared to the OGD portal, America's registered only 1,827 views.

Citizen services

India's OGD portal offers an extensive collection of 2,388 datasets related to citizen services, indicating a strong commitment to transparency, accountability, and citizen engagement in public service delivery like providing data on public transportation systems, including schedules, routes, and performance metrics. Conversely, America's OGD portal hosts a much smaller number of datasets, totaling 185, in the same category. This significant difference in dataset availability suggests that while both countries

acknowledge the importance of providing access to citizen services information, India prioritises a more comprehensive approach to transparency and citizen empowerment in service provision. Concerning views, India's citizen services datasets have gathered a substantial number of views, totaling 17,71,378 along with 2,57,202 downloads. Conversely, America's OGD portal records a lower number of views, totaling only 624.

Environmental conservation

Environmental conservation is of paramount importance in highlighting democratic principles as it directly affects the well-being and rights of citizens, both present and future generations. India's OGD portal exhibits a robust commitment to environmental conservation with 931 datasets available. With 2,36,673 views and 1,38,447 downloads, there's clear evidence of citizen interest and engagement with environmental data, reflecting an informed and empowered populace actively involved in environmental stewardship. Furthermore, the availability of 703 APIs underscores the government's proactive approach to promoting data accessibility and facilitating the development of innovative solutions for environmental challenges. Conversely, while America's OGD portal hosts a larger number of datasets at 1,798, the lower views (795) indicate potentially less citizen engagement with environmental data compared to India.

Education and literacy

Education and literacy play a crucial role in highlighting democratic principles as they empower citizens to participate fully in democratic processes, exercise their rights, and make informed decisions. India's OGD portal exhibits a strong commitment to education and literacy with 9,692 datasets available. The high number of views (518,453) and downloads (148,571) suggests significant citizen interest and engagement



with educational data, reflecting an informed and empowered populace actively involved in shaping education policies and initiatives. Additionally, the availability of 14,181 APIs underscores the government's proactive approach to promoting data accessibility and facilitating the development of innovative solutions for education-related challenges. Conversely, while America's OGD portal hosts a larger number of datasets at 16,065, the lower views (9,911) indicate potentially less citizen engagement with educational data compared to India.

Women empowerment

Women empowerment is crucial for highlighting democratic principles as it promotes equality, inclusivity, and active participation of women in decision-making processes, thereby strengthening democracy. India's OGD portal exhibits a strong commitment to women's empowerment with 7,209 datasets available. The high number of views (346,344) and downloads (100,967) suggests significant citizen interest and engagement with women empowerment-related data, reflecting an informed and empowered populace actively involved in advocating for gender equality and women's rights. Additionally, the availability of 3,196 APIs underscores the government's proactive approach to promoting data accessibility and facilitating the development of innovative solutions for women empowerment. Conversely, America's OGD portal exhibits a significant gap in providing data related to women's empowerment, with only 27 datasets available and no views recorded. This signifies a potential lack of emphasis or prioritisation of women's empowerment in the context of the OGD portal.

Press

The press plays a fundamental role in highlighting democratic principles by serving as a watchdog, providing citizens with

accurate information, fostering public discourse, and holding government accountable. India's OGD portal exhibits a limited commitment to press-related data with only 16 datasets available. This indicates a potential gap in providing comprehensive access to data related to the press, which may hinder transparency and accountability in media governance. The low number of views (48) and downloads (22) further suggests a lack of citizen engagement with press-related data on the OGD portal, reflecting a potential limitation in promoting public discourse and awareness about press freedom and media issues. Additionally, the availability of only 6 APIs underscores the limited accessibility and utilisation of press-related data for innovation and development of media-related solutions. Conversely, America's OGD portal offers a significantly higher number of press-related datasets, totaling 439. This demonstrates a greater commitment to transparency and openness in media governance, potentially fostering a more robust environment for press freedom and public discourse. The higher number of views (235) indicates some level of citizen engagement with press-related data, although further efforts may be needed to enhance awareness and utilisation. However, similar to India, the absence of information on downloads and APIs limit a comprehensive assessment of citizen involvement and utilisation of press-related data.

Human rights

The importance of human rights in highlighting democratic principles cannot be overstated. Human rights form the cornerstone of democracy, ensuring that every individual is treated with dignity, equality, and fairness. India's OGD portal exhibits a commitment to human rights with 37 datasets available, indicating a recognition of the importance of providing access to data related to human rights issues. The moderate number of views (919) and downloads (1,111)



suggests some level of citizen engagement with human rights-related data on the portal, although further efforts may be needed to enhance awareness and utilisation. Additionally, the availability of 19 APIs underscores the government's effort to promote data accessibility and facilitate the development of innovative solutions for human rights advocacy and monitoring. On the other hand, America's OGD portal offers a higher number of human rights-related datasets, totaling 599. This demonstrates a stronger commitment to transparency and

openness in addressing human rights issues, potentially fostering a more robust environment for human rights advocacy and monitoring. The higher number of views (813) indicates some level of citizen engagement with human rights-related data, although similar to India, further efforts may be needed to enhance awareness and utilisation. However, similar to India, the absence of information on downloads and APIs limit a comprehensive assessment of citizen involvement and utilisation of human rights-related data.

Table 4: Most commonly used formats by Indian and American open data government portals

Sl. No.	Open Data Government Format	India	America
1.	CSV	371679	24771
2.	JSON	106591	15899
3.	XML	273	143910
4.	HTML	×	101281
5.	ZIP	39	94653
6.	PDF	×	37259
7.	KML	26	9190
8.	ODS	1	×
9.	WMS	86	9997
10	Excel	177	7702
11.	Esri REST	×	17448

Providing data in open and easily accessible formats promotes inclusivity and ensures that a wider range of users can engage with the data, fostering democratic principles of transparency and participation. It is observed that both portals have a significant amount of CSV, JSON and XML file formats.

In essence, while the choice of file formats may not directly relate to democratic principles, it indirectly impacts principles such as accessibility, transparency, interoperability, and data preservation, which are foundational to democratic governance and citizen engagement.

**Table 5: Metadata for dataset available on OGD portals**

India (data.gov.in)	America (data.gov)
1. Title	1. Title
2. Download	2. Resource Type
3. Dataset Frequency	3. Metadata created data
4. Reference URLs	4. Metadata updated date
5. Description	5. Publisher
6. Keywords	6. Unique Identifier
7. Contributor	7. Maintainer
8. Sectors and Sub Sector	8. Date First Published
9. Date released	9. Date Last Modified
10. Group name	10. Category
11. Asset Jurisdiction	11. Public Access Level
12. Category	12. Bureau Code
13. Access Method	13. Metadata Context
14. Access type	14. Metadata Catalog ID
15. App Type	15. Schema Version
16. Note	16. Catalog Described by
17. Granularity	17. Data Quality
17. NDSAP Policy Compliance	18. Data Dictionary
	19. Harvest Object Id
	20. Harvest Source Id
	21. Harvest Source Title
	22. Homepage URL
	23. Language
	24. Date Last Update
	25. Programme
	26. Source Data JSON Identifier
	27. Source Hash
	28. Source Schema Version
	29. Spatial
	30. Downloads and Resources
	31. License

It is quite pertinent from the above table 5 that the metadata are not the same for both the data government sites. It differs from government to government sites. As the preferences are different from one government to another. According to the need for different data government sites metadata for datasets varied from one site to another. Whatever it may be, there is a significant relationship between the metadata of datasets available on

OGD portals and the promotion of democratic principles. Metadata, which provides information about the datasets such as their title, description, source, format, and licensing terms, plays a crucial role in ensuring transparency, accountability, accessibility, interoperability and usability of the data

9. Discussions

The comparison of Open Government



Data (OGD) portals in India and America reveals differing approaches to addressing democratic features. India's OGD portal demonstrates a significant effort to provide access to democratic data with 21,364 datasets, accompanied by substantial user engagement, evidenced by 5,24,877 views and 1,54,645 downloads, as well as a noteworthy provision of 18,499 APIs. Conversely, America's portal presents a larger dataset count at 43,063, but with comparatively lower user engagement and a lack of download and API data. The file format distribution also varies, with India primarily offering CSV and JSON files, while America includes XML and HTML files. These distinctions suggest that while both countries prioritise data accessibility, India's OGD portal appears to excel in user engagement and API provision, whereas America's portal could enhance metadata and provide more information on downloads and APIs to bolster democratic participation and transparency.

10. Conclusion

In conclusion, the analysis of Open Government Data (OGD) initiatives in India and America underscores the importance of data accessibility, user engagement, and transparency in empowering democracy. While both countries prioritise providing access to democratic data through their OGD portals, India's efforts stand out for their robust user engagement, evidenced by high views, downloads, and API provision. Conversely, America's portal, despite hosting a larger dataset count, shows comparatively lower user engagement and lacks download, and API information. These findings highlight the need for continual improvement in OGD initiatives to enhance democratic participation and transparency. America can benefit from adopting strategies employed by India to bolster user engagement and provide more detailed downloads and API

information, ultimately advancing the democratic principles of openness, accountability, and citizen empowerment.

11. Suggestions

While analysing the OGD data available on Indian and American OGD portals some lacunas are noted. Besides improved user engagement strategies, enhanced metadata provision, greater transparency on downloads, APIs and diverse file format support, both countries should also incorporate on their respective OGD portal the following aspects:

Community engagement and feedback mechanisms: Establishing community engagement platforms and feedback mechanisms can help OGD portals in both countries understand user needs, preferences, and challenges better. This can include online forums, user surveys, and feedback forms to gather input from stakeholders and incorporate it into future portal improvements.

Collaboration with civil society and academia: Collaborating with civil society organisations, academia, and other stakeholders can foster innovation, promote data-driven research, and address societal challenges more effectively. Both India and America can encourage partnerships and collaborations to leverage the expertise and resources of external stakeholders in enhancing the functionality and impact of their OGD portals.

Regular monitoring and evaluation: Implementing regular monitoring and evaluation mechanisms can help assess the effectiveness and impact of OGD portals over time. This includes tracking key performance indicators such as user engagement metrics, dataset usage statistics, and user satisfaction surveys to identify areas for improvement and guide future enhancements.



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Beyond Books: librarians as gatekeepers in the fight against plagiarism

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Abstract

This article is focused in the potential of college librarians as agents in the fight against plagiarism and promotion of academic integrity in educational institutions. Librarians, with their deep understanding of information quality, authenticity, reliability, and relevance to the users along with providing resources and support for plagiarism prevention act as gatekeepers in the fight against plagiarism and promoting academic integrity in academia. The objective of the study was to analyse the crucial role academic librarians play in shaping academic integrity in the digital age. The data required for the study has been collected from 51 librarians working in professional and non-professional colleges in Goa state of India. Based on the review of literature it was realised that plagiarism has become a pervasive issue in academics fuelled by the ease of copy-pasting and readily available information on the Internet. The data was analysed using MS Excel and presented in the form of tables and graphs. Results revealed that librarians play a very crucial role in addressing plagiarism in academics. Study also suggests that collaborative efforts between librarian and teachers are required for the effective plagiarism prevention in academic system. The study's results validate that overcoming obstacles is important for the successful execution of plagiarism prevention strategies within educational institutions.

Keywords: Academic Integrity, Collaboration, Plagiarism detection software, Plagiarism prevention, Plagiarism, Research ethics

1. Introduction

In the digital age, with ubiquitous nature of information, plagiarism has become a big problem. Plagiarism has become a pervasive issue in academics fuelled by the ease of copy-pasting and readily available information on the Internet. This necessitates an improved focus on academic integrity, particularly within academia (Miller, 2019). Librarians, with their deep understanding of information quality, authenticity, reliability and relevance to the users act as gatekeepers

in the fight against plagiarism and promotion of academic integrity. Librarian's proficiency in resource evaluation and citation can empower students and researchers to develop a strong ethical basis for their academic pursuits (MacDonald & Dalrymple, 2018).

Librarians who stand as disseminators of knowledge and are crucial elements in the fight against plagiarism are completely ignored when it comes to academic integrity. The traditional methods of plagiarism detection and prevention relied on technology and software



based solutions. It is important to know that awareness can be created to prevent plagiarism issues. This awareness will make students understand the importance of giving credit to the original author. Thus librarians are expected to prepare students with the knowledge necessary to navigate the complexities of academic research and research misconduct by incubating a culture of academic integrity through workshops and information literacy programmes (Bender & Pezold, 2013).

1.1 Librarians and plagiarism deterrence

Plagiarism poses a significant challenge in academic settings, eroding educational integrity and undermining genuine scholarly contributions. Librarians are pivotal in combating this issue, serving as gatekeepers who uphold ethical standards in information use. This theoretical framework examines their multifaceted roles, strategies, and impacts in addressing plagiarism. Information ethics theory guides librarians in promoting honesty and respect for intellectual property, essential in fostering ethical behaviour among students and faculty. Gatekeeping theory underscores librarians' role in filtering information and guiding users toward ethical practices. Moreover, social cognitive theory highlights their influence in shaping attitudes and behaviours through role modelling and educational initiatives.

Librarians actively educate through workshops on academic integrity and citation practices, develop educational resources, and offer personalised guidance to prevent plagiarism. They collaborate with institutions to formulate and implement policies on academic honesty and utilise plagiarism detection software to enhance digital literacy. By raising awareness and collaborating with faculty, librarians cultivate a culture of academic integrity.

Through literature analysis and librarian surveys, this research explores librarians'

potential as proactive agents in promoting ethical research practices. It advocates for librarians to expand beyond traditional roles, becoming integral partners in shaping academic integrity in the digital age. By leveraging their expertise and advocacy, librarians can empower educational communities to uphold ethical standards and combat plagiarism effectively.

2. Literature review

Plagiarism, the unethical appropriation of another's work without acknowledgment, poses serious consequences for students, necessitating a comprehensive understanding to avoid academic penalties (Biswas, 2020). Gibson and Chester-Fangman (2011) underscored librarians' efforts in orienting students and collaborating with departments to address plagiarism institutionally. Drinan and Gallant (2008) highlighted librarians' crucial role in academic integrity, advocating for their involvement in knowledge creation and plagiarism prevention through workshops and faculty collaboration. Shukla and Das (2020) further emphasised the collaborative approach between teachers and librarians in raising awareness and devising strategies against plagiarism. Caravello (2008) addressed graduate and professional students' academic integrity challenges, emphasising librarians' role in educational strategies. Gunton (2022) reaffirmed librarians' contributions beyond traditional roles in promoting ethical scholarly behaviour. Kloda and Nicholson (2007) found Canadian librarians actively promoting academic integrity in research-intensive universities through information ethics discussions. Bartlett and Casselden (2011) explored librarians' attitudes toward combating internet plagiarism, advocating for collaboration between librarians and educators. Sharma and Gupta (2019) examined a university library's initiatives in India, including workshops on plagiarism detection and citation practices, demonstrating librarians'



proactive role in fostering academic integrity. These studies collectively highlight librarians' multifaceted contributions in educating, preventing, and addressing plagiarism issues within academic settings globally.

3. Objectives

1. To investigate college librarians' views on curbing plagiarism
2. To assess library activities aimed at preventing and detecting plagiarism
3. To examine collaboration within the academic community to address student plagiarism
4. To understand the obstacles encountered in the fight against plagiarism in academia.

4. Research methodology

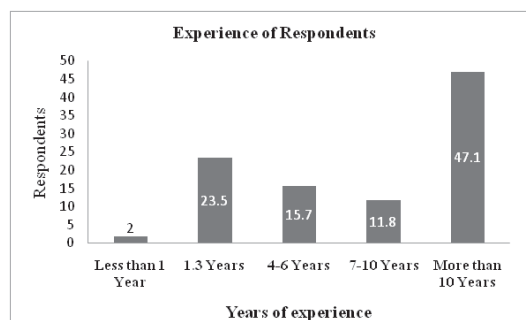
This study aimed to investigate the role of library professionals in the fight against plagiarism in Goa, India. Data was collected through Google forms and administered to participants in both professional and non-professional colleges across the state. The target population comprised library professionals in both professional (engineering, medical, law, etc.) and non-professional (arts, science, commerce, etc.) colleges in Goa. A list of all recognised professional and non-professional colleges in Goa was retrieved from the official website of Goa University. This list served as the sampling frame. The Google form included closed-ended and open-ended questions addressing the research topic. Collected data were analysed in table and figures with percentage method. MS Excel software has been used for analysing the collected data.

4.1 Sample size

The target population comprised 58 college librarians from professional and non-professional colleges in Goa. To determine the appropriate sample size for surveying a population of 58 college librarians, we used Cochran's formula for finite populations. With a 95% confidence level (Z-value of 1.96), a 5% margin of error, and an estimated population proportion of 0.5, we applied the finite population correction. This adjustment yielded a required sample size of approximately 51. This sample size ensures that the survey results will be reliable and statistically significant.

5. Data analysis and interpretation

5.1 Experience of respondents as librarian or head of the library



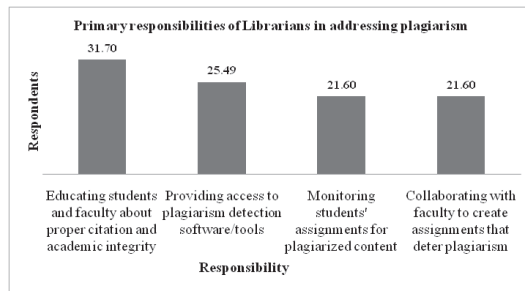
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Figure 1: Year of experience as librarian or head of the library

Figure 1 shows the distribution of responses across different experience levels. Most respondents have more than 10 years of experience, representing 47.1% of the total. The next significant group is those with 1-3 years of experience, constituting 23.5%. The remaining experience categories each contribute to the overall distribution, with less than 1 year having the smallest percentage at 2%.



5.2 Responsibilities of librarian in addressing plagiarism



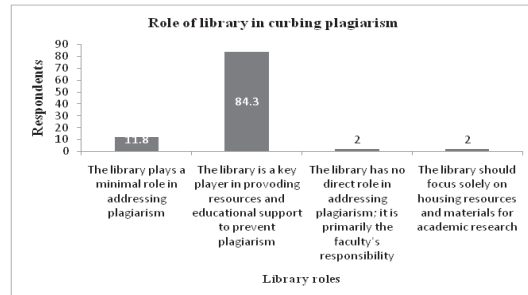
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Figure 2: Primary responsibilities of librarians in addressing plagiarism

Data in figure 2 illustrates diverse perceptions among librarians regarding their primary responsibilities in addressing plagiarism within academic institutions.

A notable percentage (31.7%) of librarians perceive their primary responsibility as educating students and faculty about proper citation and academic integrity. This emphasises the librarian's role as an educator, fostering awareness and understanding of ethical research practices. Approximately a quarter of respondents (25.49%) prioritise providing access to plagiarism detection software or tools. This reflects recognition of the technological resources libraries can offer to enhance plagiarism prevention. Similarly, 21.6% of librarians view collaborating with faculty to create assignments that deter plagiarism as their primary responsibility. This underscores the importance of cooperative efforts between librarians and faculty in designing effective anti-plagiarism measures. An equal percentage (21.6%) sees their primary responsibility as monitoring students' assignments for plagiarised content. This indicates a proactive stance in ensuring academic integrity through vigilant examination of student work.

5.3 Role of library in addressing plagiarism



(Values in the figure indicate percentage)

Figure 3: Role of the library in addressing plagiarism

In figure 3, a significant majority (84.3%) of respondents underscored the library's crucial role in providing resources and educational support to prevent plagiarism, highlighting consensus on its integral role in academic integrity. However, a minority (11.8%) view the library's role as minimal, suggesting a need for further investigation into underlying concerns. A small percentage (2%) believes the library should focus solely on housing resources, while another 2% feel plagiarism prevention is primarily the faculty's responsibility. These perspectives reveal diverse opinions on the library's functions and highlight varying expectations regarding its role in maintaining academic integrity.

5.4 Activities aimed at preventing plagiarism

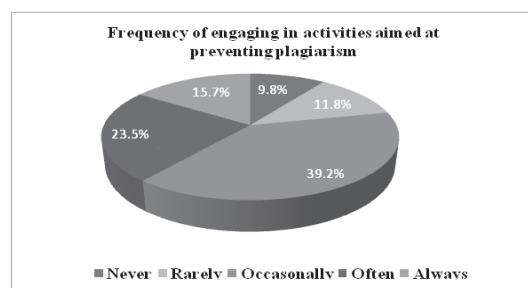
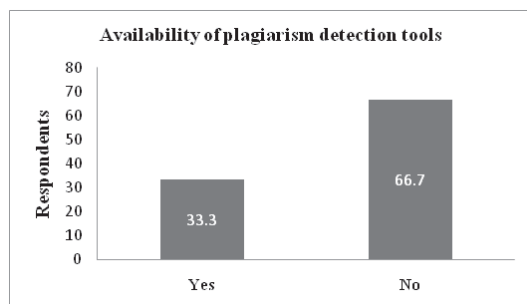


Figure 4: Frequency of engaging in activities aimed at preventing plagiarism



Figure 4 reveals the frequency of plagiarism prevention activities among library professionals, demonstrating varied levels of engagement. Approximately 39.2% participate occasionally, balancing these efforts with other responsibilities. About 23.5% are proactive, regularly integrating plagiarism prevention into their tasks. Notably, 15.7% consistently prioritise these activities, while 11.8% rarely do so, indicating potential challenges that warrant further exploration. A minority (9.8%) never engage in these activities, underscoring the need for support to enhance professional development and institutional commitment to plagiarism prevention.

5.5 Implementation of plagiarism detection software/tools within the library system



(Values in the figure indicate percentage)

Figure 5: Availability of plagiarism detection tools

Figure 5 explored the adoption of plagiarism detection software in academic libraries, revealing insights into current practices. Approximately 33.3% of respondents have implemented such tools, reflecting a proactive stance on academic integrity. Conversely, 66.7% have not adopted these tools, prompting an investigation into factors like resource limitations, institutional policies, or alternative anti-plagiarism strategies.

5.6 Different methods employed by library to check for plagiarism

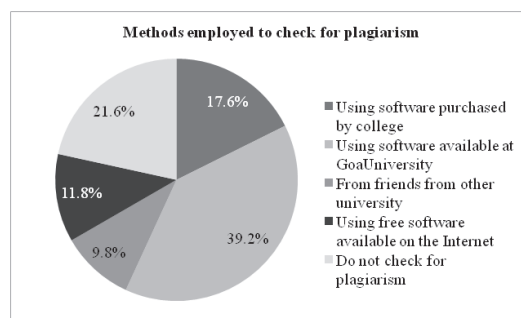


Figure 6: Methods employed to check for plagiarism

Figure 6 examines the plagiarism-checking methods used by college librarians, revealing a diverse range of strategies employed within academic institutions. A majority (39.2%) utilise plagiarism detection software provided by their university, indicating a reliance on institutional resources. However, significant portions (21.6%) do not engage in plagiarism checks, warranting further exploration into institutional practices. Some institutions (17.6%) invest in purchased plagiarism detection software, demonstrating proactive measures in preventing plagiarism. Additionally, a notable percentage (11.8%) use free online plagiarism detection tools, indicating consideration of cost-effective solutions. Small proportions (9.8%) rely on informal networks, suggesting questions about collaboration and information-sharing practices among academic institutions.



5.7 Collaborative efforts between library professionals and academic faculty in combating students' plagiarism

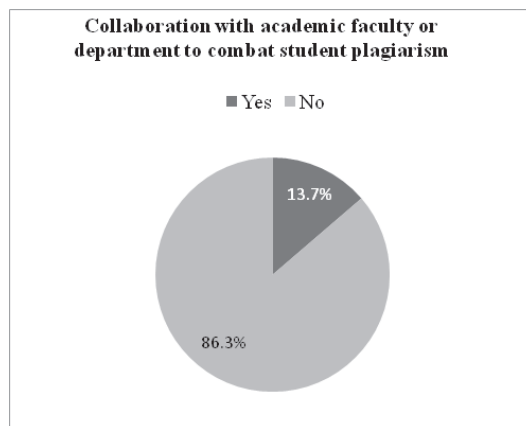


Figure 7: Collaboration with academic faculty or departments to combat student's plagiarism

Figure 7 investigates the collaborative efforts between library professionals and academic faculty in combating students' plagiarism, shedding light on the partnership level within educational institutions. Most library professionals (86.3%) reported forming partnerships or collaborations with academic faculty or departments to combat students' plagiarism. This indicates a strong commitment to a collective approach in addressing and preventing plagiarism issues. Another 13.7 % of library professional indicated that they have not formed partnerships or collaborations with academic faculty for plagiarism prevention. This raises questions about potential barriers or challenges that prevent collaborative efforts.

Table 1 reveals that a majority (70.58%) support collaborations for enhancing resources and expertise against plagiarism.

5.8 Benefits of collaboration

Table 1: Benefits of collaborations between the library and academic units in addressing plagiarism

Benefits of collaborations	Strongly disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Enhanced resources and expertise	4 (7.84)	1 (1.96)	3 (5.88)	36 (70.58)	7 (13.72)
Increased student/faculty engagement	4 (7.84)	1 (1.96)	2 (3.92)	34 (66.66)	10 (19.60)
Greater impact in combating Plagiarism	3 (5.88)	2 (3.92)	1 (1.96)	35 (68.62)	10 (19.60)

The collective skills of library professionals and faculty are valued. Additionally, 66.66% see collaborations increasing student and faculty engagement, indicating joint efforts benefit academic communities. Moreover, 68.62% believe collaborations are more

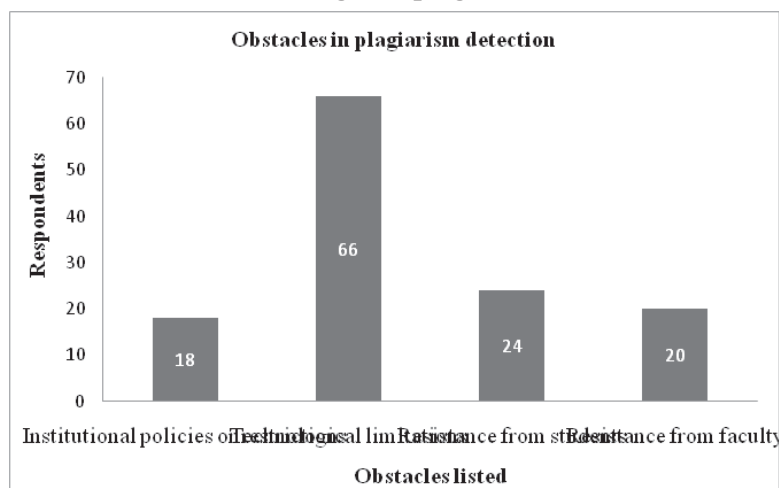
impactful in combating plagiarism, highlighting their effectiveness in strategy and outcomes.

Aure and Krupar (2001) did a similar study and they also reported that librarians play a crucial role in preventing and detecting



plagiarism by collaborating with faculty to reassess assignments and providing information on Internet paper mills and effective search strategies.

5.9 Obstacles encountered in the battle against plagiarism



(Values in the figure indicates percentage)

Figure 8: Obstacles in plagiarism detection

Figure 8 explores challenges faced by academic libraries in combating plagiarism, as reported by library professionals. Institutional policies or restrictions were noted by 18% as significant obstacles, warranting further investigation into specific hindrances. A substantial 66% highlighted technological limitations, underscoring the need to address issues related to anti-plagiarism tools and technical expertise. Resistance from students (24%) and faculty (20%) also emerged as notable challenges, requiring deeper insights for targeted interventions.

In addition to these challenges, the rise of AI-generated content in academia presents a significant concern for plagiarism detection. AI technology is increasingly capable of mimicking human writing, complicating efforts to distinguish between original and machine-generated work. This poses challenges for current plagiarism detection tools, which must evolve to effectively

identify AI-generated content. Librarians play a crucial role in staying abreast of AI advancements, updating detection methods, and emphasising the importance of proper citation practices to maintain academic integrity amidst these developments.

6. Discussion

Gibson and Chester-Fangman (2011) emphasised the pivotal role of librarians in educating students and faculty about citation practices and academic integrity. They highlighted the importance of institutional orientation programmes and professional development opportunities for librarians to enhance their teaching skills. Collaboration between library professionals and faculty is crucial in addressing plagiarism effectively in higher education. Institutions should promote communication and joint workshops to strengthen this collaboration and deter academic misconduct in writing. Libraries play a central role by providing resources and



support for plagiarism prevention and integrity promotion. Effective implementation of plagiarism prevention policies and the availability of detection software are essential. Institutions must promote awareness among faculty and students about plagiarism issues and ensure access to detection tools. Leadership support is critical in overcoming barriers to implementing these tools and fostering a culture of academic honesty.

In Nigeria, Opara and Eneh (2023) conducted a study demonstrating effective strategies in combating plagiarism, including proper referencing, citation practices, research clinics, and advocacy programs led by librarians. These initiatives significantly reduced plagiarism cases at the university level. The study underscores the effectiveness of collaborative efforts in implementing robust plagiarism prevention strategies. By prioritising the provision of plagiarism detection software, librarians enhance their capacity to detect and deter plagiarism effectively.

However, challenges in implementing plagiarism detection tools include technological limitations, and student and faculty resistance. Institutions need to address these challenges to align technological resources with educational goals effectively. Future research should explore the outcomes of plagiarism prevention strategies, such as changes in plagiarism rates and improvements in academic integrity awareness. This research would contribute to refining strategies and enhancing practices in combating plagiarism in educational settings.

7. Conclusion

Based on the analysis, researchers conclude that librarians play a crucial role in combating plagiarism through education, collaboration, addressing obstacles, and implementing strategies. However, the

emergence of Artificial Intelligence (AI)-generated content in academia presents a new challenge. Librarians must remain vigilant and proactive in adapting to these technological advancements, as AI-generated content can evade traditional plagiarism detection tools, complicating the scholarly communication process. Despite these challenges, AI has also enhanced plagiarism detection methods by analysing vast text databases and identifying similarities, including nuanced instances of paraphrasing. Librarians can leverage AI-powered tools to improve detection accuracy and efficiency, aligning with their diverse strategies that include using university-provided or purchased plagiarism detection software, free online tools, and informal networks. Collaboration between librarians and academic faculty is crucial in addressing plagiarism effectively, underscoring the need to overcome barriers to collaboration and enhance partnerships. Future research should explore effective collaborative strategies for preventing plagiarism and promoting academic integrity, recognising the benefits of enhanced resources and increased engagement that collaborative efforts can bring to maintaining academic integrity in educational settings.

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Empowering Women: exploring SheRNI's expert profiles with special reference to Library and Information Science in India

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Abstract

The She Research Network in India (SheRNI) serves as a pivotal platform dedicated to connecting and leveraging the knowledge, skills, and expertise of women across diverse sectors in India, empowering them through collaborative initiatives, mentorship opportunities, and knowledge-sharing endeavours. This study investigates the specific impact of SheRNI on empowering women professionals within the Library and Information Science (LIS) field. Utilising data extracted from SheRNI's comprehensive database, this research focuses on women experts in LIS, employing Microsoft Excel for data organisation and analysis to examine their distribution across different states and institutions. The findings underscore SheRNI's role in facilitating a diverse pool of experts across various disciplines, particularly highlighting its significant contribution to the advancement of expertise and collaborative efforts within LIS. Despite these advancements, the study reveals persistent gender disparities within the LIS profession, emphasising the ongoing necessity for initiatives that promote gender equity and inclusivity. This research contributes to existing literature by offering insights into how SheRNI empowers women professionals, specifically within the LIS domain, showcasing its effectiveness in fostering collaboration, knowledge exchange, and addressing gender disparities in professional representation.

Keywords: Empowering women, Gender wise LIS professionals, Library and Information Science, She Research Network in India (SheRNI), Vidwan women experts

1. Introduction

Empowering women or women empowerment is about ensuring that women can make choices and decisions about their own lives, have access to education, employment, healthcare, and other resources, and participate fully in society on an equal basis with men. It's essential for achieving gender equality and creating a more just and inclusive world.

Despite progress towards gender equality, women continue to face challenges

in accessing opportunities for professional growth and advancement, particularly in fields like Library and Information Science (LIS). She Research Network in India (SheRNI) emerges as a transformative platform designed to address these disparities by connecting and empowering women experts in LIS and other disciplines. This paper examines how SheRNI facilitates networking, collaboration, and knowledge-sharing among women professionals in the LIS field, ultimately contributing to their empowerment and the advancement of the sector.



2. Review of the literature

Arunachalam and Doss (2000) highlighted disparities in publication output and research impact between male and female scientists, indicating systemic barriers and inequalities that hinder women's advancement in scientific careers. Factors such as access to resources, career opportunities, and societal expectations contribute to these disparities, underscoring the need for gender-sensitive policies and interventions to promote equity and inclusion in scientific research and academia. Crawford (2019) identified that despite significant strides towards gender equality, women in fields such as Library and Information Science (LIS) continue to encounter barriers hindering their professional growth and advancement. In 2020 Biswas showed the scholarly communication trends of Indian male and women LIS professionals over LIS-Forum. Indian male LIS professionals are slightly ahead of women professionals in terms of postings but through a correlation-coefficient analysis he explained the decreasing trend of both male and women professionals on LIS-Form. Kaul and Gupta (2010) also examined gender dynamics within the LIS profession in India. They explored issues such as representation, career advancement opportunities, and challenges faced by women professionals. It highlighted disparities in leadership roles, salary scales, and workplace environments, emphasising the need for gender-sensitive policies and supportive frameworks to empower women in LIS. The research underscores the importance of addressing systemic barriers to foster inclusivity and gender equity within the profession. On the other hand, Shah, Gul, and Bhat (2023) explore in their studies, persistent disparities in representation and access to opportunities for women within the LIS sector, including under representation in leadership roles and salary discrepancies

compared to their male counterparts. In response to these challenges, the She Research Network in India (SheRNI) has emerged as a transformative platform dedicated to empowering women experts across various disciplines, including LIS.

3. Objectives of the research

The objectives of the research are

- To investigate the She Research Network in India's (SheRNI) role in empowering women in different subjects
- To explore SheRNI's impact on women's professional development, networking, and contributions to LIS
- To provide valuable insights into the distribution and roles of LIS experts within SheRNI for stakeholders' use
- To explore gender disparities among LIS professionals in India and propose strategies for achieving gender equity

4. Methodology and limitations of the study

The methodology for this study involves extracting data from the She Research Network in India (SheRNI) database, accessible via <https://sherni.inflibnet.ac.in/irins/w/searchc/search>. The extraction process focused on filtering the data initially by subject area, specifically targeting Social Science, and then narrowing it down to the subset related to Library and Information Science (LIS). Within the LIS subset, further filtering was applied based on criteria such as state-wise distribution, organisation, and designation of experts. Microsoft Excel has been used for organising and analysing the filtered data, allowing for descriptive statistics such as counts to be generated. These statistics facilitated the interpretation of data



regarding the distribution and characteristics of LIS experts within the SheRNI network.

However, it's important to acknowledge certain limitations inherent in the study. These include potential biases in data availability and interpretation, the exclusive focus on LIS within the Social Sciences domain, and the temporal scope limited to data available as of 31st March 2024. Despite these constraints, the methodology provided a systematic approach to examining the profile of LIS experts within SheRNI, offering valuable insights into their distribution and roles within the network.

5. About She Research Network in India (SheRNI)

She Research Network in India (SheRNI) serves as a robust platform connecting women experts across diverse domains. It aims to empower women through collaboration, mentorship, and knowledge sharing. SheRNI establishes a nationwide expert profile system for women faculty, fostering exchange of expertise and experiences. By supporting women scientists and faculty, SheRNI cultivates resilient networks for collaboration, mentorship, and career growth. It enables professionals to connect, collaborate, and empower each other, contributing to women's advancement and professional empowerment in India's academic landscape.

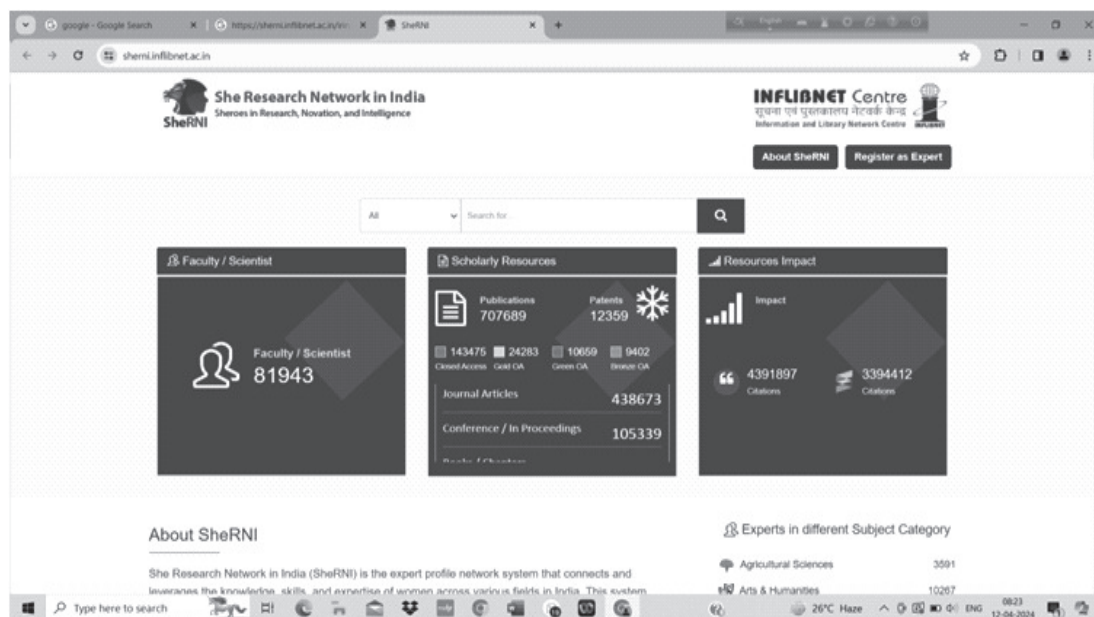


Figure 1: Overview of the participation of women in She Research Network in India (SheRNI)

Source: <https://sherni.inflibnet.ac.in/>



SheRNI, the She Research Network in India, focuses on engaging 81,943 faculty members and scientists, offering a robust platform for academic professionals. The network boasts a substantial scholarly repository comprising 707,689 resources, predominantly publications, alongside 12,359 patents, illustrating a commitment to innovation. Resource accessibility is diverse: 10,659 resources are Gold Open Access, 9,402 are Green Open Access, while 24,283 remain closed access, balancing open dissemination with subscription-based access. Scholarly outputs within SheRNI

primarily include 438,673 journal articles, 105,339 conference papers, and 35,186 books or chapters, with an additional 128,491 resources in diverse formats. Impact metrics reflect the network's scholarly influence, with a total resource impact of 4,391,897 and 3,394,412 citations, demonstrating significant academic contribution and global reach. SheRNI thus plays a pivotal role in fostering scholarly discourse, knowledge dissemination, and innovation within India and beyond, underlining its importance in advancing academic research and intellectual property generation in the region.

6. Data analysis and interpretations

6.1 Women experts in different subject category in SheRNI network in India

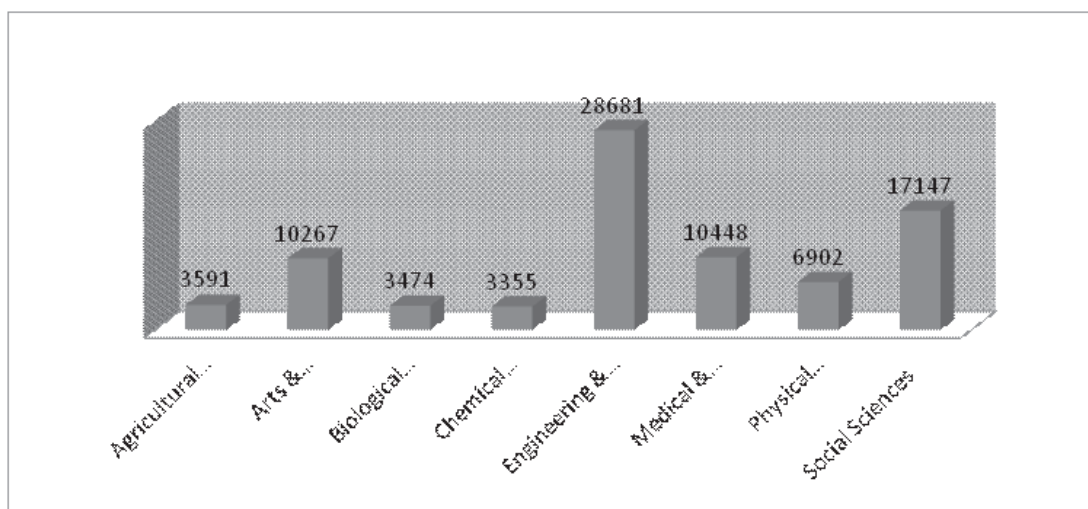


Figure 2: Women experts in different subject category

Figure 2 illustrates SheRNI's diverse expertise across subject categories. In agricultural sciences, 3,591 experts specialise in agronomy and crop science. The arts and humanities benefit from 10,267 experts in literature, history, and philosophy. Biological sciences feature 3,474 experts in biology and genetics. Chemical sciences have 3,355 experts in chemistry and chemical

engineering. Engineering and technology are robust with 28,681 experts in fields like mechanical engineering and IT. Medical sciences include 10,448 experts in biomedical research and public health. Physical sciences boast 6,902 experts in physics and geology. Social sciences are supported by 17,147 experts in psychology, sociology, economics, and political science. These categories



highlight SheRNI's interdisciplinary collaboration and knowledge exchange among diverse academic professionals.

6.2 Top 10 subject areas in SheRNI

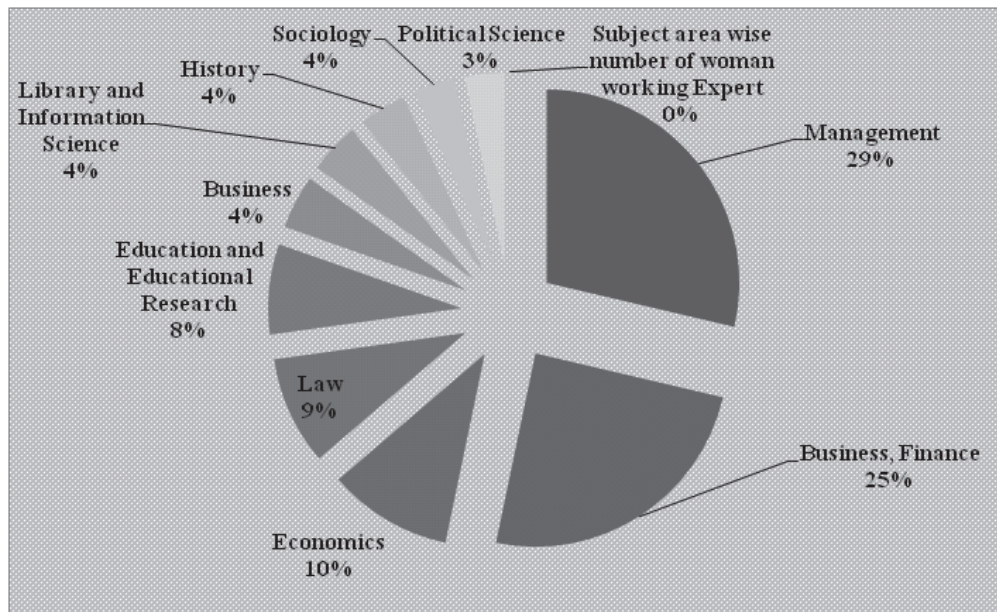


Figure 3: Top 10 subject areas with the highest number of women experts in Social Science

Figure 3 illustrates the top 10 subject areas within the She Research Network in India (SheRNI), showcasing the breadth of expertise across disciplines. Management leads with 3,562 experts (29%), spanning business management, organisational behaviour, and leadership. Business and Finance follow closely with 3,058 experts (25%), contributing to areas like corporate finance and financial management. Economics features prominently with 1,298 experts (10%), focusing on economic theory and policy analysis. Legal expertise includes 1,130 experts (9%), covering constitutional and international law. Education and Educational Research are supported by 938 experts, emphasising pedagogical research. Categories such as Library and Information Science (532 experts), History (497),

Sociology (436), and Political Science (414) highlight SheRNI's interdisciplinary nature, fostering collaboration and knowledge exchange. These subject areas underscore the network's role in enriching research and scholarship, facilitating interdisciplinary dialogue among professionals in India and globally.

6.3 The number of experts registered in (SheRNI) within the field of Library Science

The total number of registered women professionals in the She Research Network in India (SheRNI) within the field of library science is 532 and the top 20 states in India by the number of experts registered in the She Research Network in India (SheRNI) specifically within the field of library science, it is represented by the figure 4.

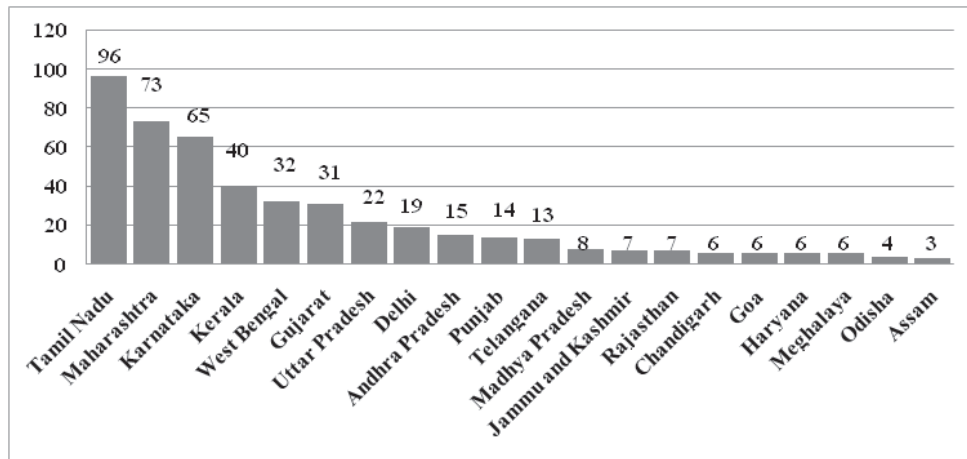


Figure 4: State-wise number of women working experts in LIS

The figure 4 provides a breakdown of the number of experts within the She Research Network in India (SheRNI) across different states and union territories. Tamil Nadu leads with the highest number of experts at 96, followed by Maharashtra with 73, and Karnataka with 65. Kerala, West Bengal, and Gujarat also feature prominently with 40, 32, and 31 experts respectively. Other states such as Uttar Pradesh, Delhi, and Andhra Pradesh contribute with 22, 19, and 15 experts

respectively. However, some states have fewer representatives, such as Assam, Odisha, and Meghalaya with 3, 4, and 6 experts respectively. Additionally, several states and union territories have only 1 or 2 experts each, indicating a lower representation within the SheRNI network. This distribution highlights the varying levels of participation and engagement across different regions, with certain areas having a more significant presence of experts compared to others.

6.4 Top 20 designation-wise number of experts registered SheRNI specifically within the field of Library and Information Science

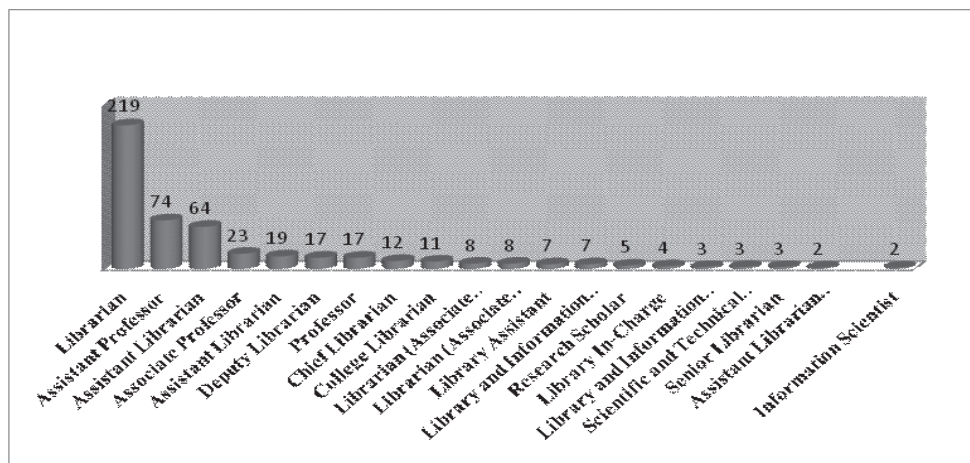


Figure 5: Designation-wise number of women experts in LIS



Figure 5 provides insights into the distribution of experts registered in the SheRNI within the field of Library Science, categorised by designation. The data reveals that Librarians constitute the largest group, with 219 experts registered, followed by Assistant Professors (74) and Assistant Librarians (64). Other significant designations include Associate Professors (23), Deputy Librarians (17), and Professors (17). Additionally, designations such as Chief Librarian, College Librarian, and Librarian in

the Associate Professor Scale each have notable representation, with 12, 11, and 8 experts respectively. Furthermore, there is diversity in designation, with various roles such as Library Assistant, Research Scholar, and Library In-Charge also represented, albeit in smaller numbers. This distribution provides valuable insights into the professional landscape within Library Science and highlights the diverse roles and expertise contributing to the SheRNI network in this field.

6.5 Number of women working experts in LIS registered in several institutes in the SheRNI specifically within the field of Library and Information Science

Table 1 : Number of women working experts in LIS

Sl. No.	Number of Women Working Experts in LIS	Number of Institute in India where Women Working Experts in LIS
1	10	1
2	6	1
3	5	2
4	4	7
5	3	12
6	2	58
7	1	110

Table 1 provides an overview of the distribution of women working as experts in Library and Information Science (LIS) across institutes within the She Research Network in India (SheRNI). The data highlights a spectrum of representation, with varying numbers of experts at different institutes. Notably, one institute boasts a substantial presence, hosting 10 women working as experts in LIS, indicating a concentrated expertise within that institution. Similarly, another institute accommodates 6 experts, demonstrating a significant concentration of expertise. Additionally, two institutes have 5 experts each, while 7 institutes have 4 experts

each, further showcasing the diversity in representation across institutions. Furthermore, 12 institutes have 3 experts each, reflecting a broader distribution of expertise. However, the most prevalent scenario is observed in institutes hosting 2 women working as experts in LIS each, with a total of 58 institutes falling into this category. Additionally, a substantial number of institutes, totalling 110, have 1 woman working as an expert in LIS, indicating a widespread but distributed presence of expertise across various institutions within the SheRNI network.



6.7 Top 50 names of organisations where varying numbers of experts registered in the She Research Network in India (SheRNI) specifically within the field of Library Science

Table 2: Name of the institute and number of working experts

Sl No	Name of the Institutes	Number of Working Experts
1	Information and Library Network Centre	10
2	Annamalai University	6
3	Rajagiri College of Social Sciences	5
4	University of Jammu	5
5	Calcutta University	4
6	Cochin University of Science and Technology	4
7	Kannur University	4
8	Panjab University, Chandigarh	4
9	SNDT Women's University	4
10	Tamil Nadu Veterinary and Animal Sciences University	4
11	University of Mumbai	4
12	Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore	3
13	Banaras Hindu University	3
14	Gandhi Institute of Technology and Management	3
15	IIMT University	3
16	Justice Basheer Ahmed Sayeed College for Women	3
17	Mangalore University	3
18	Nirmala College for Women, Coimbatore	3
19	North-Eastern Hill University	3
20	Parul University	3
21	Punjabi University	3
22	University of Kashmir	3
23	University of Kerala	3
24	ATME College of Engineering, Mysore	2
25	Adamas University	2
26	Andhra Loyola Institute of Engineering and Technology	2
27	Anna University	2
28	BLDEA's Commerce BHS Arts and TGP Science College, Jamkhandi	2
29	BLDEAS Basaveshwar Arts & Commerce College, Basavanbagewadi	2
30	Babasaheb Bhimrao Ambedkar University	2
31	Bahirji Smarak Mahavidyalaya, Vasmat	2
32	Bangalore University	2
33	Bharati Vidyapeeth	2
34	Bundelkhand University	2
35	Central University of Tamil Nadu	2
36	Cherran College for Women	2
37	Chhatrapati Shahu Ji Maharaj University	2
38	Doon University	2
39	Dr. Babasaheb Ambedkar Open University, Ahmedabad	2
40	Dr. C.V. Raman University	2
41	Farook College	2
42	Fatima College	2
43	G Narayanamma Institute of Technology and Science (For Women)	2
44	Gujarat University	2
45	Holy Cross College (Autonomous), Nagercoil	2
46	Holy Cross Home Science College	2
47	Indian Institute of Management Kozhikode	2
48	Integral University	2
49	Jain University	2
50	Karnataka State Open University	2



Table 2 lists the top 50 organisations with experts registered in SheRNI's library science domain, showcasing a diverse array of institutions contributing expertise. Leading the list is the Information and Library Network Centre with 10 experts, followed by Annamalai University with 6. Institutions like Rajagiri College of Social Sciences, University of Jammu, and Calcutta University each host 5 experts. Others such as Cochin University of Science and Technology, Kannur University, and Panjab University, Chandigarh, have 4 experts each. Several

institutions, including Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, and Banaras Hindu University, accommodate 3 experts each. Additionally, BLDEA's Commerce BHS Arts and TGP Science College, Jamkhandi, and Bangalore University have 2 experts each. This comprehensive distribution highlights collaborative efforts across SheRNI, enhancing knowledge dissemination and advancing Library Science throughout India.

6.8 Comparison of male and female ratio of LIS professionals in India

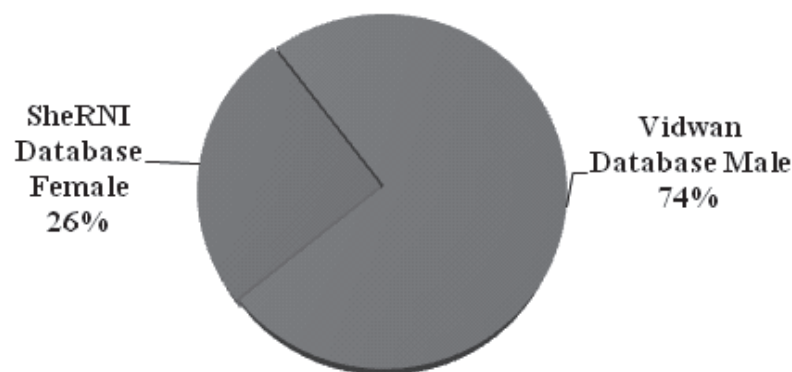


Figure 7: Male and female ratio of LIS professionals in India

Based on data from the Vidwan and SheRNI databases, gender disparities in Library and Information Science (LIS) professionals in India are pronounced (Figure 7). Of the total LIS professionals, 1,544 (74%) are male, while 532 (26%) are female, revealing a significant gender imbalance. Addressing these disparities is crucial for promoting diversity and inclusivity within the LIS field. Efforts to support female participation through education and professional development initiatives are essential to mitigate this gap and create a more representative workforce. Khan and Mondal (2021) underscore these challenges, noting specific data from the Vidwan database,

where West Bengal has 4,015 experts, with 627 in social sciences and 40 in Library and Information Science across various institutes and research organisations.

7. Findings

The analysis of SheRNI's participation underscores a strong presence of women experts, engaging 81,943 faculty members or scientists. The network hosts a substantial scholarly repository with 707,689 publications and 12,359 patents, emphasising innovation and intellectual property. Resource accessibility shows a balance between open dissemination and restricted access, with a significant portion remaining



closed. Scholarly outputs encompass diverse formats like journal articles, conference proceedings, and books, reflecting comprehensive academic contributions. SheRNI's impact metrics reveal substantial influence, with a total resources impact of 4,391,897 and 3,394,412 citations. The network's multidisciplinary nature is evident through a diverse pool of experts across various subject categories.

In terms of geographical distribution, Tamil Nadu leads with 96 experts, followed by Maharashtra (73), and Karnataka (65). Kerala, West Bengal, and Gujarat also feature prominently with 40, 32, and 31 experts respectively. Librarians constitute the largest group (219 experts), followed by Assistant Professors (74) and Assistant Librarians (64). Other notable designations include Associate Professors (23), Deputy Librarians (17), and Professors (17). The study highlights expertise dispersed across various institutions within the SheRNI network. Key institutions hosting experts include Information and Library Network Centre (10 experts), Annamalai University (6), Rajagiri College of Social Sciences, University of Jammu, and Calcutta University (5 each).

Gender analysis reveals a significant disparity, with 1,544 male LIS professionals (74%) compared to 532 females (26%), underscoring the need for initiatives to promote gender equity within the field.

8. Conclusion

The SheRNI reveals a commendable effort towards fostering collaboration, knowledge exchange, and professional growth among women experts across various fields. The network's diverse representation of experts spanning different subject categories underscores its commitment to interdisciplinary collaboration and inclusivity. Additionally, the significant participation in library science highlights SheRNI's role in advancing expertise and promoting collaboration within this

domain. However, the observed gender disparity within the LIS profession emphasises the ongoing need for initiatives aimed at promoting gender equity and inclusivity. Despite the progress made, addressing these disparities requires sustained efforts to encourage and support female participation in education and professional development.

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***PRAJÑĀ* (Journal of Banaras Hindu University) : exploring through bibliometric analysis**

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Abstract

This article delves into a comprehensive bibliometric analysis of the *Prajñā* journal, meticulously scrutinising 505 articles published between 2014-2015 and 2019-2020, spanning six years. The study meticulously evaluates various parameters including the total count of authors, authorship patterns, year-wise article distribution, reference allocation, language utilisation, and the extent of collaborative efforts, alongside author productivity. Employing bibliometric analysis as the methodological framework underscores the rigor of this investigation. The findings elucidate that the *Prajñā* journal maintained a biannual publication frequency from 2014 to 2020, encompassing 505 articles authored by 810 individuals. Remarkably, single-authored contributions constituted 240 articles (47.52%), while collaborative endeavours yielded 265 articles (52.48%). The degree of collaboration within the *Prajñā* journal was quantified utilising Subramanyam's formula, revealing a consistent output of 505 articles over the six years. Moreover, the cumulative citations of published articles amounted to 7,588 references, with a notable emphasis on contributions from multiple authors.

Keywords: Authorship pattern, Banaras Hindu University, Bibliometric analysis, Citation analysis, Collaboration in research, *Prajñā* journal, Scholarly publications

1. Introduction

The term "bibliometric" is derived from two Greek words, '*biblion*' meaning 'book' and '*metrikos*' meaning 'measure'. In 1969, Alan Pritchard introduced the English version of bibliometric in his paper titled "Statistical Bibliography or Bibliometric," defining it as the "mathematical and statistical applications of methods to magazines, books, and other communication media." (Bibliometrics - Wikipedia, n.d.). Bibliometric analysis entails the application of statistical and mathematical techniques to analyse various forms of publications such as books and

articles. This method involves evaluating the quality of journals, guiding publication development through quantitative assessments, and serving as a means to authenticate articles.

Prajñā

The *Prajñā* journal stands as a distinguished research publication affiliated with Banaras Hindu University, maintaining a biannual publication frequency since its inception in 1958 (*Banaras Hindu University, Varanasi*, 1958). It serves as a platform for disseminating scholarly articles across



various domains of Prachi (प्राची) and Pratichi (प्रतिची) knowledge, spanning Hindi, English, and Sanskrit languages. Moreover, it remains steadfast in its mission to perpetuate the visionary ideals of the university's founder through the enrichment of scholarly discourse. With an ISSN of 0554-9884, this journal holds a coveted position within Group B of the UGC CARE list (Banaras Hindu University, 1958).

2. Literature review

Several notable bibliometric analyses have been conducted recently across diverse journals. Selvam and Amudha (2020) explored 176 Library and Information Science journals from the Directory of Open Access Journals, identifying 53,959 articles. Chawla and Goyal (2021) analysed 234 articles from the Web of Science, examining citations and keywords across operational processes, social aspects, applied applications, and organizational impact. Farooq (2021) utilised systematic mapping to assess 669 studies in Knowledge Management from 1997 to 2021, offering insights into theoretical advancements. Aulianto, Annisa and Taufiqi (2021) reviewed 75 articles from Jurnal Lingkungan Dan Bencana Geologi, focusing on authorship patterns and collaborative research. Naheem and Shibu (2015) studied knowledge and communication management, noting publication trends and authorship patterns from 2011 to 2014. Singh (2010) evaluated Banaras Hindu University's chemical literature from 2000 to 2006, emphasising biochemistry's dominance. Bapte (2017) analysed 295 articles in the DESIDOC Journal of Library & Information Technology from 2011 to 2015, highlighting authorship and citation patterns. Garg, Lamba and Singh (2020) scrutinised 1,698 papers in DESIDOC Journal of Library & Information Technology from 1992 to 2019, revealing publication

peaks and international authorship distributions. Partap (2018) reviewed the Indian Journal of Agricultural Library and Information Services from 2008 to 2016, focusing on authorship and collaboration trends. These studies provide comprehensive insights into evolving research landscapes across various disciplines, offering valuable perspectives for scholars and practitioners alike.

3. Objectives

- i) To observe the article distribution pattern during the study period of *Prajñā* Journal from 2014-15 to 2019-20
- ii) To identify the authorship patterns of published articles
- iii) To identify the pattern of language in published articles
- iv) Volume and issue-wise determination of the average number of published articles
- v) To probe the distribution of reference patterns and the average of references per article.

4. Limitations and scope of the study

The scope of this review is delimited to an analysis of distribution patterns within the 6 volumes (12 issues) of the multidisciplinary journal *Prajñā*, published from 2014 to 2020. This study encompasses a comprehensive examination of all 505 articles published within this time frame.

5. Methodology

The requisite data for this analysis was sourced from the online edition of the *Prajñā* journal, accessible at https://bhu.ac.in/research_pub/pragya.php. Extracted from the 6 volumes (12 issues) of this multidisciplinary journal spanning 2014 to 2020, the data was aggregated in alignment with the study's



objectives. Notably, *Prajñā* being a semi-annual publication necessitated the collection of data from all available volumes during the specified period for statistical inference. Subsequently, the encoded data was organised in an MS Excel sheet for result interpretation.

6. Data analysis

6.1 Volume and issue-wise article distribution

Table 1 presents a comprehensive overview of the article distribution within the

Prajñā journal from 2014-15 to 2019-20, focusing on contributions by prolific authors. Notably, a total of 505 articles were published during this period. Analysis reveals intriguing trends: in 2014-15, volume 60 witnessed a peak with 113 articles, while volume 62 in 2016-17 saw the lowest count of 41 articles due to the concurrent release of two issues. Moreover, volumes 64 and 65 of 2018-19 and 2019-20 showcased 84 articles each, whereas volumes 61 and 63 of 2015-16 and 2017-18 boasted 96 and 87 articles respectively, delineating the evolving landscape of scholarly contributions.

Table 1: Article distribution (volume and issue-wise)

Articles distribution						
Publication year	Vol. No.	Issues	Issue 1	Issue 2	Total publications (%)	μ articles/issue
2014-15	60	2	40	73	113 (22.38)	56.50
2015-16	61	2	42	54	96 (19.01)	48.00
2016-17	62	2	41	-	41 (8.12)	20.50
2017-18	63	2	40	47	87 (17.23)	43.50
2018-19	64	2	49	35	84 (16.63)	42.00
2019-20	65	2	47	37	84 (16.63)	42.00
Total		12	259	246	505	

Figure 1: Total Publications (%)

- 2014-15
- 2015-16
- 2016-17
- 2017-18
- 2018-19
- 2019-20

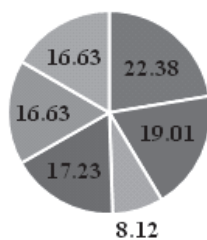
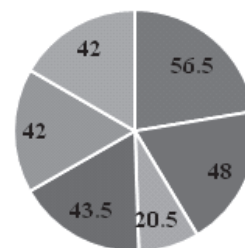


Figure 2: μ articles per issue

- 2014-15
- 2015-16
- 2016-17
- 2017-18
- 2018-19
- 2019-20





6.2 Authorship pattern (volume-wise):

Table 2: Volume-wise authorship pattern

Publication Year	Volume number	1 Author (issue 1 st +2 nd)	2 authors (issue 1 st +2 nd)	3 authors (issue 1 st +2 nd)	4 authors (issue 1 st +2 nd)	5 authors (issue 1 st +2 nd)	6 authors (issue 1 st +2 nd)	Total
2014-15	60	16+35	24+26	0+8	0+3	0+0	0+1	113
2015-16	61	16+37	26+10	0+6	0+1	0+0	0+0	96
2016-17	62	11	29	0	1	0+0	0+0	41
2017-18	63	20+20	17+26	3+1	0+0	0+0	0+0	87
2018-19	64	22+17	26+18	0+0	0+0	1+0	0+0	84
2019-20	65	23+23	20+13	4+1	0+0	0+0	0+0	84
Total		240	235	23	5	1	1	505

Table 2 presents the authorship pattern across volumes of this journal, revealing that among the 505 articles published, 240 were authored by individuals, 235 by two co-authors, 23 by three authors, and 7 by more than four authors. This analysis underscores the significant influence of single and two-

author articles on the publications within the *Prajñā* journal.

6.3 Authorship pattern(issue-wise):

Table 3 provides a detailed and accurate depiction of the distribution patterns of authorship across individual issues.

Table 3: Authorship pattern (issue-wise)

		Distribution			
Sl. no.	Authors types	Issue 1 st	Issue 2 nd	Total articles (%)	Cumulative articles (%)
1	1 author	108	132	240 (47.52)	240 (47.52)
2	2 authors	142	93	235 (46.53)	475 (94.05)
3	3 authors	7	16	23 (4.55)	498 (98.60)
4	4 authors	1	4	5 (1.00)	503 (99.60)
5	5 authors	1	0	1 (0.20)	504 (99.80)
6	6 authors	0	1	1 (0.20)	505 (100)
Total		259	246	505	

6.4 Author productivity of the articles

Table 4: Author productivity

Publication year	Total publications	Total authors	μ publication per author
2014-15	113	193	0.59
2015-16	96	147	0.65
2016-17	41	73	0.56
2017-18	87	138	0.63
2018-19	84	132	0.64
2019-20	84	127	0.66
Total	505	810	0.62



The data presented in table 4 offers insight into the published article productivity of authors within the *Prajñā* journal spanning 2014-15 to 2019-20. Notably, the average publication per author stands at 0.62, derived from a pool of 810 authors contributing to

505 articles. Interestingly, the average author productivity within this journal exhibits fluctuations over time, showcasing both a decrease and an increase across the observed period.

6.5 Language pattern of articles

Table 5 : Language pattern of articles

Vol. No.	Articles Language			Total (%)
	Hindi (%)	English (%)	Sanskrit (%)	
60	48 (9.50)	57 (11.29)	8 (1.58)	113 (22.37)
61	56 (11.09)	38 (7.52)	2 (0.40)	96 (19.01)
62	33 (6.53)	7 (1.39)	1 (0.20)	41 (8.12)
63	64 (12.67)	17 (3.37)	6 (1.19)	87 (17.23)
64	62 (12.28)	16 (3.17)	6 (1.19)	84 (16.64)
65	53 (10.50)	23 (4.55)	8 (1.58)	84 (16.63)
	316 (62.57)	158 (31.29)	31 (6.14)	505 (100)

Table 5 presents an insight into the language preferences observed in the articles. *Prajñā*, being a multidisciplinary journal, showcases a diverse linguistic landscape with articles predominantly published in three languages: Hindi, English, and Sanskrit. Analysis of the journal revealed that Hindi

(62.57%) emerged as the predominant language choice, trailed by English (31.29%) and Sanskrit (6.14%) respectively, underscoring the linguistic richness of its content. The graphical presentation has been given in figure 3.

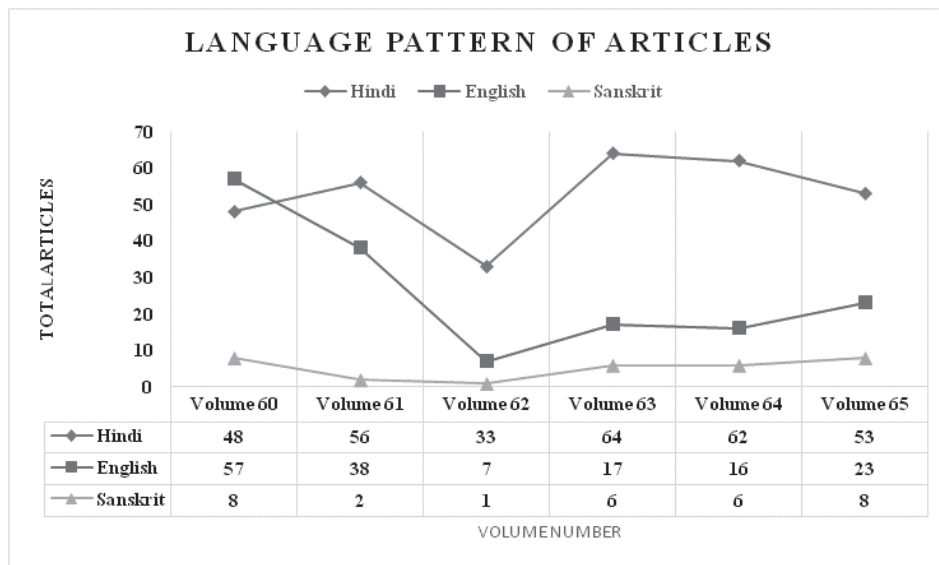


Figure 3: Language pattern



6.6 Degree of collaboration

In this study, the formula provided by Subramaniam in 1983 is used to measure the degree of collaboration (Subramanyam, 1983), and the formula is:

$$DC = \frac{Nm}{Nm + Ns}$$

Where,

DC = Degree of collaboration,

Nm = Number of multi-author research papers,

Ns = Number of single-author research paper

Table 6 : Degree of collaboration

Sl. No.	Publication Year	Publications by Single Author (ns)	Publications by Multiple Authors (nm)	Nm + ns	$DC = \frac{Nm}{Nm + Ns}$
1	2014-15	51	62	113	0.55
2	2015-16	53	43	96	0.45
3	2016-17	11	30	41	0.73
4	2017-18	40	47	87	0.54
5	2018-19	39	45	84	0.53
6	2019-20	46	38	84	0.45
Total		240	265	505	0.52

Table 6 shows the degree of collaboration of articles in source journals during 2014-15 to 2019-20 and concludes that 0.52 is the absolute degree of collaboration,

where 240 (47.52%) articles are single-authored and 265 (52.48%) articles are multi-authored.

6.7 Articles reference distribution pattern

Table 7 : Reference distribution

Publication year		Total articles	Total references		Total references (%)	Cumulative references (%)	μ References per article
			Issue 1	Issue 2			
2014-15	60	113	714	912	1626 (21.43%)	1626 (21.43%)	14.39
2015-16	61	96	784	475	1259 (16.59%)	2885 (38.02%)	13.11
2016-17	62	41	529	-	529 (6.97%)	3414 (44.99%)	12.90
2017-18	63	87	588	718	1306 (17.21%)	4720 (62.20%)	15.01
2018-19	64	84	867	625	1492 (19.66%)	6212 (81.86%)	17.76
2019-20	65	84	955	421	1376 (18.14%)	7588 (100%)	16.38
Total		505	4437	3151	7588 (100%)		

Table 7 demonstrates the distribution pattern of references to articles published in the journal *Prajñā* from 2014-15 to 2019-20, citing 7588 references in 505 published

papers during the study. A maximum of 1626 references are recorded in volume 60, and the fewest 529 references are recorded in volume 62. The data is depicted in figure 4.

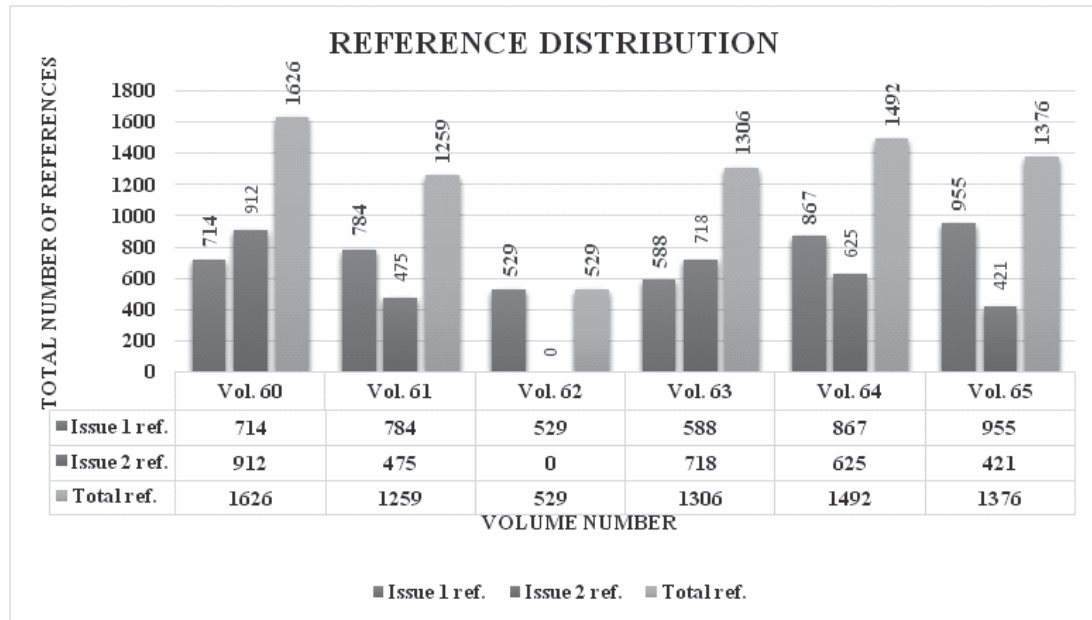


Figure 4: Reference distributionc

7. Discussion

The bibliometric analysis of *Prajñā* journal from 2014-2020 reveals consistent biannual publication with 505 articles authored by 810 individuals. Single-authored works constitute 47.52%, highlighting independent research contributions, while collaborative efforts make up 52.48%. Analysis using Subramanyam's formula indicates sustained collaborative output. Cumulative citations amount to 7,588 references, emphasising scholarly impact. This study underscores *Prajñā* as a platform for diverse scholarly engagement, suggesting further exploration into specific impact metrics for deeper insights into its academic influence.

8. Conclusion

An attempt has been made to depict the bibliometric properties of articles in the bibliometric study of the *Prajñā* journal, revealing insights such as the total number of

articles published (505) from 2014-15 to 2019-20, with volume 60 having the highest publication count (113) and volume 62 the lowest (41); authorship patterns indicating 240 single-author articles, 235 articles with two authors, 23 with three authors, and 7 with more than four authors; an overall author productivity average of 0.62 across 810 authors; dominant language usage with Hindi (62.57%) leading, followed by English (31.29%) and Sanskrit (6.14%); an overall degree of collaboration of 0.52, with 240 (47.52%) articles being single-authored and 265 (52.48%) having multiple authors; and 7588 references cited in the published papers, with volume 60 recording the highest (1626) and volume 62 the lowest (529) citations, underlining the journal's biannual publication by Banaras Hindu University, featuring articles in Hindi, English, and Sanskrit, listed under Group B of the UGC CARE list, welcoming contributions from university faculty, students, and research scholars.



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Towards Mapping Scholarly Communication Pattern among the LIS Faculty Members of West Bengal: an exploratory study

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Abstract

This study investigates the scholarly publication patterns of Library and Information Science (LIS) faculty members in West Bengal. Its primary aim is to analyse and visualise the publication trends across various universities in the LIS domain. Bibliographical data were gathered from Google Scholar and Google Scholar Profile Databases, and analysed using Pop software to compute bibliometric indicators and conduct statistical analyses for hypothesis testing. The findings reveal that faculty members from Kalyani University have the highest average number of publications, specifically 79. Additionally, Associate Professors contribute more significantly to scholarly output compared to other academic positions. A positive and robust correlation coefficient of 0.6441668 between publications and citations indicates a strong correlation. This study contributes uniquely to the field as no previous research has exclusively explored the publication patterns of LIS faculty members in West Bengal. Its insights are valuable for understanding and benchmarking scholarly productivity in this academic discipline within the region.

Keywords: Average publication, Chi-square testing, Gender wise publications, Google scholar, LIS faculty members, Publish-or-Perish scholarly communication

1. Introduction

Scholarly publication is generally interpreted as the dissemination of research findings. To clarify, it represents the documented outcomes of scholars who have expanded their knowledge within their field through the application of scientific theories and methodologies. The various forms of publications typically include scholarly articles, research papers, conference proceedings, and monographs, along with literature reviews. An additional crucial element is that the authors of such publications consistently cite the references upon which their arguments are based, allowing potential readers to verify the

accuracy of the information presented and to develop their own informed opinions.

2. Background study

The Bengal Library Association (BLA) initiated the first regular certificate course in Library and Information Science in 1937, marking a significant milestone in the field. Established on 28th December 1925 as the All-Bengal Library Association and renamed on 14th September 1933, BLA aimed to cultivate a skilled workforce for the profession.

Focusing on Library and Information Science (LIS) courses offered by universities in West Bengal, only 11 out of 34 State



Universities have LIS departments. The University of Calcutta (CU) started its Diploma in Library Science programme in January 1945, with a separate training department established in 1959. In the 1969-70 academic session, CU replaced the Diploma program with the Bachelor of Library and Information Science (B. Lib. I. Sc.) postgraduate degree, later adding M. Lib. I. Sc., Ph.D., and M. Phil courses (Biswas, 2021). A 5-year integrated MLIS programme was introduced and later modified in 2017 into a 3-year honors LIS and a 2-year MLIS course to comply with UGC regulations.

Jadavpur University's Department of Library and Information Science was incorporated into the Arts Faculty in 1964. It offered a one-year B. Lib. and Inf. Science course until 1984, after which it introduced a full-time M. Lib and Inf. Science course in 1985. In 2005, the university launched a 2-year evening course for a Post Graduate Diploma in Digital Library Management (PGDDL M) and currently offers a 2-year evening M. Lib. I. Sc (Digital Library) course.

Other universities in West Bengal that began offering LIS courses include Burdwan University in 1965, Vidyasagar University in 1985, Rabindra Bharati University in 1986, the University of North Bengal in 1990, the University of Kalyani in 1991, Cooch Behar Panchanan Barma University in 2017, and West Bengal State University in 2022.

3. Scope

The scope of the study is confined to different perspectives:

- Subject scope: Library and Information Science
- Documentary scope: Published research paper (journal article, conference paper, book chapter, book)

- Language scope: English language document
- Geographical scope: West Bengal
- Personnel scope: LIS faculties

4. Objectives

The main objective of the present study is to understand the scholarly communication of the LIS faculties of West Bengal. The sub-objectives are enumerated below:

- I. To analyse the publication trends among LIS faculty members in West Bengal
- ii. To investigate the publication patterns of university faculty members in three distinct categories within the field of LIS
- iii. To identify universities having maximum number of publications
- iv. To draw the publication patterns of LIS faculty members based on gender
- v. To explore the publication trends of LIS faculty members across different academic positions.

5. Literature review

Review of literature is a significant activity in research work. Through this researcher has found relevant areas and matching documents for the present study.

In March 2020 Biswas analysed communications of Indian LIS professionals in LIS-Forum from January 2014 to December 2018, highlighting positive aspects like events, training, job vacancies, and professional discussions that aid development. Das and Parabhoi (2020) carried out the research contribution of LIS women faculty of India between 1988 to 2018. This study emphasised the type of publications, most productive work and most



top cited paper published by the LIS women faculty of India. Panneerselvam (2018) conducted a case study about influencing factors for scholarly publications. This study investigated the faculty who are involved in scholarly publications and understand the positive and negative factors which influence scholarly publication. Bhui and Sahu (2018) evaluated the citation count of article publications in journals by faculty members in the Humanities and Social Science (HSS) Departments of Indian Institute of Technology (IIT) Kharagpur. Dabas and Kumar (2017) focused on authorship patterns, and research interest of women faculty in the discipline of physics.

Radhakrishnan and Velmurugan (2015) studied publishing trends, authorship patterns and types of documents among the academic and research community of Periyar University during the period 1998 - 2014. Adkins and Budd (2006) published a corrigendum to scholarly productivity of U.S. LIS faculty. They can be measured through research productivity publication and citation rates. On the otherhand, Pettigrew and Nicholls (1994) examined the publication patterns of Library and information science

(LIS) school faculty. This study has especially focused on the publication productivity of the Ph.D. programme.

6. Methodology

Initially, data was gathered from the websites of 14 universities and discussed with a senior instructor. Subsequently, the publication information of Library and Information Science (LIS) faculty members was obtained in September 2023 from the Google Scholar Profile database through the utilisation of the 'Publish or Perish' software. In instances where certain LIS faculty members had not established a Google Scholar Profile, the Google Scholar Database was utilised. The organisation and analysis of the collected data were conducted using MS-Excel for tabulation purposes.

7 Data analysis and interpretation

7.1 University wise average publication of LIS faculties in West Bengal

The average number of publications i.e., the number of publications per LIS faculty of different universities of West Bengal is shown in following table 1.

Table 1: Average number of publications of LIS faculty members of different universities of W.B.

Name of the Universities	Number of publications per faculty member (Average number of publications of LIS faculty member)
University of Kalyani	79
Jadavpur University	57
Vidyasagar University	32.8
University of Gour Banga	31.5
Burdwan University	31
Calcutta University	26
Rabindra Bharati University	24.34
University of North Bengal	19.67
Netaji Subhas Open University	10.25
CoochBehar Panchanan Barma University	02
Bankura University	00
Sadhu Ram Chand Murmu University	00
Sidho-Kanho-Birsha University	00
West Bengal State University	00



This graphical representation illustrates the maximum number of publications per faculty originating from University of Kalyani, score of 79. Conversely, the minimum number, which is zero, for four universities namely Bankura University, Sidho Kanu University, Sadhu Ram Chad University, and West Bengal State University, is omitted from the visual display. This is

probably because of no/insufficient permanent faculty member.

7.2 Designation wise distribution number of university faculties and average number of publications of LIS in West Bengal

Table 2 shows the number of university faculties and the average number of publications by designation.

Table 2: Designation wise distribution number of university faculties and average number of publications of LIS in West Bengal

Designation	Number of faculties	Average number of Publications
Professor	17	38.42
Associate Professor	08	45
Assistant Professor	13	10.307

Table 2 shows the distribution of 38 faculty members by rank and their average number of publications. There are 17 Professors, 8 Associate Professors, and 13 Assistant Professors. Associate Professors have the highest average publication count with 45, while Assistant Professors average 10.31 publications. These insights are crucial for enhancing research productivity and

making informed decisions to support institutional growth and faculty advancement.

7.3 Gender wise division of university faculties and average number of Publications LIS in West Bengal

Gender wise division of university faculties and average publications LIS in West Bengal is shown in following table 3.

Table 3: Gender wise division of university faculties and average publications LIS in West Bengal

Gender	Numbers of faculties	Average number of publications
Male	30	34.66
Female	08	13.38

It is apparent from table 3 that, on average, males have a higher number of publications (34.77) in comparison to females (13.38).

7.4 Experience wise publication pattern of LIS faculties

Table 4 shows the experience wise publication pattern of LIS faculties.

Table 4: Experience wise publication pattern of LIS faculties

Year	Number of faculties	Publications	Average number of publications
>20	11	531	48.28
10-20	14	408	29.15
0-10	13	222	17.07



Table 4 illustrates the publication patterns among 38 Library and Information Science faculty members, categorised by experience: 0-10, 10-20, and over 20 years. The 0-10 years group, with 13 faculty members, contributed 223 publications, averaging 17.16 each. The 10-20 years group, with 14 members, produced 408 publications, while the over 20 years group, with 11 members, authored 531 publications, averaging 48.28 each. This data shows that faculty with over 20 years of experience have the highest average publication rate, whereas those with 0-10 years have the lowest. The table effectively highlights the correlation between research productivity and years of experience, establishing a clear relationship between experience level and average publication output.

7.5 Association between different variables

7.5.1 Association between gender and number of publications

For this association testing, we have done Chi-square test. The Chi-square test statistic was calculated using following formula:

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

Here O denotes the observed frequency and E denotes the expected frequency for a particular cell. The calculated value of chi-square exceeds the tabulated value for the given degree of freedom and at a specified level the null hypothesis is rejected. Here Degree of freedom (d. f) = (Number of rows - 1) X (Number of Columns - 1) = (4-1) x (2-1) = 3.

Table 5: Association between gender and number of publications

Gender	Number of Publications				Total
	Small (0-50)	Medium (50 – 100)	Large (100 – 150)	Extra Large (150 – 200)	
Male	25	02	02	01	30
Female	08	00	00	00	08
Total	33	02	02	01	38

Calculation of Expected Frequencies

Table 6: Calculation of expected frequencies

Gender	Small (0-50)	Medium (50 – 100)	Large (100 – 150)	Extra Large (150 – 200)	Total
Male	26.06	1.57	1.57	0.78	30
Female	6.95	0.43	0.43	0.23	08
Total	33.01	2	2	1.01	38

Table 5 categorises 38 faculty members by gender (Male and Female) and publication count (small, medium, large, extra-large). A Chi-square test was conducted to assess the association between gender and publication count. The computed Chi-square value of 1.58, using R software, is lower than the

tabulated value of 7.815 at a 5% significance level with 3 degrees of freedom. Since the observed value is lower, the null hypothesis is accepted, indicating that gender and the number of publications are independent variables with no significant association between them.



7.5.2 Association between designation and number of publications

Table 7: Association between designation and number of publications

Designation	Number of Publications				Total
	Small (0-50)	Medium (50 – 100)	Large (100 – 150)	Extra Large (150 – 200)	
Professor	15	00	01	01	17
Associate Professor	05	02	01	00	08
Assistant Professor	13	00	00	00	13
Total	33	02	02	01	38

Table 7 illustrates the distribution of the 38 faculties based on their designation (Professor, Associate Professor, and Assistant Professor) and the categorisation of their publications into four distinct groups. It aims to examine the potential association between the two variables - designation and number of publications. With 6 degrees of freedom, the

critical value of the Chi-square test at a significance level of 5% is determined to be 12.59. Given that the observed value (10.47) falls below the critical value of 5%, we can infer that the null hypothesis is accepted. Thus, we conclude that the designation and publication categories are independent, indicating no association between them.

7.5.3 Association between experience and number of publications

Table 8: Association between experience and number of publications

Year	Number of Publications				Total
	Small (0-50)	Medium (50 – 100)	Large (100 – 150)	Extra Large (150 – 200)	
>20	09	00	01	01	11
10 – 20	12	01	01	00	14
0 – 10	12	01	00	00	13
Total	33	02	02	01	38

Table 8 illustrates the categorisation of the 38 faculties based on their levels of experience (>20, 10-20, 0-10) and the distribution of their publications into four distinct groups. It aims to examine the potential association between the two factors: experience and number of publications. With 6 degrees of freedom, the critical value for the

chi-square test at a significance level of 5% is determined to be 12.59. Given that the observed value (4.55) falls below the 5% critical value, the conclusion is made to accept the null hypothesis. This leads to the inference that experience and publication outputs are independent of each other, indicating a lack of association between them.

**Table 9: Co-relation between number of publications and citations of the individual faculties**

Sl. No.	1	2	3	4	5	6	7	8	9	10	11
Publications (x)	42	36	31	16	19	40	19	54	3	9	175
Citations (y)	94	291	57	45	68	138	22	398	0	8	112

Sl. No.	12	13	14	15	16	17	18	19	20	21	22	23
Publications (x)	8	36	49	2	8	40	23	140	81	16	10	24
Citations (y)	16	41	68	0	8	17	24	752	103	28	3	175

Sl. No.	24	25	26	27	28	29	30	31	32	33	34	35
Publication (x)	19	7	104	13	3	23	2	31	4	26	10	37
Citations (y)	29	12	242	38	10	6	0	59	4	54	2	30

The correlation matrix illustrates the correlation coefficients, representing the extent of the linear association between the quantity of publications and citations. In cases where the two variables exhibit simultaneous increments or decrements, the correlation

coefficient is positive. Specifically, the correlation coefficient value stands at 0.6441668, denoting a positive linear correlation between publications and citations, indicative of a moderately positive relationship between the variables.

Table 10 : Top 10 authors as per the publication and citations

Sl. No.	Authors	Publications
1	Dr. Subarna Kumar Das	175
2	Dr. Parthasarathi Mukhopadhyay	140
3	Dr. Bidyarthi Dutta	104
4	Dr. Sibsankar Jana	81
5	Dr. Bijan Kumar Roy	54
6	Dr. Saptarshi Ghosh	49
7	Dr. Pijush Kanti Panigrahi	42
8	Dr. Sabuj Kumar Chaudhuri	40
	Dr. Prabin Karkee	
9	Dr. Ziar Rahman	37
10	Dr. Udayan Bhattacharya	36

Sl. No.	Authors	Citations
1	Dr. Parthasarathi Mukhopadhyay	752
2	Dr. Bijan Kumar Roy	398
3	Dr. Biplab Chakrabarti	291
4	Dr. Bidyarthi Dutta	242
5	Dr. Durga Sankar Rath	175
6	Dr. Sabuj Kumar Chaudhuri	138
7	Dr. Subarna Kumar Das	112
8	Dr. Sibsankar Jana	103
9	Dr. Pijush Kanti Panigrahi	94
10	Dr. Saptarshi Ghosh	68
	Dr. Susmita Chakraborty	

The top 10 authors as per the number of publication and citations in LIS faculty in West Bengal are listed in table 10. According to this table, Dr. Subarna Kumar Das has the most publications with 175 and the most citations with 752, followed by Dr.

Parthasarathi Mukhopadhyay with 140 publications and Dr. Bijan Kumar Roy with 398 citations. This could mean that they are more engaged than other writers in the LIS field. Articles are often contributed to journals.

**Table 11: Top 10 authors as per the H-index and G-index**

Sl. No.	Authors	H-index
1	Dr. Parthasarathi Mukhopadhyay	15
2	Dr. Bijan Kumar Roy	12
3	Dr. Bidyarthi Dutta	8
4	Dr. Biplab Chakrabarti	7
5	Dr. Sibsankar Jana Dr. Sabuj Kumar Chaudhuri Dr. Subarna Kumar Das	6
6	Dr. Pijush Kanti Panigrahi Dr. Durga Sankar Rath Dr. Rajesh Das Dr. Saptarshi Ghosh Dr. Udayan Bhattacharya Dr. Sudip Ranjan Hatua	5
7	Dr. Arabinda Maity Dr. Nivedita Bhattacharyya Dr. Susmita Chakraborty Dr. Swapna Banerjee Dr. Ziar Rahman Mr. Sabuj Dasgupta	4
8	Dr. Prabin Karkee Dr. Tridib Tripathi	3
9	Dr. Arun Kumar Chakraborty Dr. Santanu Das Dr. Tapan Barui Dr. Sunil Kumar Chatterjee Dr. Parikshit Mondal	2
10	Dr. Barnali Roy Choudhuri Dr. Snigdha Naskar Dr. Pijush Kanti Jana Dr. Soumen Mallik	1

Table 11 lists the top 10 authors among the LIS faculty in West Bengal based on the H-index and G-index. This table demonstrates that Dr. Bijan Kumar Roy has the second-highest H-index (12) and G-index (18) after Dr. Parthasarathi Mukhopadhyay.

8. Conclusion

Through its persistent efforts, the field of LIS education has significantly advanced the information society. This investigation details the academic publications of LIS faculties in West Bengal, providing an overview of research output based on university-wise averages, designation, gender, and experience. By analysing these factors, the study offers insights into scholarly

Sl. No.	Authors	G-index
1	Dr. Parthasarathi Mukhopadhyay	22
2	Dr. Bijan Kumar Roy	18
3	Dr. Biplab Chakrabarti	16
4	Dr. Durga Sankar Rath	13
5	Dr. Bidyarthi Dutta	12
6	Dr. Sabuj Kumar Chaudhuri	11
7	Dr. Sibsankar Jana	9
8	Dr. Pijush Kanti Panigrahi Dr. Subarna Kumar Das Dr. Susmita Chakraborty	8
9	Dr. Arabinda Maity Dr. Udayan Bhattacharya Dr. Sudip Ranjan Hatua	7
10	Dr. Rajesh Das Dr. Tridib Tripathi	6

communication trends among LIS faculty members in the region. It examines the research efficacy of 38 faculty members across 14 universities, noting that three have not produced any publications in the Google Scholar database. This comprehensive analysis enables comparisons of publication status and explores Chi-square and correlation values to identify areas for improvement, strengths, and performance indicators. The research highlights the contributions of LIS faculties to both academic performance and the broader societal context, facilitating valuable research initiatives and offering crucial insights into the academic domain.

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Developing a Digital Archive on Cultural Heritage Information System of Murshidabad using GSDL Software

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Abstract

This paper outlines the development of a digital archive using open-source digital library software, focusing on creating a Cultural Heritage Information System for Murshidabad using GSDL (Greenstone Digital Library) Software. The archive aims to benefit heritage enthusiasts and tourists by providing up-to-date information on Murshidabad's cultural heritage. The methodology involves key processes such as documentation, digitisation, metadata creation, software customisation, testing, and promotion. Materials such as books and journal articles related to Murshidabad are selected, scanned, or typed and saved in formats like PDF, DOC, and JPG to serve as digital objects. The paper aims to preserve, make accessible, raise awareness, and engage the community in heritage preservation. It underscores the significance of preserving and sharing heritage information for current and future generations. This article is intended to assist digital archive developers, heritage organisations, and library professionals in developing and customising digital collections using GSDL, thereby supporting the establishment and enhancement of digital libraries in their respective institutions.

Keywords: Cultural heritage, Cultural heritage information system, Digital archive, GSDL, Information system, Metadata

1. Introduction

India, known for its immense cultural diversity, boasts a rich repertoire of heritage sites that reflect its historical significance. Murshidabad district in West Bengal, specifically, holds numerous cultural treasures that serve as tangible memories of the country's past (Sinha & Murdia, 2018). The preservation of these historical properties is crucial, prompting the adoption of innovative digital preservation methods as advocated by researchers (Jenifar et al., 2024). The article emphasises the integration of such methods into heritage conservation efforts across India, highlighting the potential

of platforms like GSDL (Sonkar et al., 2005). Digital archives play a pivotal role in this process, converting archival materials into machine-readable formats to enhance accessibility and ensure preservation, as exemplified by projects such as American Memory by the Library of Congress. However, despite the evident benefits, there remains a significant gap in implementing these methods effectively within India's cultural heritage sites, attributed to limited awareness, inadequate resources, and technological barriers. The diverse and complex nature of these sites further complicates implementation, necessitating



tailored solutions and interdisciplinary collaboration. This study focuses on developing a digital archive specifically for the cultural heritage of Murshidabad, underscoring the future potential to extend similar systems to other lesser-known sites across the district. The initiative aims to preserve, promote, and share valuable cultural information, paving the way for future research and technological advancements in heritage conservation and digital archiving within India.

2. Review of related literature

Significant numbers of research works have been conducted on the topic of Cultural Heritage Information System. Sehaiah and Veeraanjaneyulu (2009) developed an Institutional Repository using Greenstone Digital Library Software to gather, manage, preserve, and disseminate information output within and outside of an institution. Another study focused on the organisation and dissemination of digital objects through web and CD-ROM: A framework for Indian libraries was presented in the Proceedings of the International Conference on Digital Libraries (Mukhopadhyay, 2004). The author explained here how to create digital objects for Indian Libraries that are compatible with the web and CD-ROM. Gupta (2022) conducted a feasibility study of preservation metadata in Greenstone Digital Library Software. Sonar et al. (2005) conducted a study on setting up a digital archive on the application of Greenstone Digital Library (GSDL) Software in Newspapers clippings. Jenifar et al. (2024) also conducted a study on Digital Preservation Methods for Cultural Heritage Sites in India. Lata and Somvir (2019) made a study on the creation of the digital library for the assimilation and dissemination of information using GSDL, as referenced.

The review of literature identifies that

there is no such work that shows the implication of the cultural heritage information system of Murshidabad. This study attempts to fill that research gap.

3. Objectives of the present study

The main objectives of the study are to design and develop the mechanism to build the digital archive on cultural heritage through the application of open source software sub-objectives of the study are given below:

- To understand the overviews of the digital archive on cultural heritage monuments of historical place Murshidabad
- To implement the metadata standards in the design of the digital library
- To export the Cultural Heritage monuments on CD-ROM for offline access
- To help the learners and researchers for future study as well as the information seekers to get the information about the heritage monuments of Murshidabad
- To help the tourists get information about the cultural heritage of Murshidabad by providing remote access through the internet (Sinha & Murdia, 2018).

4. Research design and methodology

We have applied self-modified metadata element sets for design and methodology of this research paper. In this study, we have utilised the Greenstone Digital Library Software (GSDL) and Greenstone Librarian Interface (GLI) as a tool. These tools help to create a searchable information product. These are available on the most durable media. The following are the five



fundamental tasks needed to develop the product:

- Gather: Storage of the heritage monuments materials.
- Enrich: Encoding each through self modified schema.
- Design: Controlled indexing of digital materials.
- Format: Designing user interface for searching and browsing.
- Create: Building of collection on religious heritage monuments.

Following this method, we can implement successfully the aforementioned design.

Installation of the system:

- Installation of Apache server.
- Installation of Java language.
- Installation of GSDL.
- Linking of Apache and GSDL
- Installation of PERL.

Data collection:

Developer can select the content of books and journal articles relating to Murshidabad, selection materials are scanned or typed and saved in a needed format like pdf, doc, jpg, etc, scanned or typed articles are used as digital objects, these methods are done in the background.

Collection development:

- Decision on scope and coverage.
- Create HTML template to store and display religious heritage monuments resources.
- Storage HTML formatted pages in a folder.

- Recording of religious heritage monuments, following a standard format self-modified as metadata elements sets.

Organising the collection:

- Uploading the HTML templates in local space through GLI.
- Incorporation of self-modified as metadata elements set in GSDL.
- Enriching of digital objects by using my self-created metadata schema.
- Controlled indexing.
- Design of the user interface.
- Designing of display format.
- Finally testing and debugging.

5. Organisation of cultural heritage monuments of Murshidabad

The development of Information and Communication Technology (ICT) created new phenomena for preserving and access of cultural heritage and develop a method of digitisation to build a digital archive. The latest technologies have endless advantages which reflect images of architects with metadata attached and can now be efficiently used for a variety of tasks, including archiving, conservation and promotion. The idea of digitising content for promotional purposes is relative. It helps to shorten the distance between the viewer and the architect and enables multidimensional object display. Digitisation is a procedure that requires detailed instructions on how to set up the process and a well-defined set of parameters to be implemented. A sophisticated technical procedure that is specifically tailored to every collection is needed to digitise them, and this difficulty increases with the number of materials collected. It appears to be lot easier, than digital museum collections (Mukhopadhyay, 2004).



In this research work, we have tried to build up different types of metadata schemes as standards across the work, such as library science, education, archiving and so on.

5.1 Proforma of metadata schemas

We selected Heritage Monuments of Murshidabad and the objectives of this research work are to provide offline service to the heritage lover's community. We have preferred a self-modified metadata element set, which is a standard format. The schema is designed to support structure of the HTML formatted web pages in a suitable form. First of all, we had prepared a domain specific metadata schema with the unique space (MDA) by the help of Greenstone Editor for Metadata Sets. As per this domain, we had to choose 12 fields to complete our metadata collection. The namespaces of our metadata are

Table 1: Shows the namespace of special metadata schema

Sl. No.	Namespace
01.	MDA.Title
02.	MDA.Creator
03.	MDA.Measurement
04.	MDA.Materials and Techniques
05.	MDA.Additional Physical Characteristics
06.	MDA.Style
07.	MDA.Date
08.	MDA.Current Location
09.	MDA.Description

6. Developing steps of open-source framework work for web-integrated cultural heritage information system

The paper discusses not only the

methods and steps of the open sources framework for web integrated cultural heritage information system of Murshidabad but also the procedures or techniques regarding the collections and their organised process, analysis and evaluation of data or facts. This would be executing the research works. To design of this research work of web integrated heritage place in Murshidabad information services, described in two angles:

- I) Designing a working model of heritage places information service for Murshidabad.
- II) Making searchable and browse able heritage monument information products on CD-ROM.

6.1 Digital library environment development

- Building a domain-specific collection of digital materials relating to my research area of heritage monuments of Murshidabad (Seshaiah & Veeraanjaneyulu, 2009).
- Incorporation of self-modified format in the digital objects.
- Installation and configuration of Apache web server (ver. 2.2.14) in Linux (Ubuntu) platform.
- Installation of Java Runtime Environment (ver. 1.6.0_26) in Linux platform.
- Installation of GSDL (Ver. 2.84) Linux platform.

6.2 Web access mechanism development

In order to provide access to the digital collection in the distributed information environment, configure the system as a server (Apache) and digital collection in GSDL by modifying the server configuration (Mukhopadhyay, 2004).



6.3 Organisation the digital collection through GSDL

- Gather: Storage of cultural heritage monuments materials.
- Enrich: Encoding each Architect by the self-modified schema.
- Design: Controlled indexing of digital monuments.
- Format: Designing user interface for searching heritage monuments.
- Create: Creation of a collection of cultural heritage monuments.

6.4 Offline Access Mechanism Developments

The Primary goal of my research work is to create a digital archive that can be searched or accessed from any PC on any platform, and it can be compatible with CD-ROM.

6.5 Apache web server Installation

In this research work, Apache has been used as a web server because it is free and open-source software. Installing of a web server is necessary in order to deliver your web pages online. Because of its stability and flexibility, the Apache web server is used in many production scenarios.

6.6 Installation of Java Runtime Environment

It is advised you that disable your Internet firewall before Installing Java online. The following manner is followed for Installation of Java:

Step 1-Go to Java download page by Google search then click on Windows online,

Step 2- You see the download dialog box then click on download, after download you can run or save the downloaded file.

Step 3- To Installation you may choose file from your system and double click on save file.

The installation of the downloaded file begins when click on Install and accept the terms and conditions, at the end of the Installation you can click on finish.

6.7 Installation of PERL (Programming Environment)

Perl is a Programming language. The Perl language was originally developed by Larry Wall. The Greenstone Digital Library Software uses Perl programmes, Perl compiler should be loaded.

6.8 Installation of GSDL

In this article, the installation process of Windows version GSDL software from CD-ROM has been discussed. First of all you can place the CD-ROM into the drive then restart your system if the installation process does not begin immediately. Then click on setup.exe file to launch the software then click on next button after accepting the default each time to begin the software installation. After installation is finished, you may click on start button, open the programme menu and select Greenstone Digital Library Software. A dialogue box in the Greenstone Digital Library Software is located there, you can simply click on enter library, this may automatically start your internet browser and load the GSDL home page (Seshaiah & Veeraanjaneyulu, 2009) which should look something like the below:

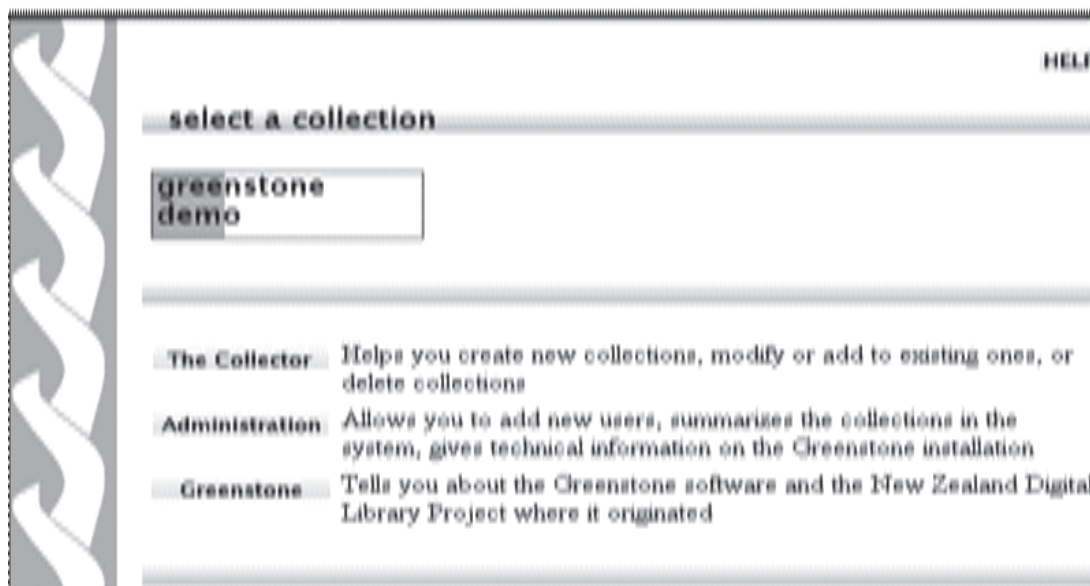


Figure 1: Greenstone digital library software homepage

Basically Local Library and Web Library are the two distinct programmes that are included on the CD-ROM. The URL <http://localhost/gSDL/.....> type into address bar of the web browser to use GSDL home page.

Process to creation of metadata schema in Greenstone Editor for Metadata Sets

- Open the Metadata set editor (GEMS). Then click on File and then click on New. Then put the metadata set title ("MDA"), metadata set name space ("MDA"), metadata set description ("Digital Library of Murshidabad") and click on ok.
- Right click on given metadata set title and click on "Add Element" and enter a name for the new element and so on.

6.9 Collection building with GLI under Linux (Ubuntu)

The GLI is an extremely user-friendly interface for creating digital library

collections that is based on Java. There are four ways to create a digital library that the librarian can be used, this is Librarians, Assistant Librarians, Library specialists and users. The GLI facilitates basic six types of activities, such Gather, Enrich, Design, Create, Build and Preview. The collection, which may be consider as modules for making Greenstone collections (Mukhopadhyay, 2004). The Major tasks of GLI are:

- Gather: Storage of heritage monuments of Murshidabad.
- Enrich: Encoding each monument by self-modified metadata schema.
- Design: Controlled indexing of digital collections.
- Format: Designing user interface for searching and browsing heritage monuments.
- Create: Creation of the collection on cultural heritage monuments of Murshidabad.



- Convert: Digital library converted into a CD-ROM.

Gather: Greenstone Librarians Interface allows us to gather heritage collections of Murshidabad in different ways. These consist of i. Documents in GSDL

collection, ii. Local file space, iii. Home folder (root), and iv. Download files. Here, I gather heritage monument collections from Local file space. So, the processes are Gather→Local file→Home→Desktop→Related file drag.

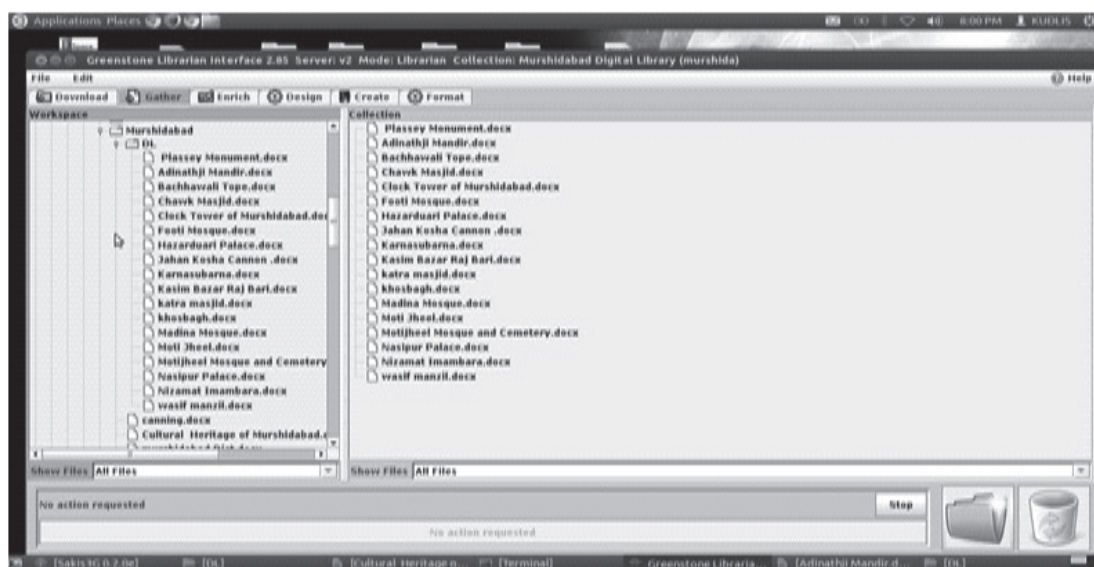


Figure 2: Gathering procedure of documents

Enrich: To prepare metadata for every source of the document in the collections, enrich involves entering the source document data in the metadata fields and assigning metadata to each source of document.

Design: To setup of a collection is specified in terms of format, index, classifier, document plugin and display, among other things. It is able to automatically exact basic metadata like Time, Date, and so forth. It is necessary to exact explicit metadata using

'Classifiers' such as Subject, Author, Organisation, and so on. If we select design then different options appears, which provide different functions. These consist of (i) Document plugins, (ii) Search index, (iii) Partition indexes and (iv) Browsing classifiers.

- **Document Plugins:** Document plugins are necessary in order to convert the document format that Greenstone requires.

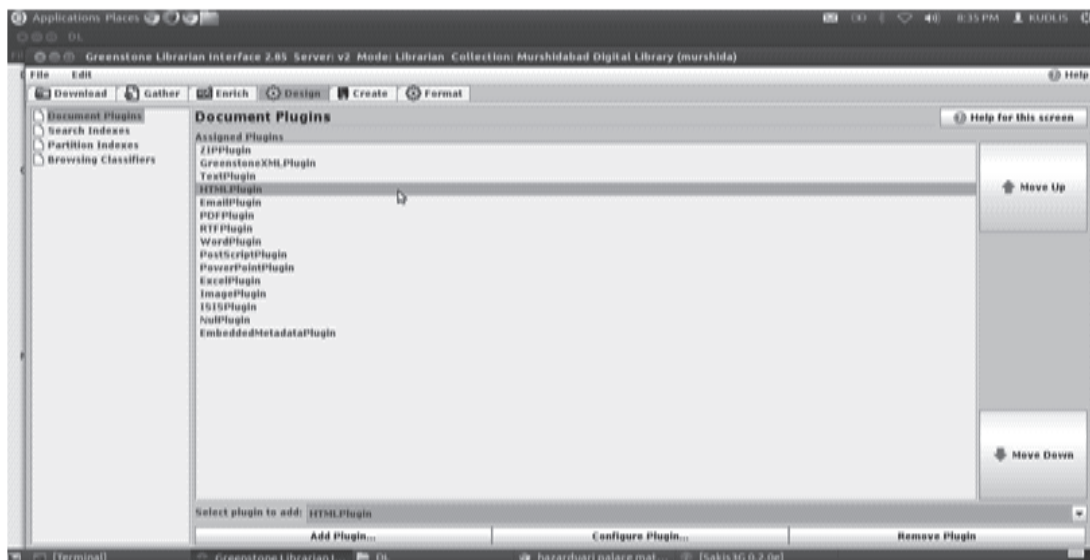


Figure 3: Document plugins

- **Search indexes:** The steps of search index are - Design then Search index → all files delete → New index → Full text and finally Add index.
- **Browsing Classifiers:** The process of Browsing classifiers are- Design then Browsing classifiers → all file remove → select classifiers to add → A to Z compact list → Add classifiers → Metadata then Sort → Bottom name and finally OK.
- ii. **Search:** The steps are - Format → Search → Index text → Full text
- iii. **Format Feature:** The steps are - Format → Format features → Choose features → HTML format string

Format: The next step for collection building is format. When we select this option then here appear different portions, which provide different functions. These consist of (i) General, (ii) Search, (iii) Format Features, (iv) Translate Text, (v) Cross collection search, (vi) Collection specific macros and (vii) Depositor metadata. Here I discuss some of them

- i. **General:** To give general information about the collection of digital content, we can select a photo that will appear as an icon of

the collection in the home page.

Create: Create is the initial step to starting the building operations, and build a collection is the collection of digital materials and in the compressed form of the source documents and coordinating all the activities done in the previous models into one place in the GSDL system. A connection to the user interface that allows one to view the current collection is called a preview.

7. Cultural heritage information system on CD-ROM

The method of creating cultural heritage information system of Murshidabad on CD-ROM is described in the previous chapter. Here, this paper describes the searchable access mechanism and how to write digital content into a CD-ROM.



Converting the collection into a CD-ROM

The primary goal of my research work is to create a digital archive that can be searched or accessed from any PC on any platform, and that is compatible with CD-ROMs. The following are the steps to convert the digital content into a CD-ROM:

Go to File then write CD-ROM → Check box to select your collection → write CD/DVD → Close.

The Greenstone Digital Library software facilitates both basic and advanced searches, as well as convenient browsing of digital content. The homepage of Information system is shown below:

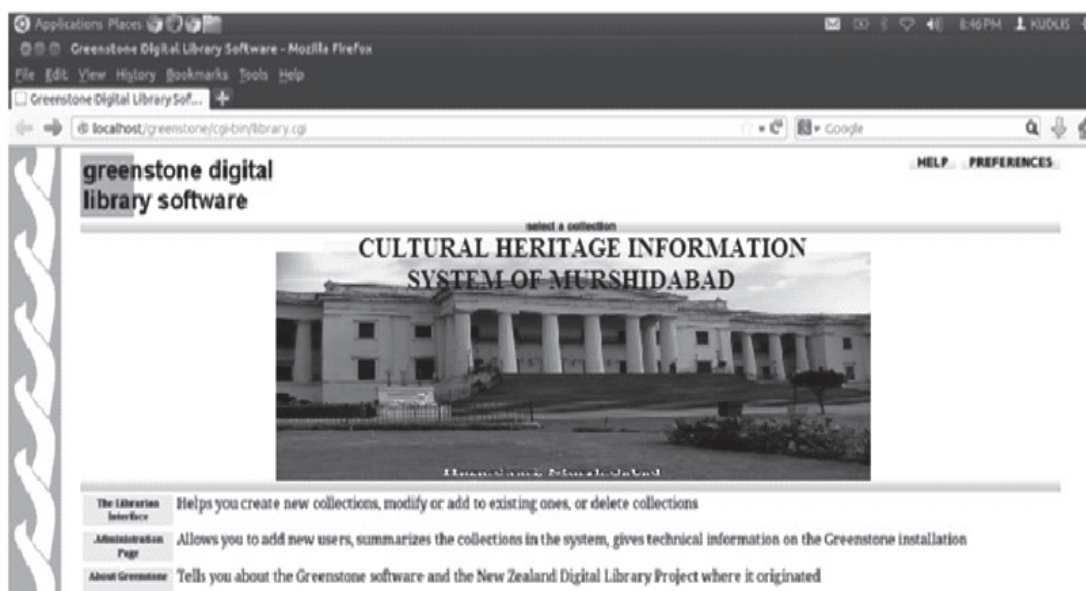


Figure 4: Homepage of information system

Users can choose some keywords and type in into the search box, so they can get needed information. Users can search the

collection through the word 'about' and the search results relating to about are shown.

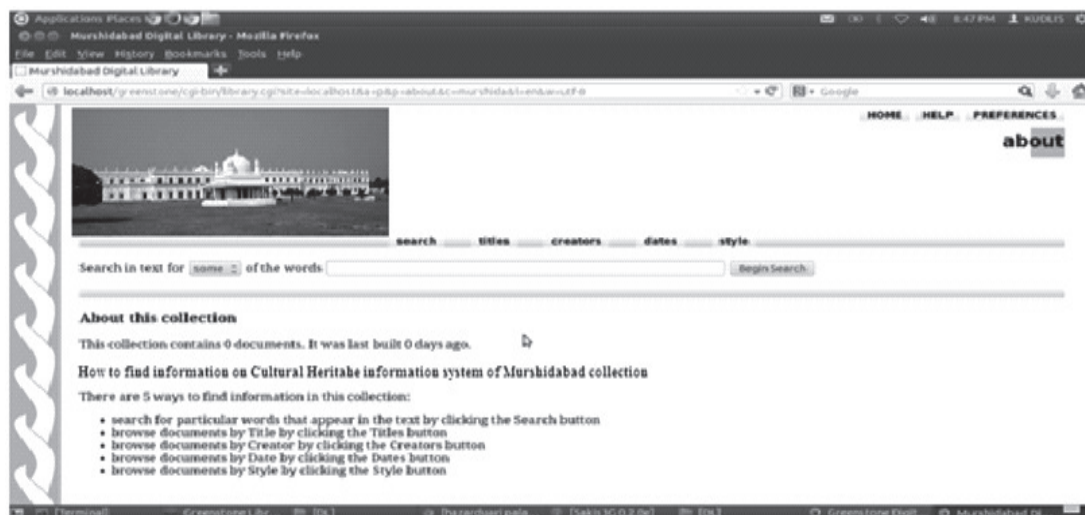


Figure 5: Main user interface

8. Conclusion

This research paper gives information regarding the heritage places of Murshidabad and how to build a digital archive. It also provides an overview of processes such as documentation, digitisation, metadata creation, software selection, customisation, testing, and promotion. The concept discussed in this article will help create a web-based information service for the cultural information system in Greenstone Digital Library Software. From this concept, one can expand the method of creating value-added e-information services that are available on CD-ROM as well as the Web. It is possible to implement the idea for all districts of West Bengal, and one can improve the same. This is the future scope of work. This work will also help researchers in the future build a digital archive for preserving, promoting, and sharing information. It will assist the specialists, tourists and heritage lovers by giving them the latest information about the different famous cultural heritages of Murshidabad.

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- * ASSOCIATION COUNTS NOT THE INDIVIDUAL**
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