ReIL - 2025

Proceedings of National Conference on ReImagining of Libraries : Balancing Tradition and Innovation in a Digital Era

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10th January 2025

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Foreword

Over the past few decades, scholarly communication has benefitted from the advances in digital technologies. Libraries are actively adapting and adopting these changes and challenges for the benefit of their clientele. However, on one hand the users wants the desired information on few clicks, at the same time they also need a physical conducive environment where they can enjoy reading, organize their thoughts, and finally create valuable intellectual contributions to society. Thus, this process completes a full cycle of information communication through reading and learning. Libraries have historically been ideal spaces to foster such an environment, and if designed with aesthetics and user needs in mind, most users will feel at ease. To understand the undercurrent in a better way, Tata Memorial Hospital (TMH) is hosting a national conference titled ReImaging Library-2025 (ReIL-2025) on January 10, 2025, at TMH in Mumbai in collaboration with the Bombay Science Library Association (BOSLA).

Thus, the theme of the conference is pertinent and offers a chance for library and information science (LIS) professionals to exchange their experiences and perspectives regarding the opportunities and challenges they face.

Until now, the Department of Atomic Energy (DAE) adapted a consortium approach to broaden the availability of online content across its units. In 2024, the DAE took the next level by establishing One DAE One Consortia (ODOS) with two prominent publishers and effectively implemented the read-and-publish model for 2024 through the Transformative Agreement (TA). This agreement allows DAE scientists and researchers to publish their papers in hybrid journals as open access (OA) articles, with the article-processing charges (APC) covered. Many users regard this as a significant method for disseminating their research effectively. The Government of India is set to introduce a One-Nation One-Subscription (ONOS) for 30 major publishers in 2025, which is another positive development.

TMH library from the inception of the institute is making all possible efforts to meet the information needs of clientele by offering various information services. Perhaps in India, TMH library's ongoing activity has resulted in building one of the leading clinical oncology-related literature.

I am confident that this conference will provide a platform for LIS professionals to engage in an interactive discussion based on themes and sub-themes. Optimizing the use of existing resources and planning for future needs is crucial to achieving success. LIS professionals can identify and propose actionable solutions for recognized needs. The papers and poster abstracts presented during the conference

will be available on the website. We gratefully acknowledge the participants of the conference, sponsors and all those involved in organizing the conference.

I wish the event a great success.

Best wishes

Dr. Sudeep Gupta
Director (TMC)

Mumbai
10 January 2025

Preface

ReImaging Libraries – TMH and BOSLA Conference 10 January 2025

Information in today's context is held as a key resource for the growth in all spheres of society. Timely accessibility, retrieval, discovery, and availability are necessary to make a positive difference in every endeavour aimed at the development of mankind. In this context, by the inherent nature of the Library and Information Science (LIS) discipline, we professionals are at the forefront of helping the users. The introduction of the Information Communication Technology (ICT), the Internet, and the upcoming Artificial Intelligence (AI) are creating transformative challenges in the Information or Knowledge Society. Such changes have also posed many challenges for the LIS. Thus, the conference theme is relevant and provides an opportunity for LIS professionals to put forth their views and visions and to share their experiences with colleagues. Additionally, this platform can be used to strengthen the social networking. We are receiving a favorable response regarding the conference, as evidenced by the abundance of papers and posters submitted. Many LIS professionals are keen to attend the scientific/technical deliberations relevant to the profession. We believe you all will benefit from the experience of some of the senior LIS professionals, the challenges you foresee, and the rational solutions you may work out. Some of you may belong to special libraries or slant more towards academic libraries. Nevertheless, the goal is that over a period, the experience gained should be used to its optimum. The formal and informal communication among the participants will help all the professionals to enrich their experience enhance their skills and finally take one more step towards the uplift of the profession's image.

The editors have prepared the volume without altering the contents of any contribution. Contributors are themselves responsible for the views expressed in their contributions. For ease of reading, the book is organized into four (five) broad themes.

Many individuals lent a helping hand that made it possible for us to complete the task within the time we had at our disposal. We are thankful to all such people for their timely cooperation. M/s. Sundaram Publications has taken the complete copyediting work.

Mumbai

January 10, 2025

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CONTENT

POSTERS

Reforming Academic Publishing in India: A Critical Analysis of the UGC CARE List

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Abstract

The UGC CARE (Consortium for Academic and Research Ethics) list, introduced in 2019, represents a significant step in reforming India's academic publishing ecosystem. Designed to address issues of predatory journals and unethical publishing practices, the initiative aims to enhance the credibility and global visibility of Indian research. This article critically examines the evolution, benefits, and challenges of the UGC CARE list, highlighting its emphasis on inclusivity and quality while identifying systemic gaps and unintended consequences.

Key challenges include the overreliance on flawed metrics such as the Impact Factor and h-index, which prioritize quantity over quality, marginalize interdisciplinary research, and encourage predatory practices. The analysis explores the list's implications for researchers, institutions, and the broader academic community, including its role in driving commercialization and creating inequities in resource access. Proposed reforms include adopting article-level metrics, fostering regional and interdisciplinary journals, and leveraging technology to ensure transparency and equity.

This study concludes that while the UGC CARE list has laid a robust foundation for ethical research practices, its success relies on sustained reforms, stakeholder collaboration, and adaptability to India's diverse academic landscape. These measures can position the UGC CARE list as a model for academic publishing reform globally.

Keywords

UGC Care List, Academic Publishing, Academic Performance Indicator, Predatory Journals, Research Ethics

Introduction

The UGC CARE (Consortium for Academic and Research Ethics) list, introduced by the University Grants Commission (UGC) in 2019, marked a crucial moment in the evolution of academic publishing in India. This initiative replaced the UGC Approved List of Journals, which had come under scrutiny for including several predatory and non-credible journals. The primary goal of the UGC CARE list was to enhance the quality of academic research and address the challenges posed by unconvincing publishing practices (Raju, 2020).

India's academic landscape has been shaped significantly by the Academic Performance Indicator (API) system, introduced as part of UGC's Performance-Based Appraisal System (PBAS) in 2010. Initially intended to standardize and incentivize academic output, the API framework emphasized metrics-based evaluation, inadvertently promoted a "publish or perish" culture. This emphasis led to a surge in predatory publishing, where low-quality journals exploited the demand for rapid academic output (Das & Chattopadhyay, 2014).

Recognizing the issues with predatory journals, the UGC initially created the Approved List of Journals. However, this list faced criticism for including numerous predatory journals, as highlighted by studies identifying India as a global hub for such exploitative publishers (Shen & Björk, 2015). These predatory practices not only undermined the credibility of Indian research but also affected its global visibility and ethical standards (Raju, 2020).

In response to these challenges, the UGC launched the Consortium for Academic and Research Ethics (CARE) initiative in 2018. The UGC CARE list replaced the Approved List of Journals and introduced stringent evaluation protocols to ensure the inclusion of credible and high-quality publications. Updated quarterly, the CARE list evaluates journals based on criteria such as peer review, editorial board standards, and publishing ethics. This ensures that only reputable journals remain part of the list (UGC CARE Report, 2020).

A significant feature of the UGC CARE list is its inclusivity, particularly its emphasis on regional and interdisciplinary journals. By incorporating publications in Indian languages, the initiative aims to preserve linguistic diversity and promote localized research, aligning with the goals of the

National Education Policy 2020. This focus enhances the relevance of Indian academia while maintaining global standards (Nagarkar et al., 2023).
In 2020 alone, the UGC CARE list reviewed over 15,000 journals, of which only a fraction met the stringent inclusion criteria. This rigorous process underscores the initiative's commitment to ethical publishing and positions Indian research on a stronger global footing. By fostering transparency and academic integrity, the UGC CARE list has become a cornerstone in India's efforts to promote impactful and credible research (Pandita & Singh, 2023; Mukherjee, 2019).

Evolution of the UGC CARE List

The UGC CARE list was introduced to address long-standing issues in India's academic publishing ecosystem, particularly the proliferation of predatory journals. The Academic Performance Indicator (API) system, launched by the University Grants Commission (UGC) in 2010, played a significant role in influencing research output. By tying faculty promotions and appointments to metrics-based research output, the API encouraged researchers to prioritize publishing. This focus on metrics, while structuring evaluations, inadvertently pushed for quantity over quality in research outputs (Patwardhan et al., 2021; Nagarkar et al., 2023).

The misuse of metrics such as the Impact Factor (IF) and h-index has further worsened these issues. Institutions frequently use these metrics as absolute measures of research quality, ignoring their inherent limitations. This overemphasis has driven researchers to pursue high-volume outputs, often in predatory or low-quality journals, to meet institutional and API requirements. This practice has marginalized collaborative and interdisciplinary research, as API scoring methodologies often grant differential credits to multi-author papers, discouraging teamwork and innovation (Madhan et al., 2018).

The initial attempt to guide researchers came in the form of the UGC Approved List of Journals in 2017, which relied on recommendations from universities. However, this approach failed to filter predatory journals, as evidenced by the inclusion of numerous unethical publications exploiting inexperienced researchers. These journals employed tactics such as fake impact factors, questionable indexing agencies, and fabricated editorial credentials, undermining the credibility of Indian academia (Patwardhan et al., 2021).

In 2018, UGC established the Consortium for Academic and Research Ethics (CARE) to combat predatory publishing and uphold research integrity. The UGC CARE list, introduced in 2019, is a dynamic and rigorously evaluated repository of credible journals. It employs a three-tier evaluation protocol focusing on editorial standards, peer review processes, and compliance with ethical publishing norms.

A distinguishing feature of the UGC CARE initiative is its emphasis on inclusivity, particularly in the Arts, Humanities, and Social Sciences (AHSS). The list includes Indian-language journals to preserve and promote local knowledge and cultural diversity, aligning with the objectives of the National Education Policy 2020. As of 2023, over 290 regional language journals, spanning 18 Indian languages, are included, showcasing India's linguistic and disciplinary diversity (Nagarkar et al., 2023; Patwardhan et al., 2021).

The UGC CARE list has significantly improved the global visibility and credibility of Indian research. By 2020, 15% of the 6,803 journals evaluated under Group I met the strict inclusion criteria. This rigorous approach has made the CARE list a cornerstone of India's academic publishing landscape, fostering ethical practices and promoting high-quality research (Patwardhan et al., 2021; Nagarkar et al., 2023).

Benefits of the UGC CARE List

The UGC CARE list has brought transformative changes to India's academic publishing ecosystem by addressing critical issues and promoting ethical research practices. Its benefits span several dimensions:

a. Ensuring Credibility and Quality in Research Publications

The UGC CARE list emphasizes rigorous peer review and ethical publishing standards, ensuring that only high-quality journals are included. This credibility safeguards the integrity of Indian research and elevates its global standing. By removing predatory journals and introducing rigorous evaluation criteria, the list has set benchmarks for quality in academic publishing (Patwardhan et al., 2021; Nagarkar et al., 2023).

b. Safeguarding Researchers from Predatory Publishers

One of the UGC CARE list's primary objectives is to protect researchers from exploitative journals. By offering a scrutinized directory of credible publications, the initiative prevents researchers from falling prey to unethical practices, such as high publication fees, fabricated impact factors, and poor peer review processes (Patwardhan et al., 2021). Additionally, this list also provides details of the cloned journals in the interest of the academicians.

c. Promoting Inclusivity Through Regional and Interdisciplinary Journals

The UGC CARE list promotes linguistic and disciplinary diversity by including journals in regional languages and niche fields. As of 2023, over 290 journals in 18 Indian languages have been included, reflecting the commitment to preserving cultural and intellectual diversity. This effort aligns with the National Education Policy 2020, which emphasizes the importance of regional language publications (Nagarkar et al., 2023).

d. Enhancing Global Visibility of Indian Research

By aligning with international publishing standards, the UGC CARE list improves the global discoverability and impact of Indian academic work. This visibility encourages international collaborations and ensures that Indian research contributes meaningfully to the global knowledge pool.

e. Supporting Ethical Practices and Research Integrity

The CARE initiative actively promotes research ethics through awareness workshops and mandatory courses, such as the two-credit "Research and Publication Ethics" course for Ph.D. students. These efforts strengthen the foundation of ethical academic practices across institutions (Patwardhan, 2021).

Through these multifaceted benefits, the UGC CARE list has become a cornerstone in fostering a robust, ethical, and inclusive academic publishing ecosystem in India.

Challenges Faced by Researchers

The implementation of the UGC CARE list, while beneficial, has introduced several challenges for researchers in India. These challenges are diverse and significantly impact the academic community:

a. Increased Competition for Publication

The rigorous criteria of the UGC CARE list limit the number of journals available for publication. As more researchers compete for limited spaces, the pressure to meet academic deadlines and institutional requirements has intensified. This often results in prolonged review and acceptance timelines, further complicating the publication process.

b. Commercialization of Academic Publishing

The UGC's mandate to publish in CARE-listed journals has inadvertently led to the commercialization of academic publishing. Many journals on the list charge significant publication fees, leveraging their vetted status to demand high payments from researchers. This has created financial barriers, particularly for faculty in government institutions and researchers from underfunded colleges. A 2018 report highlighted that some publishers exploit the CARE list's mandatory nature, turning academic publishing into a profit-driven industry (Patwardhan et al., 2021; Nagarkar et al., 2023). Cases of deceptive journals charging high fees to exploit researchers' desperation further exacerbate this issue (Retraction Watch, 2023).

c. Deceptive and Hijacked Journals

Despite the UGC CARE list's stringent evaluation processes, some deceptive and hijacked journals continue to exploit gaps in the system. Such journals mimic reputable titles, misleading researchers into submitting their work. This undermines the credibility of the publishing ecosystem and damages the careers of unsuspecting researchers (Anderson, Rick, 2015). Although, UGC CARE provides clone journals list on website, however, this step is not enough.

d. Limited Accessibility for Niche and Interdisciplinary Research

Niche and interdisciplinary research often struggles to find representation in UGC CARE-listed journals. The list's focus on established academic disciplines sometimes excludes emerging or less traditional fields, forcing researchers in these areas to look elsewhere or adapt their research to fit conventional frameworks.

e. Marginalization of Regional and Local-Language Publications

Despite efforts to include regional journals, researchers working on local or culturally specific topics still face challenges. Many such journals lack the

resources to meet the stringent inclusion criteria, leaving gaps in representation. As reported by Nagarkar (2023) only 298 journals of Indian regional languages find place in UGC CARE List.This marginalization particularly affects work published in Indian languages or addressing regional issues, limiting the diversity of academic discourse.

These challenges highlight the need for continuous reform and support mechanisms to ensure the UGC CARE list remains inclusive, accessible, and supportive of diverse academic pursuits.

Impact on Academic Institutions

The implementation of the UGC CARE list has had far-reaching implications for academic institutions, particularly government colleges and universities in India. These impacts can be broadly categorized as follows:

a. Implications for Faculty

The UGC CARE list directly influences faculty appraisal and career progression by prioritizing publications in listed journals. Faculty members in government institutions are required to meet stringent publication targets in UGC CARE-approved journals, which often leads to significant stress and pressure to produce high-quality research within tight deadlines (Patwardhan et al., 2021).

b. Influence on Research Funding and Resources

Institutions with better access to resources and funding are often at an advantage when it comes to supporting their researchers in meeting UGC CARE requirements. This creates a disparity between well-funded universities and under-resourced institutions, perpetuating inequities within the academic system (Nagarkar et al., 2023).

c. Standardization of Research Quality

The CARE list has raised the bar for research quality across institutions by ensuring that only credible and rigorously vetted journals are recognized. This has enhanced the overall credibility of Indian academic institutions on a global scale, encouraging a shift towards ethical and impactful research practices.

d. Challenges for Regional and Niche Institutions

Regional colleges and universities, often with limited exposure to high-impact publishing platforms, face difficulties in meeting the criteria set by

UGC CARE. The emphasis on global standards can inadvertently marginalize regional academic voices and localized research efforts (Patwardhan et al., 2021).

e. Institutional Policies and Compliance

The UGC CARE list has driven institutions to revise their academic and research policies to comply with its guidelines as NAAC also demands publications in UGC CARE Listed Journals. While this promotes consistency and adherence to ethical practices, it also demands administrative overhaul and capacity-building efforts, particularly in institutions with limited infrastructure.

By influencing faculty assessments, funding dynamics, and research priorities, the UGC CARE list has become a transformative yet challenging factor in shaping the future of academic institutions in India. Its long-term impact on fostering equitable, inclusive, and high-quality academic ecosystems remains a critical area for continued evaluation and reform.

Ethical and Systemic Concerns

The implementation of the Academic Performance Indicator (API) system has drawn significant criticism for its unintended consequences. While initially intended to enhance research quality and faculty evaluations, it inadvertently incentivized quantity over quality, leading to a surge in predatory journals and compromised academic integrity. By tying promotions and career advancements to metrics-driven outputs, the API system pressured researchers to prioritize publishing in bulk, often at the expense of impactful and original work (Das & Chattopadhyay, 2014; Madhan et al., 2018).

a. Misuse of Metrics in Evaluation

The overreliance on metrics such as the Impact Factor (IF) and h-index has significantly distorted research evaluation. These metrics, while useful in certain contexts, are often misapplied, such as attributing a journal's IF to individual articles or researchers. This misuse creates a flawed evaluation framework that emphasizes journal prestige over actual research quality (Madhan et al., 2018).

b. Impact on Research Culture

Metric-driven evaluation systems discourage interdisciplinary and innovative research by rewarding conformity to established publication norms. Researchers are incentivized to focus on topics that are more likely to be published in high-impact journals, sidelining novel or regionally significant research. This approach stifles creativity and limits the diversity of academic discourse (Anderson, Rick, 2015).

c. Encouragement of Predatory Practices

The API system and the misuse of metrics have inadvertently encouraged predatory publishing practices. By prioritizing numerical indicators, researchers often resort to publishing in journals with questionable ethical standards to meet institutional requirements. This practice undermines the credibility of the academic ecosystem (Retraction Watch, 2023).

d. Lack of Transparency in Journal Evaluation

Concerns over favoritism, inconsistent criteria, and opaque decision-making processes in journal evaluations worsen mistrust in the system. This lack of transparency not only affects the credibility of the UGC CARE list but also shakes researchers' confidence in institutional frameworks (Madhan et al., 2018).

Addressing these ethical and systemic concerns requires reforms in evaluation methodologies, greater transparency, and an emphasis on research impact and originality over quantitative metrics.

Collaborative Approaches to Improve the System

Collaboration among stakeholders is crucial to address the systemic challenges of the UGC CARE list and foster a balanced and inclusive academic publishing ecosystem. The following approaches aim to improve the system:

Moving Beyond Metrics

Shifting from journal-level metrics like the Impact Factor (IF) to article-level metrics can ensure that the quality and impact of individual research outputs are appropriately evaluated. Emphasizing qualitative assessments and peer review mechanisms over quantitative metrics would create a fairer and more accurate evaluation framework. This would encourage innovative and interdisciplinary research rather than prioritizing easily

publishable topics (Madhan et al., 2018). UGC also need to rethink over linking publication with promotions and career advancements.

Building Partnerships Between Stakeholders

Strengthening collaboration between the UGC, academic institutions, and publishers is essential. Regular feedback from researchers and faculty should be incorporated into the review and update process of the UGC CARE list. Partnerships with credible publishers can streamline journal evaluations, ensuring that only high-quality publications are included (Patwardhan et al., 2021). Transparency in these processes would boost confidence in the system.

Developing Regional and National Repositories

Creating repositories for regional-language journals with rigorous quality standards can address the marginalization of local knowledge systems. Regional academic councils and national-level initiatives can collaborate to support these efforts, enhancing inclusivity and accessibility for diverse disciplines and linguistic groups (Nagarkar et al., 2023).

Leveraging Technology for Journal Evaluation

Adopting advanced technologies such as artificial intelligence and machine learning can improve the journal evaluation process by detecting unethical practices and ensuring compliance with publishing standards. Additionally, digital platforms can facilitate real-time updates and transparent communication about the inclusion and exclusion of journals in the UGC CARE list (Anderson, 2015).

Fostering Global Collaborations

Collaborations with international academic bodies can align the UGC CARE list with global publishing norms and standards. Reciprocal agreements with global repositories can provide Indian researchers broader access to international publications and promote the visibility of Indian research on the global stage (Patwardhan et al., 2021).

By implementing these collaborative approaches, the UGC CARE framework can be refined to better support the academic community, ensuring ethical and impactful research while preserving diversity and inclusivity.

Conclusion

The UGC CARE list represents a pivotal reform in India's academic publishing landscape, aiming to address the proliferation of predatory journals and promote high-quality research practices. By setting rigorous criteria for journal evaluation and emphasizing inclusivity, it has enhanced the credibility of Indian academia both nationally and globally. However, the implementation has also revealed systemic and ethical challenges that merit critical reflection.

One significant issue is the overreliance on metrics such as the Impact Factor (IF) and h-index in evaluating research quality. These metrics, often misapplied, prioritize journal prestige over the actual quality of individual research outputs. This has fostered a "publish or perish" culture that incentivizes quantity over quality, discourages interdisciplinary research, and perpetuates unethical practices such as predatory publishing (Madhan et al., 2018; Patwardhan et al., 2021).

The UGC CARE list has taken steps to address these challenges by emphasizing transparency, inclusivity, and quality in journal evaluation. Yet, significant gaps remain. Moving forward, reforms such as adopting article-level metrics, enhancing peer review mechanisms, and promoting collaborative approaches are essential. Additionally, greater support for regional and interdisciplinary research is crucial to ensure the system reflects the diversity of Indian academia.

In conclusion, while the UGC CARE list has laid a strong foundation for ethical and impactful research dissemination, its long-term success depends on continued collaboration among stakeholders, sustained reforms, and adaptability to the evolving academic landscape. By balancing quality with inclusivity and accessibility, it can serve as a global model for academic publishing reform.

References

1. Anderson, Rick (2015). Deceptive Publishing: Why We Need a Blacklist, and Some Suggestions on How to Do It Right. Retrieved from https://scholarlykitchen.sspnet.org/2015/08/17/deceptive-publishing-why-we-need-a-blacklist-and-some-suggestions-on-how-to-do-it-right/

2. Das, S., & Chattopadhyay, D. N. (2014). Academic Performance Indicators Straitjacketing Higher Education. Economic and Political Weekly, 49(50), 68-71.
3. Madhan, M., Gunasekaran, S., & Arunachalam, S. (2018). Evaluation of Academic Performance Indicators in Research. International Journal of Research and Analytical Reviews. Retrieved from [https://doi.org/10.20529/IJME.2018.024].
4. Nagarkar, S., Thakur, A., Mane, M. and Nagare, P. (2023), "Indian languages, print journals and the UGC-CARE project", Global Knowledge, Memory and Communication, Vol. ahead-of-print No. ahead-of-print. https://doi.org/10.1108/GKMC-11-2022-0266
5. Pandita, R., & Singh, S. (2023). Can Impact Factor Be a Measure to Rank Research Publications: Time to Revisit UGC Regulation, 2018. University News, 61(8), 61-68.
6. Patwardhan, B., & Nagarkar, S. (2021). The UGC-CARE initiative: Indian academia's quest for research and publishing integrity. First Monday, 26(10). https://doi.org/10.5210/fm.v26i10.10349
7. Raju, V. (2020). UGC-CARE List: Some Observations. SSRN. Retrieved from https://ssrn.com/abstract=3687663.
8. Retraction Watch (2023). How hijacked journals keep fooling one of the world's leading databases. Retrieved from https://retractionwatch.com.
9. Shen, C., Björk, BC. 'Predatory' open access: a longitudinal study of article volumes and market characteristics. BMC Med 13, 230 (2015). https://doi.org/10.1186/s12916-015-0469-2
10. Sivapathasundharam B. (2024). Publications! Where are we going?. Journal of oral and maxillofacial pathology: JOMFP, 28(1), 7–10.https://doi.org/10.4103/jomfp.jomfp_77_24
11. UGC (2020). Guidance Document on Good Academic Research Practic- es (GARP). University Grants Commission. Retrieved from https://www.ugc.ac.in.

Academic Libraries in Transition: Shelves to Clicks in the Digital Age

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Abstract
The transformation of libraries from physical repositories to digital access hubs marks a significant shift in the delivery and usage of information. This article, Libraries in Transition: Shelves to Clicks in the Knowledge Age explores the evolving role of academic libraries in adapting to the changing needs of modern teaching and learning environments. Over time, academic libraries have transitioned to meet the expectations of a digital-first generation, bridging the gap between traditional resources and contemporary digital platforms. This evolution emphasizes the importance of empowering users with seamless access to knowledge—anytime, anywhere, and in any format.

It highlights strategies for maintaining the relevance and effectiveness of library services, such as fostering engagement through personalized resources, adopting emerging technologies, and creating flexible spaces that encourage both collaboration and individual study. The benefits of digital transformation, including improved accessibility and operational efficiency, are also discussed alongside challenges like digital equity and privacy concerns.

The purpose of this article is to examine the changing relationship between libraries and their patrons and to propose key considerations for designing and planning library services. By doing so, it aims to provide insights into sustaining a strong and viable library-user relationship in an increasingly digital world.

Keywords
Digital Transformation, automated services, academic library, emerging technologies, digital libraries, hybrid model, adaptability ,RFID, Virtual and augmented reality, cyber-security etc.

Introduction

The modern library is undergoing a dramatic transformation; it is no longer merely a collection of printed resources but has evolved into a dynamic knowledge hub powered by advanced technologies.. Traditionally libraries were known for rows of neatly arranged shelves and quite study areas, but today these shelves and quite places have undergone a drastic change to meet the demands of the digital age. Today, with the click of a button, users can access vast collections of resources on personal devices, bridging the gap between information and accessibility. Libraries are no longer limited to their physical walls; they have become gateways to a universal network of digital knowledge. From e-books and online databases to virtual research assistance and cloud-based services, the modern library caters to the needs of diverse user communities, redefining the very concept of access and engagement.

The journey from library shelves to personal devices is not just about technological advancements—it is about reimagining the role of libraries in an ICT-driven world. In order to deliver user-centric service and keep pace with the rapidly evolving web technologies librarians must adapt and grow alongside these changes. It is, therefore, crucial for library professionals to understand and embrace new technologies, enabling them to introduce and adopt the latest trends in library practices and services.

1. Traditional Libraries v/s Digital Libraries:

Digital Library and a Traditional Library can be differentiated based on their fundamental library functions like acquisition, circulation, cataloguing, both the libraries can be distinguished in some aspects as mentioned below:

Aspect	**Traditional Library**	**Digital Library**
Library Resources	Physical resources like books, journals, periodicals, theses & dissertations etc…	Digitized or non print resources like e-books, e-journals, e-newspapers, CDs/DVDs
Access	At library during library working hours.	Remote, 24/7 access via the Internet.
Search	Manual catalog browsing; time-consuming.	Fast, precise searches using algorithms.
User	Face-to-face interactions in a	Interactive features like

Aspect	Traditional Library	Digital Library
Engagement	pin drop silence zone	annotations and multimedia tools.
Preservation	Long-lasting but needs manual conservation systems	Vulnerable to technology obsolescence; requires constant updates.
Space	Requires significant physical storage.	Minimal physical space needed; resources stored electronically.
Cost	Costs for building, storage, and materials.	Digital infrastructure and licensing expenses.
Learning	Tactile, immersive experience with historical value.	Dynamic, multimedia-driven learning experiences.

2. **Need for Modern Academic Library Services**:

Academic libraries' functions and services have been significantly impacted over the past three decades by the emergence of Internet technology (IT), ICT, and various related fields like management information systems (MIS), information retrieval systems (IRS), etc. It has been thought which provide users with information when, how, and in the format they desire. The younger generation, often known as netizens, is very at ease working in internet environments. The user's expectations and needs have significantly improved. They need information services outside the physical library's four walls, thus they are no longer satisfied with the location-based library services. It is advantageous for libraries to change in accordance with the demands and expectations of their user base. Libraries can adopt new technology that can provide reduced information services that let them maintain their current patrons and draw in new ones. Libraries face going extinct if they don't adapt to provide new, contemporary services that meet the requirements and expectations of their patrons. We can sum up by saying that contemporary library services are essential for the reasons listed below:

- ❖ Information searching for user behavior changes
- ❖ Users' expectations and needs have grown, and
- ❖ Technology is now available to support accessibility and availability

3. Manual and Automated Library Services:

Academic libraries have unique ways of providing services, which are typically divided into two classes: manual services and automated services. These are mentioned below.

Table 1 explains the distinctions between manual and automated services offered by academic libraries:

Sr. No.	Manual Library Services	Automated Library Services
1	Books issued via manual registration/cards.	Issuance managed through ID-linked automation software.
2	Print/card catalogs prepared for books.	Users search resources via OPAC.
3	Bibliographies, abstracts, and indexes prepared manually.	Access to e-resources with indexing, abstracts, and full texts.
4	CAS provided via photocopies.	Email alerts for new arrivals and publisher notifications.
5	Reference service through face-to-face interaction.	Reference service via email, chat, or instant messaging.
6	Staff monitors security manually.	CCTV and RFID-enabled stock verification.

4. Role of Emerging Technologies in Libraries:

1 Description:

"Emerging technologies are innovations that have the potential to change the status quo," said business dictionary.com. These cutting-edge technologies will fundamentally transform the social and economic landscape

2. Applications in Libraries:

- **User Services**: Technologies like AI, chat bots, and virtual reality enhance user interactions and experiences.
- **Library Management**: Tools like RFID and big data analytics streamline cataloging, circulation, and inventory.
- **Information Access**: Cloud computing and institutional repositories expand access to resources beyond physical collections.

3. <u>Examples of Emerging Technologies</u>:

a. **Artificial Intelligence (AI)**: Automates processes, enhances search results, and supports personalized recommendations.

b. Internet of Things (IoT): Smart devices to manage environmental conditions and monitor library usage. IoT-enabled devices for book tracking and inventory management.

c. Robotics: Used for shelving, book retrieval, and visitor assistance.

d. Virtual and Augmented Reality (VR/AR): Create immersive learning environments.

e. Big Data: Analyze user behavior and optimize resources.

f. Block chain Technology: Enhances secure transactions, digital rights management, and the preservation of digital archives. Ensures transparency in interlibrary loans and digital resource sharing.

g. 3D Printing: Makerspaces in libraries for prototyping and creative projects.

h. **RFID Technology**: Streamlining check-in/check-out processes and inventory management. Enhanced security for library assets.

i. Cloud Computing: Scalability and accessibility of library management systems and digital resources. Collaboration through shared cloud-based repositories.

4. <u>Benefits of Emerging Technologies</u>:

a. Increased footfall due to engaging, innovative services.
b. Cost and time savings through automation and streamlined workflows.
c. Strengthened user loyalty as libraries adapt to modern needs.

5. <u>Trends and Readiness</u>:

a. Technology trends guide libraries towards future-readiness, enabling proactive adaptation to changes.
b. They help librarians address challenges like resource constraints, evolving user expectations, and the need for digital transformation.

6. Challenges in Adoption:

a. Variability in implementation due to institutional resources and priorities.
b. Necessity for skill development among library professionals to effectively leverage these tools.

This overview underscores the significance of integrating emerging technologies to sustain relevance and foster innovation in libraries. It also emphasizes that the success of such integration depends on resource availability, professional adaptability, and alignment with user needs.

❖ **Benefits of Digital Transformation in Academic Libraries**

Digital transformation has revolutionized academic libraries, providing innovative solutions that enhance library operations, improve accessibility, and enrich the learning experience. The following are key benefits:

1. Accessibility and Convenience

Digital libraries break traditional barriers by offering **24/7 access** to resources, including e-books, journals, and databases. This ensures users can connect to materials anytime and anywhere. Additionally, global reach allows libraries to serve users beyond geographical constraints, supporting remote learning and international collaboration.

2. Enhanced User Engagement

Digital tools foster self-reliance through **self-service options**, such as online catalogs, chatbots, and request portals. Personalization features, powered by AI and machine learning, provide tailored resource recommendations, creating a more intuitive and relevant experience for users.

3. Cost and Space Optimization

With reduced dependency on physical collections, libraries save on storage requirements, freeing up space for collaborative and educational activities. Automation of routine tasks like cataloging and circulation also leads to significant cost savings by minimizing labor-intensive processes.

4. Streamlined Resource Management

Digital formats ensure the **long-term preservation** of valuable content, protecting it from damage and loss. Libraries can also use analytics to track usage trends, optimizing decisions about acquiring, retaining, or weeding resources based on data-driven insights.

5. Facilitation of Collaboration

Digital systems make **resource sharing** across institutions seamless, enabling quicker and easier interlibrary loans. Additionally, shared repositories and collaborative platforms foster partnerships among students, faculty, and researchers, driving interdisciplinary projects and knowledge sharing.

6. Support for Advanced Learning and Research

- Modern libraries offer access to sophisticated research tools, such as citation management software and academic databases, which simplify scholarly work. Immersive technologies like VR and AR further create immersive learning experiences, making complex concepts more understandable.

7. Focus on Security and Privacy

Digital systems ensure controlled access to resources, safeguarding sensitive materials from unauthorized use. Libraries also benefit from enhanced data privacy measures, securing user information in compliance with modern privacy standards.

8. Sustainability and Environmental Responsibility

The move toward digital collections reduces the reliance on paper and minimizes physical storage needs, contributing to an eco-friendly approach. Digitization also helps libraries cut operational costs while promoting sustainable practices.

9. Adaptability and Innovation

- Digital platforms are flexible and can adapt to emerging technologies, ensuring long-term relevance.

In conclusion, digital transformation empowers libraries to better serve their patrons by creating efficient, user-centric, and sustainable environments. It fosters continuous learning, supports academic success, and keeps libraries at the forefront of innovation.

❖ **Challenges in the Digital Age:-**

In today's digital age, academic libraries face numerous challenges as they navigate evolving user needs and technological advancements. Some of the major challenges and solutions to meet those challenges include:

1. Information Overload

Challenge: The vast amount of digital information available can overwhelm users, making it challenging for libraries to guide them toward credible and relevant resources.

Solution: To tackle information overload, academic libraries can hire machine learning and data analytics for effective content curation. Collaborating with educators and researchers ensures resources align with academic needs. User education programs further

enhance information literacy, equipping users to navigate and filter content efficiently.

2. **Budget Constraints:**
   Challenge: Limited funding impacts the library's ability to adopt new technologies, maintain subscriptions, and enhance collections.
   Solution: Libraries can tackle budget constraints through consortia subscriptions, prioritizing open access resources, securing grants, and negotiating flexible licenses. Cost-effective technologies and data-driven spending ensure optimal resource us
   Rapid transformations, such as integrating digital repositories, managing hybrid collections, and rethinking physical spaces, demand constant adaptation.
3. **Adapting to Library Changes:**
   Challenge: Rapid technological and spatial transformations require continuous adaptation.
   Solution: Foster a culture of agility, provide staff with ongoing training, and adopt flexible, user-focused service models.

4. **Rising User Expectations:**
   Challenge: Users demand instant, seamless, and personalized digital services.
   Solution: Invest in user-friendly platforms, improve accessibility, and offer proactive, tailored support through virtual and in-person channels.
5. **Declining Footfalls:**
   Challenge: Fewer physical visits challenge the library's role as a community hub.
   Solution: Redesign spaces for collaborative learning, host events to engage users, and promote hybrid services that combine digital and physical experiences.
6. **Technical Infrastructure Requirements:**
   Challenge: Maintaining up-to-date IT systems and ensuring cyber security is resource-intensive.
   Solution: Adopt cloud-based solutions, invest in scalable technologies, and regularly upgrade cyber security measures to protect digital assets.

7. Tracking Performance Metrics

Challenge: Measuring the impact of digital services requires new tools and expertise.

Solution: Use advanced analytics tools, gather user feedback, and align metrics with institutional goals to demonstrate library value.

8. **Career Advancement for Librarians:**

Challenge: Librarians must keep pace with evolving skills in digital and data literacy.

Solution: Encourage professional development through trianing, workshops, and webinars, and foster a culture of lifelong learning.

9. **Open Access Resources and Initiatives:**

Challenge: Balancing advocacy for open access with sustaining proprietary resources.

Solution: Promote open access publishing, negotiate balanced licensing agreements, and educate users about the benefits of open access content.

10. Policy changes:

Challenge: The scholarly world continuously updates policies on the handling of educational materials, creating uncertainty for libraries. Library practices align with these changes can be complex and require thorough understanding of legal requirements. Librarians must stay on top of things to ensure that they are not in violation of any regulations.

Solution: Libraries should invest in regular training and professional development for staff to stay informed about policy changes. Collaborate with other libraries, academic institutions, and professional organizations can provide valuable insights and advocacy for best practices.

Academic library challenges impact both staff workflows and students' research. Addressing these issues improves efficiency and supports academic success, as some challenges affect staff and users differently.

Redesigning Academic Libraries with a Hybrid Model:

To meet the changing needs of users in today's digital age, academic libraries must adopt innovative approaches that blend traditional and contemporary resources. The rise of digital technologies and shifts in how students learn and engage with information has created a demand for more flexible and accessible library services. The Hybrid Model responds to this demand by integrating physical collections with digital resources, enabling users to access both classic texts and cutting-edge digital content

seamlessly. This model acknowledges the enduring value of print while leveraging the flexibility and interactivity of digital platforms to create a versatile and engaging learning environment.

Implementing the Hybrid Model requires thoughtful planning and investment in both technology and staff training. Libraries must consider factors such as infrastructure upgrades, the integration of digital content, and the development of policies that support a balanced mix of physical and digital offerings. By embracing this model, academic libraries can enhance user satisfaction, improve access to knowledge, and strengthen their role as central hubs for learning and research in the digital age.

Conclusion

The journey of academic libraries in transitioning to meet the demands of the digital age is both challenging and exciting. Academic librarians must continuously reinvent themselves through ongoing learning and adaptation to new roles and technologies. By leveraging collective knowledge, fostering a positive service-oriented mindset, and forming strategic partnerships with information schools, they can effectively respond to evolving user needs and emerging opportunities. The transformative capabilities of digital tools, mobile applications, and open access initiatives demonstrate how libraries can enhance user interaction and ensure the longevity of resources. These advancements enable libraries to offer inclusive, high-quality learning and research experiences, adapting to a world that is increasingly digital. The embrace of technology from cloud-hosted library solutions to artificial intelligence empowers librarians to remain competitive, revolutionizing traditional models and unlocking new possibilities. As libraries evolve, their fundamental role of providing access to information remains steadfast, with the integration of cutting-edge technologies paving the way for a future where academic libraries are not just repositories but dynamic, user-centric spaces.

References

1. Asif, M., & K. Singh, K. (2019). Emerging trends and technologies for digital transformation of libraries. *IP Indian Journal of Library Science and Information Technology*, *4*(2), 41–43. https://doi.org/10.18231/j.ijlsit.2019.011
2. Asim, M., Arif, M., & Rafiq, M. (2022). Applications of Internet of Things in university libraries of Pakistan: An empirical investigation. *The Journal of Academic Librarianship*, *48*(6), 102613.

https://doi.org/10.1016/j.acalib.2022.102613
3. Chari, D. S. N. (2023). From Shelf To Screen : Innovations And Emerging Technologies For From Shelf To Screen : Innovations And Emerging Technologies For Modern. *International Journal of Information Movement*, *8*(October), 9–16.
4. Gaikwad, M., & Bilawar, P. (2023). *Transforming Academic Libraries: Exploring Emerging Trends and Technologies*. *9*(June), 1–9.
5. Nepali, S., & Tamang, R. (2022). A Review on Emerging Trends and Technologies in Library. *American Journal of Information Science and Technology*, *6*(1), 8. https://doi.org/10.11648/j.ajist.20220601.12
6. Poluru, L., Vaghora, P., & Naveen, K. S. (2018). Emerging Trends in Libraries of Design Institutes : A Case Study. *Envisioning Digital Transformation In Libraries For Nextgen Academic Landscape*, 245–254.
7. Racheal, A. F. (2020). Global trends and emerging technologies in libraries and information science. *Library Philosophy and Practice*, *e-journal,*(January), 1–14.
8. Association of College and Research Libraries (ACRL) College Libraries Section Standards Committee (2000). Standards for college libraries 2000 edition. Retrieved March 22, 2002, from American Library Association (ALA) website: http://www.ala.org/acrl/guides/college.html.
9. Bainton, T. (2001). Information literacy and academic libraries: the SCONUL approach (UK/Ireland). Paper presented in the User education workshop, 67th IFLA Council and General Conference, August 16-25, Boston, USA.
10. Hardesty, L. (2000). Do we need academic libraries? Position paper of the Association of College and Research Libraries (ACRL). Retrieved March 22, 2002 from American Library Association (ALA) website: http://www.ala.org/acrl/academiclib.html
11. Kaag, C.S. (1998). Collection development for online serials: Who needs to do what, and why, and when. The Serials Librarian, 33(1/2), 107-122.

Breaking Barriers to Access to Published Work: End of Book Famine

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Abstract
There is no limit to the effort put towards achieving access to information. From the time when academics, researchers, and scientists noticed that access to information was restricted by the traditional publishing system, which gives publishers complete copyright control over content, authors have been actively working to promote open access on a worldwide scale. Yet, open access alone cannot solve the issue of providing information to individuals who are blind, visually impaired, and print-disabled. So, to make published work more available to these individuals, numerous nations globally have collaborated with the World Blind Union and the World Intellectual Property Organization (WIPO) to develop an international treaty focusing on the rights of individuals with learning disabilities. The Marrakesh Treaty was approved on June 27, 2013, at WIPO for visually impaired and print disabled. On June 27, 2013, WIPO ratified the Marrakesh Treaty, which aims to provide blind, visually impaired, and print-disabled people access to published works. It became effective on September 30, 2016, in nations that have endorsed and ratified it. This paper gives a summary of various collaborative initiatives aimed at tackling the global 'Book famine', the effective enforcement of the Marrakesh treaty, and the involvement of libraries. This paper aims to raise awareness regarding the status of individuals with print disabilities, promote their accessibility rights, and spotlight the efforts of the Indian Government.

Keywords
Marrakesh Treaty; copyright law; library; blind; visual impairment; print disability; access to information; WIPO.

Introduction

The right to read is viewed as a fundamental human right globally. Engaging with reading materials is crucial for the accumulation of knowledge and the application of this knowledge contributes to personal development and growth. However, individuals who are blind, visually impaired, or have other print disabilities are consistently denied their rights and have restricted access to books and other reading materials for recreation, work, and education. There is a severe lack of library and information services for the blind.

The primary reasons for the situation are copyright and legal barriers, and occasionally in developing countries, it may also be due to technological differences. According to the World Health Organization's estimation, there are approximately 285 million individuals worldwide living with disabilities, with India having over 63 million visually impaired individuals, including around 8 million who are blind (WIPO Assembly Report, 2016). According to UN statistics, roughly 15% of the world's population is disabled and more than 90% of published materials are not accessible to blind or print-disabled individuals because they are not offered in formats like large print, audio, braille, or daisy. Maryanne Diamond characterized this situation as a 'Book famine'.

To address the book famine, the World Blind Union (WBO) and the World Intellectual Property Organization (WIPO) initiated a global campaign to enhance book accessibility for blind and other print-disabled individuals. This resulted in the creation of an international copyright treaty in Marrakesh on June 28th, 2013, which was enforced on September 30th, 2016 following ratification by 20 countries. The initial Marrakesh Assembly meeting after the Marrakesh Treaty came into effect took place in Geneva from October 3 to 11, 2016. Currently, 193 member states are part of this treaty.

Additionally, the quick advancement in technology and networking, along with its cost-effectiveness, has advanced the goal of providing reading accessibility to visually impaired individuals. This progress has made it feasible to create and disseminate books in accessible formats at a low cost.

National and Global Initiative for the Disabled Community's Rights

Numerous measures and regulations are implemented both on a national and global scale to ensure that education, employment, and other amenities are easily available for individuals with disabilities. Several emerging nations, including India, have taken steps in laws, regulations, and measures to support and empower individuals with disabilities to gain equal access to education and employment. In India, the government implements different measures and regulations to strengthen the abilities of individuals with disabilities and foster a society that is open to everyone. Over the years, the Government of India has put into effect various acts to support and enable people with disabilities. The most recent one is the Rights of Persons with Disabilities (RPwD) Act, 2016, among other laws.

These laws are crucial measures to guarantee equal opportunities and involvement of the community of differently-abled individuals in national advancement. These ensure a barrier-free environment including barrier-free infrastructure, buildings, and surrounding areas, transportation facilities to visit effortlessly, and rehabilitation of persons with disability. Children with disabilities should have access to complimentary braille books and other associated resources, financial aids for education, assistive devices to access information for their education and research development, etc.

Developed nations like the United States, Canada, the United Kingdom, and several European countries have legal provisions for providing access to information to differently-abled persons. They have implemented national policies in their libraries and institutions, and providing infrastructure, information, services, assistive technology, devices, and trained staff to support people with disabilities. Certain acts and provisions consist of the Americans with Disabilities Act (ADA) of 1990; The Disability Discrimination Act 1995; Special Educational Needs and Disability Act (SENDA) 2001; United Nations Convention on the Rights of Persons with Disabilities (CRPD) in 2006; Convention on the Rights of Persons with Disabilities established in 2008; The Marrakesh VIP Treaty in 2016, etc. The American with Disabilities Act (ADA) 1990 of U.S. legislation ensures equal opportunity in education, employment, public services, and private sector services. The Disability Discrimination Act

1995 was replaced with the Special Education Needs and Disability Act (SENDA) 2001 which mandated educational institutions to make reasonable provisions to ensure equal access to opportunities, access to library services and information in institutions and colleges, without facing any discrimination. Other initiatives to support disability communities have also been framed by the Canadian Federation of Library Associations (CFLA), the Australian Library and Information Association (ALIA), and the American Library Association (ALA).

Marrakesh Treaty 2016 for Disabled Community

Marrakesh Treaty is a global effort to provide the necessary information to print-disabled individuals. The treaty is generally referred to as the Marrakesh treaty, although its official title is "The Marrakesh Treaty to Facilitate Access to Published Works by Visually Impaired Persons and Persons with Print Disabilities." The treaty is also known as the 'Books for Blind' treaty. It is closely related to the Convention on the Rights of Persons with Disabilities (CRPD) 2006 by United Nation and contains necessary provisions to protect the rights of individuals with disabilities. On June 27, 2013, in Marrakesh, Morocco, 79 WIPO members ratified the Marrakesh Treaty. The Treaty takes effect on September 30, 2016. The Treaty makes it easier to access and reproduce published, copyright-protected works for people with visual impairments. It has been implemented in many developing and developed countries. The Treaty has provisions for transferring books in accessible formats between various nations (Were, Otike & Bosire, 2021). If the countries fully participate in the Treaty, it will have significant positive impacts. The Marrakesh Treaty aims to ensure equal opportunities for blind and visually impaired individuals by granting them access to information and services, ultimately enhancing their engagement in cultural and social activities within their communities (Macharia, Otike, and Bosire, 2020).

The treaty focuses on giving new mandatory accessibility rights to physically impaired persons. To ensure accessibility of accessible work formats without violating the nation’s copyright laws, it requires the ratifying country to revise its national copyright law which includes exceptions that allow the permission or license-free transformation of print materials into accessible formats and the sharing of these works by libraries and other agencies without any cross-border restriction. However, Helfer, Land, Okediji and Reichman (2017) pointed out that

simply adapting the national copyright laws to the Marrakesh Treaty may not be sufficient to ensure the Marrakesh Treaty's effectiveness. They suggested that for effective implementation of the Treaty, governments ought to take various tangible actions such as engaging with individuals with print disabilities, establishing legal measures to address infringements, enable national institutions to monitor and enforce international commitments, and provide updates on execution strategies within the UN human rights system.

Implementation of Marrakesh Treaty in India

As per the 2011 Census, India has 26.8 million individuals with disabilities, with 14.9 million being men and 11.9 million being women (Government of India, 2021). The Constitution of India ensures that all citizens of India have equal rights, with no discrimination. Regrettably, individuals with disabilities are frequently refused numerous rights that the sighted population experiences. Millions of individuals with disabilities in India deserve to have equal rights and legal safeguards as any other citizen. Acknowledging the situation, the Indian parliament made amendments to India's copyright laws, which included significant exceptions for people with physical disabilities. The Indian Government collaborated with private local organizations to enhance the implementation of the Marrakesh Treaty. India's multi-stakeholder approach showcased the fundamental principles of its model. India's multi-stakeholder approach demonstrated the core principles of its model. In addition, India and WIPO collaborated on creating a digital library of easily accessible books (WIPO, 2016).

It is worthy to mention that India was the earliest nation to approve the Marrakesh Treaty. India ratified the Treaty in 2014 and ensured that the treaty was enforceable within its boundaries, providing legal acknowledgment and protection for its blind or visually impaired citizens. Ever since then, the Indian government has been making efforts to fully implement the treaty in the country to improve the lives of the disabled. India has the following pre-Marrakesh exception.

Section 31B The Copyright Act, 1957

Section 31B of the Copyright Act, 1957 allows for the issuance of compulsory licenses to publish copyrighted works for the benefit of persons with disabilities. Any entity working for the benefit of disabled

individuals on a profit or business basis can apply to the Copyright Board for such a license. The Board will investigate the applicant's credentials and determine if a compulsory license is necessary to make the work accessible to the disabled. If granted, the license will specify the publication method, duration, and number of copies allowed. The Board can extend the license period and authorize the issuance of more copies upon further application. This section aims to ensure that copyrighted works are accessible to individuals with disabilities while balancing the rights of copyright owners.

Certain acts not to be infringement of copyright

Section 52 of Copyright Act, 1957

The following acts shall not constitute an infringement of copyright, namely: the adaptation, reproduction, issue of copies or communications to the public of any work in any accessible format. In a brief it is summarised as follows:

This provision allows for the creation and sharing of accessible formats of copyrighted works for the benefit of people with disabilities. This includes personal use, education, and research. Organizations working for the benefit of people with disabilities can also make and distribute these accessible formats, as long as they are provided to the disabled on a non-profit basis and only cover the cost of production. These organizations must also ensure that these accessible copies are only used by people with disabilities and take measures to prevent their distribution through regular commercial channels.

Explanation.—For the purposes of this sub-clause, "any organisation" includes an organisation registered under section 12A of the Income Tax Act, 1961 and working for the benefit of persons with disability or recognised under Chapter X of the Persons with Disabilities (Equal Opportunities, Protection or Rights and full Participation) Act, 1995 or receiving grants from the government for facilitating access to persons with disabilities or an educational institution or library or archives recognised by the Government (Band & Cox, 2021).

Following the Marrakesh treaty, India introduced an E-Library named 'Sugamya Pustakalaya' for the visually challenged as part of the Prime Minister's Accessible Digital India campaign (Sugama Bharat Abhiyan).

With assistance from TCS Access, it was created by the Ministry of Social Justice and Empowerment's Department of Empowerment of Persons with Disabilities (Divyangjan) in collaboration with Daisy Forum of India member organizations. Sugamya Pustakalaya can be easily accessed by individuals with print disabilities through a single registration, and it offers support in accessing necessary reading materials worldwide. It contains a variety of textbooks, novels, reference books, etc. on various subjects that can be accessed in audio, video, or both formats. Currently, the library possesses a total of 3,33,912 downloadable e-books in 09 various Indian languages such as Gujarati, Hindi, Kannada, Punjabi, Sanskrit, Tamil, Telugu, Urdu, and English. Sugamya Pustakalaya offers a variety of formats for its materials, including Word format (DOC/DOCX), HTML, BRF (Braille ready files), RTF, EPUB, DAISY audio, and DAISY full text. The library also gives individuals with print disabilities the opportunity to access Bookshare, the world's biggest online library, created by Jim Fruchterman.

Success of Marrakesh Treaty: Role of Libraries

Ever since the release of "The Standard Rules on the Equalization of Opportunities for Persons with Disabilities (ONU, 1993), the "UNESCO Public Library Manifesto" (1994), and the Persons with Disabilities Act (UN, 1993), the understanding that information is a basic right for individuals with disabilities has significantly increased (Bernardi). Libraries worldwide provide various library and information services to cater to the information requirements of individuals who are blind or visually impaired. In addition to the usual professional duties, libraries for the blind also handle the publication of accessible books for their clients, not just offering library services (Brazier, 2007). According to the Marrakesh treaty, the exclusive rights to produce and distribute accessible format copies are reserved for approved organizations serving the visually impaired, libraries, and other designated 'authorized entities'. Hence, in addition to offering library and information services and taking care of routine professional duties, libraries for the blind are frequently in charge of the publication of books in accessible forms and making them available to their users. Nevertheless, a lack of specialised format resources, limited government support, and funding plague many of these libraries. This issue is universal across both wealthy and

impoverished nations. However, a lot of them are in a good position to benefit from advancements in digital library services.

Teresa Hackett from EIFL emphasised the significance of libraries in overseeing the successful implementation of an important global treaty, which grants them the responsibility to provide accessible format copies to individuals with print disabilities. It is crucial for librarians to participate in establishing national laws to ensure the maximum possible impact, and to effectively fulfill the objective of the treaty. Hence, various privileged libraries for the visually impaired globally, such as IFLA Libraries for the Blind Section, with extensive accessible collections, can collaborate with countries that ratify and enforce the treaty. Therefore, the key to the treaty's effective enforcement primarily rests on libraries fulfilling the responsibility of supplying easily accessible copies to individuals with print disabilities. While the services provided by libraries to the blind and visually impaired differ from nation to nation, libraries for the blind typically play a major role in meeting their needs.

Conclusion

The Marrakesh Treaty is the result of extensive discussions, research, and negotiations among copyright holders around the world, including publishers, authors, and trustees, over the course of several decades. The primary support for the initiative came from the World Intellectual Property Organization (WIPO), an international platform for copyright holders worldwide. The non-profit organizations, libraries, educational institutions, and other organizations should make use of the provision to provide accessible books to print-disabled readers in different countries without needing permission from the copyright holders. The countries involved should agree, approve and enforce the treaty in its entirety without any changes to the National Copyright Act. Brazil is the first country to incorporate the treaty into its legal system as a constitutional amendment. Physically disabled individuals now have greater opportunities to be actively involved and accepted in various aspects of the community, including social, cultural, and educational activities. This agreement aims to create a society that is more equitable and fairer. The agreement will have a significant impact on individuals with visual impairments and on libraries catering to those with reading difficulties. Simply put, individuals with print disabilities must now have equal access

to books and reading materials in alternative formats, regardless of copyright limitations.

References

1. Ahuja V. (2017). Marrakesh treaty to facilitate access to published works for visually disabled: Putting an end to global book famine. In: Sinha M., Mahalwar V. (Eds), Copyright Law in the Digital World. Springer, Singapore.
2. Band, J. & Cox, K. (January 15, 2021). National Implementations of the Marrakesh Treaty: By countries that have ratified or acceded to the treaty. Compiled by Jonathan Band and Krista Cox. Association of Research Libraries. P. 51-53. Retrieved on December 26, 2024 from https://www.arl.org/wp-content/uploads/2021/01/2021.01.15-MarrakeshTreaty.pdf
3. Calvo, F.J.M. (2014). The role of libraries in the implementation of the Marrakesh Treaty for persons with a print disability. IFLA, 2014, Lyon.
4. Concern over access to library material for visually impaired people raised with Minister. Posted on 16 March 2017. Retrieved on December 24, 2024 from: https://www.cilip.org.uk/news/concern-over-access-library-material-visually-impaired-people-raised-minister
5. Fitzpatrick, S. (2014) Setting its sights on the Marrakesh Treaty: The US role in alleviating the book famine for persons with print disabilities. *Boston College International and Comparative Law Review,* 37(1), 139-172.
6. Government of India (2021). Persons with Disabilities (Divyangjan) in India: A Statistical Profile, 2021). Retrieved on January 4, 2025 from: https://mospi.gov.in/sites/default/files/publication_reports/Persons_Disabilities_31mar21.pdf
7. Helfer, L.R., Land, M.K., Okediji, R.L. & Reichman, J.H. (2017). Putting the Marrakesh Treaty into Practice in National Law. In The World Blind Union Guide to the Marrakesh Treaty: Facilitating Access to Books for Print-Disabled Individuals. New York, NY: Oxford University Press.
8. Kerscher, G. (2006). The essential role of libraries serving persons who are blind and print disabled in the information age. In: Miesenberger K., Klaus J., Zagler W.L., Karshmer A.I. (eds)

Computers Helping People with Special Needs. ICCHP 2006. Lecture Notes in Computer Science, vol 4061. Springer, Berlin, Heidelberg
9. Macharia, S., Otike, J. and Bosire, E.K. (2020). Exploiting the Marrakesh treaty to obviate copyright-related challenges on access to information by visually impaired people in academic libraries. *Library Management*, 41 (4/5), 235-246.
10. The Treaty of Marrakesh (2016). Retrieved on January 02, 2025 from: https://www.ifla.org/node/10916
11. Were, S. M., Otike, J. N., & Bosire, E. K. (2022). Framework for the provision of information to the visually impaired in academic libraries in compliance with the Marrakesh Treaty. *IFLA journal*, *48*(4), 727-741.
12. World Intellectual Property Organization (2016). Report of First (1st Ordinary) Assembly Session of Marrakesh Treaty to Facilitate Access to Published Works for Persons Who Are Blind, Visually Impaired or Otherwise Print Disabled (MVT) held at Geneva, October 3 to 11, 2016

Patent: A Treasure trove of Technical Insights in India

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Abstract
This manuscript presents a comprehensive information regarding patents, delineates inventions that do not qualify for patent protection, and elucidates the terminology pertinent to these concepts. Additionally, it addresses the importance of patents in fostering innovation and the librarian's function in facilitating such innovation. The focus is towards the Patent Landscape in Indian context.

Keywords
Intellectual Property, Patent Analysis, Patent Landscape, India, Libraries, Patent trends

1 Introduction

1.1 Intellectual Property

Intellectual property constitutes the intellectual outputs generated by human cognition. The rights that safeguard these creations are referred to as Intellectual Property Rights (IPR).
Types of IPR
These rights can be categorized into two principal classifications:
1.1.1. Industrial Property - This encompasses intellectual property rights such as patents, trademarks, industrial designs, configurations of integrated circuits, and geographical indications.
1.1.2 Copyright and Neighbouring Rights – This includes a diverse array of literary creations, musical arrangements, theatrical works, audiovisual productions, visual art such as paintings and drawings, three-dimensional artworks including sculptures, photographic creations, architectural blueprints, audio recordings, live performances by musicians, actors, and vocalists, in addition to various forms of broadcast media, among other categories.

1.2 Patent - A patent signifies a legally granted entitlement, privilege, or authority concerning an invention. An invention may relate to either a novel product or a method. For an invention to be eligible for patent protection, three fundamental criteria must be satisfied: novelty, non-obviousness, and industrial applicability. This entitlement grants the right to prohibit others from producing, utilizing, offering for sale, distributing, or importing the invention within the jurisdiction of India. It constitutes a restricted monopoly (for a period of 20 years) conferred by the state under legislative provisions in return for the disclosure of technical information. Moreover, it is a right that is confined to a specific territory.

The legal structure regulating patents is comprehensively outlined in the Patents Act of 1970, inclusive of its subsequent modifications. Section 2(1)(m) of the Indian Patent Act, 1970 delineates that a "patent" refers to a patent for any invention granted under this statutory framework. (The Patents Act, India (1970))

2. Non-Patentable Inventions (The Patents Act, India (1970))

- An innovation distinguished by its inconsequential characteristics.
- An innovation that has the potential to violate societal norms or ethical standards, or that causes significant detriment to animal, human, or botanical existence or well-being, or to ecological systems.
- The basic identification of a scientific axiom or the development of an ethereal hypothesis, or the recognition of any living entity or non-living substance that manifests within the natural realm.
- The simplistic recognition of any novel characteristic or application for an established substance, or the rudimentary employment of a recognized process, apparatus, or mechanism unless such recognized process generates an unprecedented product or integrates at least one innovative reactant.
- A substance obtained exclusively from a combination that culminates merely in the confluence of the properties inherent to its constituent elements, or a methodology to synthesize such a substance.
- The simple arrangement, rearrangement, or duplication of established apparatuses, each functioning autonomously in a familiar fashion.
- A technique related to agronomy or botany.
- Any systematic approach for the medical, surgical, remedial, preventive, diagnostic, therapeutic, or alternative care of humans or non-human animals.

- The complete range of flora and fauna, including all constituent components, excluding microorganisms, yet encompassing seeds, cultivars, and taxonomic classifications, in addition to essential biological processes for the cultivation or distribution of such flora and fauna.
- A mathematical or commercial methodology, a software application in and of itself, or computational procedures.
- A creative work in the literary, theatrical, musical, or artistic domain.
- An elementary framework, regulation, or procedure for the execution of a cognitive operation, or a systematic approach for participation in a game.
- A demonstration of data or information.
- The spatial arrangement of integrated circuits.
- An innovation that fundamentally embodies conventional wisdom,
- A collection or reproduction of the established characteristics of conventionally acknowledged elements.
- Innovations pertaining to atomic energy do not qualify for patent safeguarding.

3 Significance of Patents

Patents constitute an essential repository of technical literature within the field of engineering by enabling the transference of scientific innovations into practical applications that yield societal benefits. In contrast to academic citations, which primarily emphasize scholarly contributions, patents embody advancements that are directly pertinent to commercially viable technologies. The research indicates that through the examination of patent data, one can determine noteworthy correlations with scholarly publications, thereby elucidating trends in innovation and the technical prerequisites of nascent technologies, ultimately augmenting the comprehension of advancements in engineering. (Adrian et al., 2024)

Patents represent vital repositories of technical literature within the engineering domain, as they furnish comprehensive details regarding inventions, methodologies, and technological advancements. They function as essential references for innovators and engineers, thereby enhancing access to established knowledge and groundbreaking innovations. This is especially important in disciplines such as Science and Technology, where comprehension of prior art can significantly impact subsequent advancements. (Simsek et al.,2024)

Patents function as a significant reservoir of technical literature within the field of engineering by chronicling novel inventions and the fundamental principles that underpin them. They furnish comprehensive descriptions and legal assertions that can enlighten engineers regarding existing prior art, thereby enabling them to evaluate the novelty and non-obviousness of their own creations. Furthermore, patent illustrations enhance comprehension of intricate technical specifics, rendering patents invaluable assets for research and development endeavors. This documentation not only safeguards intellectual property but also stimulates innovation amid the competitive milieu of technology-driven enterprises. (Corcoran, 2013)

According to Noruzi & Abdekhoda(2012) information regarding patents can be useful in the following ways.

- ascertain the originality, patentability, or legitimacy of an invention
- observe and project technological advancements and trends
- perform thorough research and assessment cultivate an increased number of inventions.
- secure additional research funding
- assess the research efficacy of institutions, departments, or individuals
- monitor and benchmark the progress and activities of competitors or peers
- identify researchers and inventors for competitive intelligence and patent analytics
- recognize and address potential deficiencies and prospective avenues for innovation
- discover inventive solutions to technological challenges
- examine the current state of technology and pinpoint exemplary practices within the field
- evaluate the breadth of patent protection coverage
- mitigate and prevent the replication of innovations diminish or lessen the risk of patent infringement claims

4 Role of Librarians in supporting Innovation

In the rapidly transforming domain of intellectual property, the significance of librarians has escalated markedly, especially within the sphere of patent investigation and acquisition. Functioning as the custodians of extensive knowledge repositories, librarians are endowed with the specialized skills requisite for navigating intricate databases and

information systems that contain patent-related data. Their adeptness in information literacy empowers them to support inventors, researchers, and legal practitioners in pinpointing pertinent patents, comprehending patent classifications, and executing comprehensive prior art investigations. This is indispensable for driving innovation and facilitating comprehensive development within their respective fields. As the complex landscape of intellectual property continues to undergo constant evolution and transformation, it is imperative to recognize that the invaluable contributions made by librarians will remain fundamentally essential in nurturing and fostering a well-informed society that is fully capable of leveraging patent information as a vital resource for promoting technological advancement and stimulating substantial economic growth.

The library plays a multifaceted role in facilitating the process of innovation. It reinforces its esteemed reputation as a trustworthy and credible repository of information for both the scientific community and the broader innovation sector. Through the incorporation of patent services into the operations of libraries, they are equipped to deliver crucial information and advisory services pertaining to patents. This integration facilitates researchers in navigating the intricacies of intellectual property, subsequently promoting innovation. By emphasizing the domains of intellectual property and innovation, libraries have the potential to enhance their standing as credible sources of information. Such an enhancement may attract new patrons and strengthen ties with the scientific and innovation sectors. (Mitroshin, 2023)

5 Patenting trends in India

The World Intellectual Property Organization (WIPO) in its annual report titled World Intellectual Property Indicators, asserted that India exhibited the most rapid growth among the top twenty nations regarding the number of patents filed, with patent applications increasing by 15.7% in 2023, thereby signifying five consecutive years of double-digit growth. This notable increase has elevated India to the 6th position worldwide in terms of patent applications, motivated by an enhancement in domestic innovation, as reported by the Ministry of Commerce and Industry. (India’s Patent Filings Doubles in Five Years; Country Now Ranks 6th Globally, 2024)

5.1 Patent Filing trends in India

Year	2018-19	2019-20	2020-21	2021-22	2022-23
No. of Patents Filed	50659	56267	58503	66440	82811

Table No.1- No. of Patents filed in the last 5 years
(Source- Annual report Intellectual Property India 2022-23)

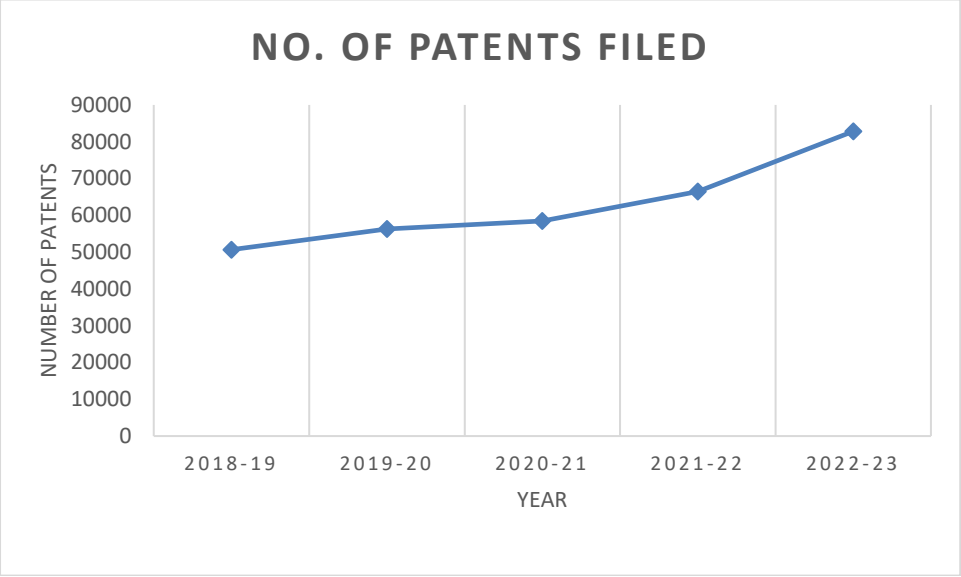

Figure 1- No. of Patents filed in the last 5 years

It is observed from Table number 1 that number of patents being filed is consistently on the rise.

5.2 Number of Patents Published and Granted

This data is generated from the Indian Patent Advance Search System (inPASS)

Year	Published	Granted
2019	50058	27203
2020	51726	24797
2021	57195	20225
2022	71940	8910
2023	72993	1962

Table No. 2- No. of patents published and granted at the Patent Office India

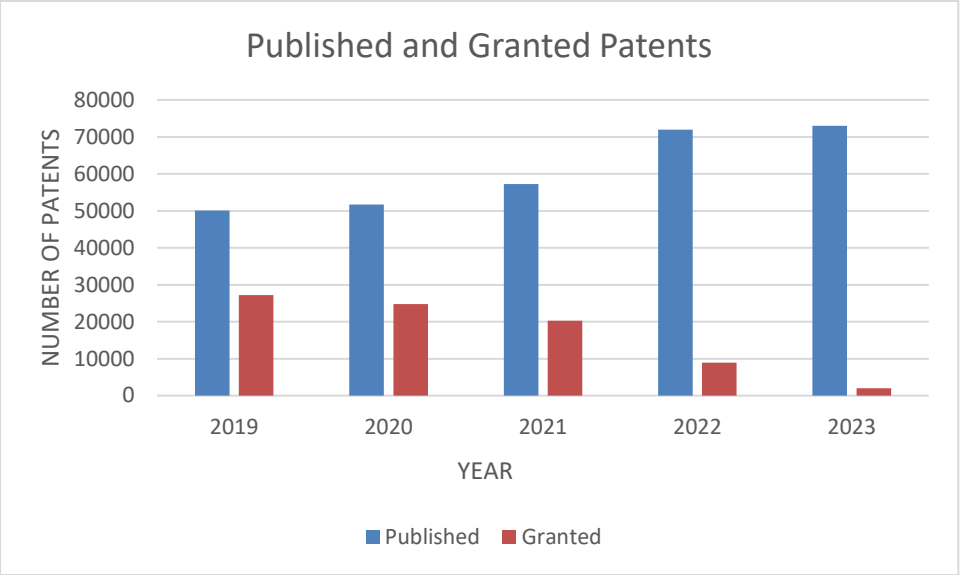

Figure 2- No. of patents published and granted at the Patent Office India

It is seen from Table number 2, that though the number of published patents is on the rise, the number of patents being granted is declining. This could be attributed to either the patent applications not meeting the patentability criteria or delay in the examination process of patents due to a reduced workforce of patent examiners.

5.3 Granted Patents under different Fields of Inventions

Field of Invention/Year	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**Total**
Chemical	4242	4848	6074	4279	6958*	26401
Pharmaceuticals	761	1930	1264	3371		7326
Polymer Science and Technology	701	923	1745	893	1237	5499
Computer Science & Electronics	1074	2141	2049	2459	3718	11441
Communication	1414	2692	2857	3238	3795	13996
Electrical	1253	2451	2637	3084	3489	12914
Physics	703	1349	1396	1609	1971	7028
Biomedical	290	565	703	982	1165	3705
Mechanical	2857	5301	6348	6832	8663	30001
Others#	1988	2736	3312	3380	3138	14554
Total	15283	24936	28385	30127	34134	132865

Table No. 3 – Granted Patents in different Fields of Inventions (Source- Annual report Intellectual Property India 2022-23)

*Chemical applications include pharmaceutical applications for the year 2022-23

#Includes Biotechnology, Biochemistry, Food, Microbiology, Metallurgy and Material sciences, Textiles, Civil, General Engineering, Agrochemicals & Agriculture Engineering.

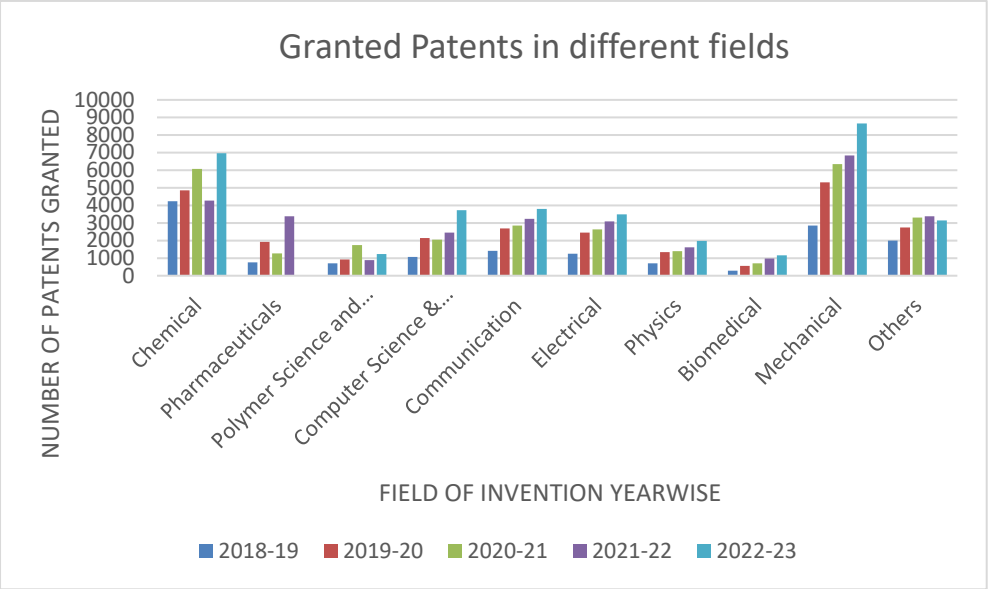

Figure 3 – Granted Patents in different Fields of Inventions

From Table number 3, it is evident that the highest concentration of patents exists within the domain of Mechanical engineering, subsequently followed by Chemical engineering. The substantial number of patents within the realm of Mechanical engineering may be attributed to its expansive nature, encompassing a multitude of subfields such as manufacturing, thermodynamics, aerospace, design engineering, combustion, marine engineering, automotive technology, turbines, fluid mechanics, control systems, and robotics, among others.

Conclusion

This article has highlighted the significance of patents as a substantial reservoir of technical information, as well as the way librarians can enhance their contributions by facilitating the retrieval of patent-related data. This

bolsters their reputation as custodians and gatekeepers of knowledge. The quantity of patents submitted in India has experienced a notable increase over the preceding five years. The bulk of patents awarded have occurred within the domain of mechanical engineering during the fiscal year 2022-23.

References

1. Adrian, Sven, Geissler., Jan, Gorodkin., Stefan, E., Seemann. (2024). 1. Patent data-driven analysis of literature associations with changing innovation trends. Frontiers in Research Metrics and Analytics, doi: 10.3389/frma.2024.1432673
2. Corcoran, P. M. (2013, January). A crash course on patents for engineers. In 2013 IEEE International Conference on Consumer Electronics (ICCE) (pp. 25-26). IEEE.
3. I., A., Mitroshin. (2023). Information Support of Innovation Activities by Libraries: The Experience of Library for Natural Sciences of RAS. doi: 10.19181/smtp.2023.5.3.11
4. *India's patent filings doubles in five years; country now ranks 6th globally*. (2024, November). Economic Times https://economictimes.indiatimes.com/news/economy/indicators/indias-patent-filings-doubles-in-five-years-country-now-ranks-6th-globally/articleshow/115186980.cms?from=mdr (Accessed 14th November, 2024)
5. Intellectual Property India. Retrieved November 14, 2024, from https://ipindia.gov.in/writereaddata/Portal/IPOAnnualReport/1_114_1_ANNUAL_REPORT_202223_English.pdf
6. Simsek, B., Demirel, O., Tamkoç, A. K., Kilinçkaya, B., Somuncu, Ö., & Sahin, P. D. (2024, January). Comparison of Different Approaches to Patent Search. In *SIU*.

Online Accessible Libraries for Blind and Print Disabled Students

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Abstract
The purpose of this study is to identify online libraries for visually impaired students like Bookshare and Sugamya Pustakalaya, which are useful for people with disabilities. Whenever disabled students need information as sighted readers and want to read books, they face some problems, because most of the reading material is not available in an accessible format. So this research paper is focused on Bookshare and Sugamya Pustakalaya, which provide books in accessible formats like DAISY, EPUB, BRF, MP3 and Microsoft Word Document. So that disabled students should not face any problems while reading books.

Key words
Visual impairment, Online libraries, Blind student, Print Disabled, Digital Libraries

1. Introduction:

In today's technological era, visually impaired students/readers need the same information as sighted readers. Just as sighted students can read newspapers, listen to articles in audio format, or download information available electronically from the Internet. visually impaired students/readers need to have access to relevant information in an accessible format of their choice. Therefore, it is now important to develop library services for print-disabled readers. Today, there are fewer commercially available books in accessible format than there are in printed form for the general reader. Hence, it has become the need of the hour to create collections in an accessible format for visually impaired readers.

Among the 37 sections of the International Federation of Library Associations (IFLA), "IFLA LBS" represents a total of 135 countries in the world, including India. Its main objective is to develop library services for

print-disabled readers around the world. This department was started to provide vocational training to library workers for the blind.

2. Objectives:

i. To create awareness about online accessible libraries available for Blind and Disabled
students.

ii. To provide ways to access online libraries.

3. Online Library:

As per Wikipedia “A digital library, also called an online library, an internet library, a digital repository, or a digital collection is an online database of digital objects that can include text, still images, audio, video, digital documents, or other digital media formats or a library accessible through the internet.” (Wikipedia 2022)

4. Online Accessible Libraries are as follows:

4.1 Bookshare:

Bookshare is an online library recognised as the world's largest online library of accessible e-books for print-disabled readers. Bookshare is an online library that offers its extensive collection of academic and popular titles, special book formats, and a variety of reading tools to individuals who cannot read standard print materials. Bookshare library provides books in different format such as DAISY (Digital accessible information system), EPUB (Electronic publication), BRF (Braille refreshable Format), MP3 and Microsoft word document format. Bookshares collection contents many thousands of books including textbooks and reading books.

Members can read Bookshare materials using a wide range of commercially available products. These include both hardware and software applications. Besides, after logging into their accounts, Bookshare members can download free reading software and high-quality voices to use when reading bookshare books and publications. Members can also read Bookshare books on mobile devices such as iPADS, iPOD touches, and iPhones, as well as Android phones and tablets. Bookshare is funded by an award from the United States Department of Education's Office of Special Education Programs (OSEP). As a result of this funding, all qualified U.S. students can use Bookshare at no cost. Because Bookshare is a non-profit organization, anyone with a qualifying print disability who is not a student

can join for a small annual fee. Because Bookshare is a website its available to members 24 hours a day, 7 days a week

Steps of login for Bookshare account:

- Open Google Chrome browser
- Browse www.bookshare.org

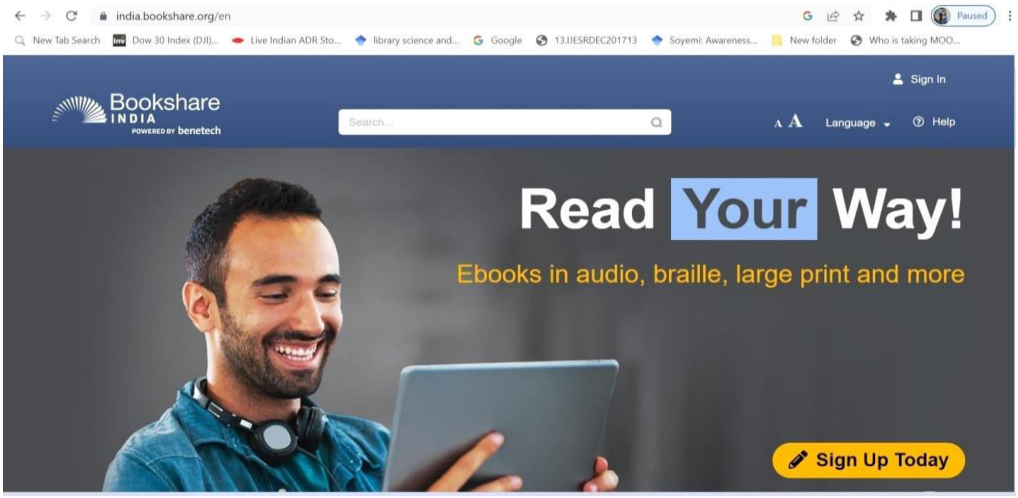

Fig.1 Bookshare website

Then click on to the Sign Up Today option

3 steps is there

- Create an account
- Submit proof of disability
- Purchase a subscription

4. 2 Sugamya Pustakalaya:

Sugamya Pustakalaya is a platform where print-accessible reading material is made available to people with disabilities. The Sugamya Pustakalaya has been developed by the Department of Empowerment of Persons with Disabilities (Divyangjan), Ministry of Social Justice and Empowerment, in collaboration with member organizations of the Daisy Forum of India and TCS.

Sugamya Pustakalaya is an online library that brings together accessible versions of books available in India. This library has been created by the DAISY Forum of India to make books available to people with print disabilities. Accessible reading materials are provided here for visually impaired students or all people who are unable to read printed materials

due to other disabilities. BookShare is an online library integrated into Sugamya Pustakalaya. All the titles available in the Bookshare library are also downloadable from Sugamya Pustakalaya.

Persons with print disabilities, Organizations producing accessible content, Organizations serving the print impaired, Universities, schools and libraries and Publishers are the stakeholders and beneficiaries of Sugamya Pustakalaya. Anyone can visit the Sugamya Pustakalaya website and can see the collection of books. But an account is required to download books.

Any reader can open an account at the Sugamya Pustakalaya. The procedure for opening a personal account at the Sugamya Pustakalaya is given below.

- Go to Google Chrome Browser or any other Browser.
- www.sugamyapustakalaya.in

Fig.2 Sugamyapustakalaya website

- Click on Register Now option
  After clicking on the "Register Now" option, different registration options appear.
- Print-disabled students should click on the "Register as End User" option to register.
- After that, a captcha comes up. Fill it out.

- After filling out the captcha, the form titled "Register as End User" opens in front of you.
- After filling out the three steps of basic information, agreement, and advanced configuration, print-disabled students' Sugamya Pustakalaya account is opened.

4. 3 Online Braille Library:

On January 4, 2012, the National Institute for the Visually Handicapped (NIVH) Dehradun launched an online Braille library under the Ministry of Social Justice and Empowerment, Government of India. NIVH has hosted an online catalogue of Braille books, allowing visually impaired people to determine the location and availability of a desired Braille book without having to visit Braille libraries and presses.

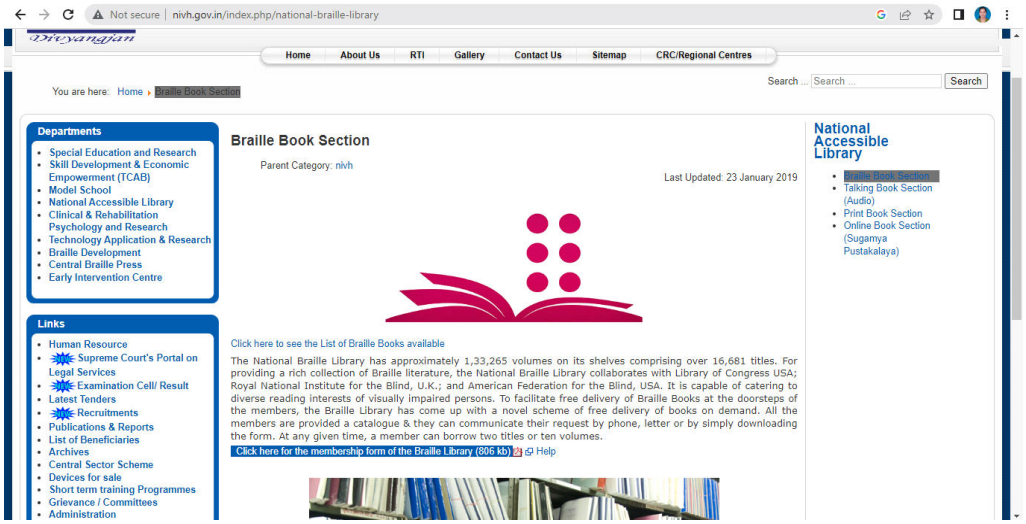

Fig.3 National Institute for the Visually Handicapped (NIVH) Website

5. Conclusion

In today's technology era, blind students need reading materials like sighted readers it means they need reading material in accessible format. Libraries like Bookshare and Sugamya Pustakalaya work to provide reading material in an accessible format to disabled students. That is, books are scanned and edited here so that visually impaired readers can access the content in audio mode using screen-reading software. This article provides information about these libraries so that blind and disabled readers can

open an account at these libraries and access the reading material they need from there.

6. References

1. Retrieved from https://en.wikipedia.org/wiki/Digital_library (Accessed on 04/11/2022)
2. Retrieved from Bookshare India https://www.bookshare.org/cms/bookshare-india (Accessed on 05/11/2022)
3. Retrieved from Sugamya Pustakalaya https://library.daisyindia.org/NALP/welcomeLink.action (Accessed on 07/11/2022)
4. Retrieved from https://nivh.gov.in/index.php/national-braille-library (Accessed on 09/11/2022)

Libraries as Catalysts for Cultural Empowerment: A Case Study of the National Centre for the Performing Arts

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Abstract

Libraries today are vital catalysts for cultural preservation and creative expression transcending their traditional role as repositories of knowledge. Modern libraries have evolved into vibrant spaces that go far beyond storing books and information. They play an active role in preserving cultural heritage and inspiring creativity. This paper explores the innovative efforts of the National Centre for the Performing Arts (NCPA) Library, which bridges the worlds of literature and performing arts to create meaningful connections with the community. Initiatives like *Page to Stage*, where literary works are adapted for theatrical performances, celebrate a wide array of traditions, including literature in Marathi, Punjabi, Sindhi, Hindi, and Urdu. These events also feature works by celebrated authors and Nobel Prize winners. Furthermore, the paper highlights the library's contributions through its specialized resources in performing arts, the adoption of digital tools to expand access, and its support for interdisciplinary collaborations. By blending technology, inclusivity, and creative initiatives, the NCPA Library is reshaping what libraries can achieve and offers a compelling model for fostering community engagement and cultural preservation

Keywords Cultural Preservation, Performing Arts, NCPA, Page to Stage, Multilingual Literature, Community Engagement, Digital Innovation, Interdisciplinary Collaboration, Literary Traditions, Regional Literature, Cultural Heritage, Empowering Communities.

Introduction

In the evolving landscape of cultural institutions, libraries have emerged as dynamic hubs that bridge the gap between knowledge preservation and creative expression. The library at the National Centre for the Performing Arts (NCPA), Mumbai, epitomizes this transformation. Beyond housing an

extensive collection of resources in the performing arts, the NCPA library curates' events that celebrate regional and international literary traditions, fosters interdisciplinary collaboration, and leverages technology for cultural preservation. With visionary leadership and encouragement from Chairman Khushroo N. Suntook and Vice-Chairman Noel Tata, the library has become a dynamic platform for innovation, creativity, and community engagement. This paper examines the innovative initiatives of the NCPA library, focusing on its *Page to Stage* program, digital endeavours, and community-centric approach to cultural engagement.

Expanding the Role of Libraries in the Arts

The NCPA library serves as a specialized resource centre for music, dance, and theatre, offering books, play scripts, vinyl records, and archival materials. It caters to scholars, performers, and enthusiasts through reference services tailored to the performing arts. The library's dual role as a repository and a curator of cultural programs enables it to address the evolving needs of its audience, fostering both academic research and public engagement.

Page to Stage Initiative: Celebrating Diversity

The *Page to Stage* initiative exemplifies how libraries can act as platforms for cultural exchange.

A keystone of the NCPA library's programming is its commitment to inclusivity. Events that celebrate regional literature, such as Marathi, Punjabi, Sindhi and Hindi poetry readings, ensure representation of diverse voices. These initiatives not only preserve linguistic heritage but also provide a platform for marginalized narratives. Programs in Punjabi and Urdu have further highlighted the shared cultural histories of these languages, fostering a sense of community.

Designed to bring literature to life through performance, this program highlights works across languages and genres

1. **Regional Literary Traditions:** Events featuring Marathi, Punjabi, Sindhi, Hindi and Urdu poetry have celebrated India's linguistic diversity. Collaborations with renowned authors like Pravin Davane, Eknath Avhad, Vishwas Patil, also legendary authors, Late Jaywant Dalvi, Ratnakar Matkari etc., have amplified Marathi literature, while

Sindhi poetry readings of Sahitya Akademi Award winners like Nandlal Jhaveri, Punjabi literature by Amrita Pritam have honoured the legacy of this rich linguistic heritage.

2. **Sufi and Spiritual Poetry:** Staged reading performances of Shah Abdul Latiff, Mahmoud Darwish, Kamala Das's works, and Sufi poetry sessions have delved into themes of spirituality, fostering introspection and dialogue.

3. **Global Literary Icons:** The program has showcased internationally renowned poets and authors, including Pablo Neruda, Nobel laureates Wisława Szymborska, and Korean author Han Kang's *White Book*, In Praise of Shadows by Jun'ichiro Tanizaki. These events bridge cultural boundaries, introducing audiences to global literary excellence.

4. **Lecture Demonstrations:** The Infinite Dimensions of Pannalal Ghosh's Eternal Music by the renowned scholar, BARC scientist and flautist, Dr. Vishvas M. Kulkarni. The event celebrated the legacy of Pandit Pannalal Ghosh, whose contributions transformed the bamboo flute into a prominent instrument in Hindustani classical music.

By integrating performance with literature, *Page to Stage* has redefined audience engagement, creating a unique cultural experience that merges storytelling, music, and dramatic reading.

Workshops and the Maker's Space Concept

At the NCPA, performative readings are staged in the auditorium, while workshops take place in the library, embracing the modern **"Maker's Space**" concept. These workshops transform the library from a static space into a dynamic and interactive environment, offering opportunities to engage audiences through hands-on sessions and immersive experiences.

The Page to Stage initiative enhances this vision by integrating educational workshops that bridge the literary and performing arts. These curated sessions nurture talent and foster creativity, bringing an educational edge to the arts.

Workshops Offered:

1. **The Art of Performing Poetry**

   This workshop delves into the nuanced craft of poetry performance. Participants learn to interpret poetic texts, explore rhythm and tone, and enhance emotional delivery, bringing poetic words to life through engaging presentations.

2. **Basics of Filmmaking**

   A hands-on introduction to the filmmaking process, this workshop covers storytelling, camera techniques, editing essentials, and the basics of directing. Designed for budding filmmakers, it blends theoretical insights with practical exercises.

3. **Introduction to Scenography**

   Dive into the art of designing theatrical spaces with this scenography workshop. Participants explore visual storytelling, set design, lighting techniques, and the creative processes behind constructing compelling stage environments.

4. **Speech and Diction**

   Tailored to enhance vocal clarity and expression, this workshop focuses on improving enunciation, delivery, and confidence in public speaking or performing dialogue. It is ideal for professionals and enthusiasts alike.

These workshops provide a unique platform to merge traditional knowledge with contemporary techniques, fostering a deeper connection to the arts while equipping participants with practical skills.

Digital Innovation for Cultural Preservation

To sustain its archival legacy, the NCPA Library has embraced digital tools such as i-Arch for cataloguing archives and is collaborating with Advanced Technologies to explore AI-driven content management solutions. Simultaneously, the library is undertaking analogue-to-digital conversions of vinyl records and magnetic spools to digitized forms while preserving the original formats. Listening booths for vinyl records have also been introduced, blending traditional formats with modern accessibility. These technological

advancements ensure the preservation of invaluable resources while enhancing the user experience.

Interdisciplinary Collaborations

Libraries thrive as spaces for interdisciplinary exploration. The NCPA library collaborates with organizations like Metamorphosis Theatre and Films, Aakhyan Theatre Group, Millian Dollar Confidence, The University of Mumbai, Dr Babasaheb Ambedkar International Research Centre to host workshops and events that reinterpret literature through prose, verse, and performance. Dramatic readings of Munshi Premchand's *Boodhi Kaki*, Ranjit Desai's Babulmora or Roschelle Potkar's Coins in the River have integrated multimedia elements to engage audiences, demonstrating the library's commitment to blending tradition with innovation.

The NCPA library's initiatives illustrate the transformative potential of libraries in contemporary society. Its approach combines:

1. **Inclusivity:** Event programming that amplifies diverse literary traditions fosters cultural representation.
2. **Interdisciplinary Engagement:** Collaborative events bridge literature with performing arts and technology.
3. **Technological Adaptation:** Digital tools enhance accessibility and long-term preservation.

By prioritizing these elements, the library has created a sustainable model for cultural advocacy.

Conclusion and Recommendations

The NCPA library's dynamic initiatives highlight its pivotal role in fostering cultural exchange and intellectual growth. As the library continues to evolve, there are several strategies that can further expand its impact:

1. **Broadening Book Readings**: Incorporating a diverse range of props and multimedia elements to enhance the audience's experience can make book readings more engaging and immersive. This approach will help capture the attention of younger generations, who are often immersed in digital entertainment. By transforming traditional book

readings into performance-oriented experiences, libraries can bring stories to life in a compelling way, sparking interest in both literature and the library itself.

2. **Investing in Technology**: Embracing new technologies, such as digital archiving tools and AI-driven content management systems, can significantly improve the library's archival practices. These innovations can make historical, cultural, and literary materials more accessible to the public, helping to preserve and share the richness of global and regional cultural heritage.

3. **Strengthening Collaborations:** Partnering with cultural and academic institutions can help expand the library's reach and amplify its efforts. Collaborations with universities, literary institutions, and other cultural organizations can foster a broader engagement with diverse audiences and encourage the exchange of ideas and resources.

4. **Engaging Communities**: Developing participatory programs that invite community involvement can deepen the library's connection to the public. Initiatives such as storytelling sessions, interactive readings, or workshops on creative writing can create an inclusive environment where individuals feel empowered to engage with literature in a meaningful way.

By implementing these strategies, libraries can continue to serve as powerful spaces of inspiration, education, and connection, helping to shape the next generation of thinkers, creators, and cultural stewards. As Dr. Ranganathan said, "Every book has its reader." Similarly, every reader can find their book.

Libraries, with their evolving strategies, can remain relevant and essential to future generations. Through the concept of "Page to Stage," books will not just be read—they will come alive, offering exciting, enlightening, and transformative experiences to the world.

References

- https://en.wikipedia.org/wiki/National_Centre_for_the_Performing_Arts_(India)

- National Centre for the Performing Arts (NCPA). (2022). Archives and Documentation Centre Annual Report.

The Future of Open Access Repositories: Challenges, Innovations, and Global Impact on Academic Collaboration

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Abstract
Open Access Repositories (OARs) play a transformative role in academic communication by enabling unrestricted access to research outputs and enhancing transparency, visibility, and collaboration. These repositories align with FAIR principles—ensuring data is findable, accessible, interoperable, and reusable—promoting open science and reducing knowledge disparities. Integrating technologies such as blockchain and artificial intelligence (AI) improves data integrity and discoverability, while compliance with international mandates like PlanS ensures global relevance. Exemplary initiatives, including arXiv and Shodhganga, highlight the importance of robust infrastructure and active stakeholder engagement. Despite challenges in sustainability and widespread adoption, strategic management and the incorporation of emerging trends position OARs as key instruments for equitable knowledge dissemination. Effectively engaging researchers and stakeholders is essential for the success and sustainability of Open Access Repositories (OARs).
By fostering innovation and societal progress, OARs contribute to the democratization of research and advance the global scientific enterprise.

Keywords: Open Access, DSpace, OAR, DOAR, Repository, EPrints.

Introduction

The meaning of 'Open access' is referred to as 'Open storage'. Open access is a significant global movement that aims to provide academic data and papers with free and open web access. A publication is "open access" without financial, legal, or technical restrictions. This means that anyone can read, download, copy, distribute, print, search for, and use the information, as well as use it for educational purposes or in any other way permitted by law.
A repository is a type of centrally located storage where you can keep all your project's files and resources.

Open-access repositories are the documents of open-access publications that are permanently stored and made online, available in full text or free of charge by the authors or respective institutions. Open-access repositories are also classified as subject repositories and institutional repositories.

Numerous academic organizations that endorse open access preserve the works of their scholars in online repositories that are readily available and freely accessible from anywhere in the world. The "green road" to open access refers to publishing scholarly material in these internet databases; self-archiving is another word for this practice. Most universities of applied sciences, all Dutch universities, and other research institutions have their repository.

According to OpenDOAR, Digital Commons, DSpace, and EPrints are the most frequently used repository software for open repositories. Other examples are arXiv, bioRxiv, Dryad, Figshare, Open Science Framework, Samvera, Ubiquity Repositories, and Invenio (a solution used by Zenodo).

1. Overview of the open access movement

From 1991 to 2003, the Open Access Movement was started. At Los Alamos National Laboratory (LAN-L), Paul Ginsparg established the arXiv archive for physics preprints in order to make physics preprints publicly accessible. VitekTracz launched Biomed Central (BMC), the first open-access publisher, in 1999—the technical standards for metadata interoperability established by OAI-PMH. In 2001, the first version of OAI was released. Budapest's Open Access initiative arose in 2002. Additionally, SPARC Europe has been established as a coalition of national libraries, library associations, European science and research libraries, and research institutes committed to furthering the open access movement. Lund University in Sweden launches the Directory of Open Access Articles, a central repository for open-access articles.

The infrastructure for open access expanded between 2004 and 2009. In 2004, Bielefeld University established the Bielefeld Academic Search Engine (BASE) for academic documents on the Web. The Australian Science Fund (FWF) announced its open access policy, which strongly encourages publishing papers in this format. In 2006, Nottingham University and Lund University collaborated to create the Directory of Open Access Repositories (DOAR), which went online. Open-access.net, a DFG-funded information platform, was launched in 2007.

In 2009, Open Access Infrastructure for Research in Europe started.

From 2010 to 2015, there was an upswing in open access funding and promotion. Since 2016, there has been an open-access transformation.

2. Importance of open access repositories (OARs) in the scholarly landscape

An open-access repository is a digital platform or online database that freely and unfettered makes scholarly research outputs, including journal articles, theses, datasets, conference papers, and other academic works, available. Usually run by academic institutions, research groups, or consortiums, these repositories encourage information sharing and uphold the values of open science.

Unlike the traditional subscription model, which requires readers to pay a subscription fee (typically through libraries) to access scholarly content, open-access publishing makes research information freely available to readers.

3. Objectives and Scope

This study has been undertaken to identify and describe various characteristic aspects of open access repositories by following objectives:

a. To Understand the open-access repositories
b. To identify the benefits of open-access repositories
c. To Know the current trends and innovations in OAR
d. To study the role of metadata standards in OAR

Understanding Open Access Repositories

Open-access repositories are the documents of open-access publications that are permanently stored and made online, available in full text or free of charge by the authors or respective institutions. Open-access repositories are also classified as subject repositories and institutional repositories.

Digital data, music, video, and other media, as well as reprints or preprints of journal articles, are all preserved and made publicly accessible through open repositories. Any researcher in a particular field may deposit into a repository, or an institution may manage it for the benefit of its writers and researchers.

The benefits of open access among different institutions have gradually become apparent in India. Various open access projects have been started and are now in operation, and many are still developing. Initiatives in the field of metadata harvesting services, especially those supported by

the government, have also been undertaken. Developing a suitable framework and policy is essential to the future of open access in India.

1. **Definition and types of repositories**

An open-access repository is a collection of full-text documents available in online databases on the Internet that can be accessed freely and instantly. Research institutions manage institutional repositories to house their own authors' works (**Pinfield, 2005**).

2. **Institutional repositories**

An institutional repository is a digital platform within an academic institution that stores and provides open access to scholarly materials produced by researchers affiliated with the institution. Most institutional repositories aim to make research outputs openly available; they usually contain a combination of Open-Access (OA) full text, embargoed full text, and metadata-only records.

A digital archive of the intellectual product created by the faculty, research staff, and students of an institution and accessible to end users both within and outside the institution, with few if any barriers to access," is the definition of an institutional repository. As per Lynch, it is "a collection of services that a university provides to its community members for the administration and distribution of digital content produced by the institution and its community members." Therefore, an institutional repository's primary function is to gather, preserve, and distribute the research outputs of the host institution. The research could include producing preprint and post-print articles, conference and working papers, committee papers, instructional materials, theses and dissertations, monographs, multimedia, student projects, and more electronically.

3. **Subject-based repositories:**

Digital collections of research results in particular discipline areas are subject-based or discipline repositories. Research publications include journal articles, conference proceedings, and working papers. These can include both peer-reviewed and non-peer-reviewed publications and serve the demands of specific knowledge community patrons. A directory can be used to access subject repositories. Higher education institutions, university systems, some companies, a consortium, a publisher, or a research centre can all host subject-based research repositories. Early in the 1990s, repositories initially appeared, and in certain scientific domains, they have

grown to be a crucial means of disseminating study findings. Among the subject-based repositories are:

E-prints in computer science, physics, mathematics, quantitative biology, quantitative finance, statistics, electrical engineering and systems science, and economics are available on Arxiv.

- bioRxiv: (biology preprint server)
- Cogprints: Computer science, linguistics, neuroscience, and psychology
- The MLA Open Access Repository for the Humanities is the central repository.
- OpenDOAR: Directory of Open Access Repositories;
- Engrxiv: Open Archive of Engineering;
- medRxiv: Preprint server for health sciences;
- RePEc: Research papers in Economics;
- Sportxiv: Sport, Exercise, and Physical Activity-Related Research
- SSRN: Social Science Research Network
- Disciplinary repositories: List of subject repositories from the Open Access Directory

4. **National and governmental repositories:**

National and governmental repositories are centralized digital platforms run by national institutions or governments. They store, archive, and make research results accessible, frequently with an emphasis on publicly financed research. These repositories are essential for encouraging open access and guaranteeing that taxpayer-funded research is publicly available to the general public, scholars, and decision-makers.

Benefits of Open Access Repositories

An institution may maintain repositories to benefit its authors and researchers or be open to deposits from any researcher in a subject area. There are many more benefits to making your work open access

1. **Enhancing research visibility and citation impact**

OARs remove paywall barriers, allowing anyone with internet access to freely access research outputs. Openly accessible research tends to receive more citations and visibility than subscription-based publications. OARs ensure that research from all regions is discoverable, enabling greater collaboration and influence across borders.

2. **Democratizing Access to Knowledge Globally**

OARs allow researchers from underrepresented communities and regions to share their work with a global audience. Public access to research outputs fosters community engagement and supports informed decision-making.

3. **Supporting compliance with open access mandates from funders and institutions**

Institutional Repository could also be seen from two complementary perspectives. First, it is a natural extension of academic institutions' responsibility as generators of primary research seeking to preserve and leverage their constituents' intellectual assets; second, it is one potentially major component in the evolving structure of scholarly communication. Also, the research reaches to other researchers worldwide, citation rates, the impact and readership of research, and transparency. The following figure also highlights the benefits of open access.

4. **Preserving institutional and disciplinary knowledge**

In light of emerging trends in digital scholarly communication, open-access Institutional Repositories play an important role in the preservation and dissemination of institutional research outputs, which in turn become a constituent part of global research output.

Technological Foundations of OARs

1. **Overview of Repository Platforms**

A Digital system called a repository platform is made to store, organize, and make accessible research results, scholarly publications, and other academic information. These platforms allow academic content to be shared and preserved by organizations, scholars, and institutions, usually by open access laws. Here is a summary of a few well-known repository platforms, such as Zenodo, EPrints, and DSpace:

DSpace is among the most widely used open-source repository platforms, particularly in academic and research institutions. It provides a flexible system for managing and storing digital content such as research articles, theses, datasets, and multimedia files. DSpace allows for managing multiple versions of deposited content (e.g., preprints, final published versions). DSpace can handle various media formats, such as PDFs, pictures, and audio and video files.

Another popular open-source repository platform is EPrints, created to assist corporations and academic institutions set up and maintain their digital repositories. EPrints is renowned for being user-friendly and offering various customization options. Like DSpace, several academic institutions and research centres use EPrints to develop institutional repositories. It is especially well-known for being easy to use and offering smaller institutions customizable choices.

CERN (European Organization for Nuclear Research) created and runs Zenodo, a general-purpose open-access repository. Researchers can deposit and share their research outputs on this user-friendly portal, such as articles, datasets, software, and other content. Zenodo is frequently used to share research outputs, software, and datasets that might not be associated with a particular organization. Researchers who deal with open science and open data and those in disciplines like computer science, physics, and engineering frequently advocate it.

2. Role of metadata standards

In Open Access Repositories (OARs), metadata standards are essential for digital content's interoperability, discoverability, and organizing. In order to facilitate effective retrieval, sharing, and long-term preservation, these standards offer an organized method for describing and managing data about digital resources. An outline of the main metadata standards and their functions is provided below:

Dublin Core Metadata Standard: Dublin Core is a simple and widely used metadata standard designed to describe a wide variety of resources, both digital and physical, with a set of 15 core elements (e.g., Title, Creator, Subject, Date). It ensures repositories can share and exchange metadata across systems and platforms. It provides a minimalistic yet effective framework for resource description. It is also widely supported by OAI-PMH for metadata harvesting.

MARC (Machine-Readable Cataloging) is a comprehensive metadata standard for library systems that encodes bibliographic data. It was initially created for library cataloguing.

It supports compatibility between repositories and library catalogs, ensuring seamless resource discovery. It captures detailed bibliographic information, suitable for rich metadata needs, and works well with linked data and semantic web initiatives when combined with newer standards like RDF.

OAI-PMH (Open Archives Initiative Protocol for Metadata Harvesting): OAI-PMH is a protocol that enables repositories to make their metadata

available for harvesting by other systems and aggregators; it is not a metadata schema in and of itself. Although it supports alternative schemas like MARC and MODS, Dublin Core is frequently used by default. OAI-PMH is a protocol that enables repositories to make their metadata available for harvesting by other systems and aggregators; it is not a metadata schema in and of itself. Although it supports alternative schemas like MARC and MODS, Dublin Core is frequently used by default. It also improves the visibility of repository contents by making them accessible through search engines and metadata aggregators. OAI-PMH Provides a common framework for sharing metadata, ensuring consistency across platforms. It facilitates the connection of institutional and national repositories to global networks.

3. **Integration with discovery tools and databases (e.g., Google Scholar, OpenAIRE).**

Integrating Open Access Repositories (OAR) with databases and discovery tools guarantees that research outputs are widely accessible and discoverable. Integration with platforms such as Google Scholar, OpenAIRE, and others improves resources' visibility, compliance, and usefulness within the global research ecosystem.

Challenges and Barriers

Although Open Access Repositories (OARs) are essential for promoting equitable access to scholarly knowledge, they encounter various challenges and obstacles, including technical, financial, cultural, and policy-related issues. These difficulties can impede their development, long-term viability, and overall effectiveness.

1. **Technical Challenges**

Inconsistent use of metadata standards (e.g., Dublin Core, MARC) can hinder integration with global discovery tools. Limited adoption of protocols like OAI-PMH reduces the repository's ability to share content with aggregators. Ensuring long-term accessibility of digital content is challenging due to evolving file formats and storage technologies. Poorly designed interfaces and inadequate search functionalities can frustrate users and limit repository usage.

2. Policy and Legal Issues

Complex copyright laws and restrictive licensing terms often prevent researchers from depositing their work in OARs. Different funders and institutions impose varying requirements, creating confusion for researchers regarding where and how to deposit their work. Ensuring compliance with data protection regulations (e.g., GDPR) while promoting open access can be challenging.

3. Cultural and Institutional Barriers

Researchers may hesitate to deposit their work in OARs due to concerns over copyright, potential misuse, or fear of undermining traditional publishing models. Many researchers and institutions need to be aware of the benefits of OARs and how to use them effectively. Institutions and funding bodies often need to mandate or incentivize using OARs, leading to low participation.

4. Financial and Resource Constraints

Many repositories operate on limited budgets, relying on institutional or governmental funding, which may need to be more sustainable. Also, there are high initial costs for setting up and maintaining repositories, including server infrastructure, software development, and technical support.

Current Trends and Innovations

1. Role of AI and machine learning in repository management

Smart Search Algorithms: Artificial Intelligence (AI) and Machine Learning (ML) transform repository management by streamlining processes, improving discoverability, enhancing user experience, and enabling better content organization. By comprehending the context and intent of search queries, AI and ML can improve search functionality and produce more precise and pertinent results. This is very helpful for huge repositories, where conventional keyword-based search may not always produce the best results.

Recommender Systems: Also based on user choices, past searches, or the content other users with related interests have viewed, machine learning algorithms can suggest pertinent articles, datasets, or other study resources. This improves engagement and content discovery. Authorship, publication date, keywords, and other metadata can be automatically extracted from deposited documents and other research outputs using AI-

driven technologies. This increases the efficiency of repository management by eliminating the necessity for human data entry.

Automatic Categorization: AI can categorize content into predefined categories or topics based on its content. For example, it can classify research into disciplines like biology, physics, or social sciences. This helps organize large datasets and improve content discoverability.

Content Similarity Checking: By comparing the uploaded content to extensive databases of scholarly articles, artificial intelligence (AI) tools—particularly those that use deep learning—can identify plagiarism. This ensures that the content is unique and appropriately attributed, which can help preserve the repository's integrity.

User Authentication and Authorization: AI can improve the security of user accounts and content access by implementing intelligent authentication technologies, including behaviour analysis or biometric identification, which guarantee that only authorized people may access critical research.

Ethical Guidelines and Compliance: AI can help ensure that information added to repositories conforms to legal requirements and ethical norms. For instance, it can verify that the required licenses have been obtained for copyrighted information or identify content that does not adhere to open-access guidelines.

AI and ML significantly improve repository administration by increasing the effectiveness of content curation, search, metadata production, and user experience overall. They offer strong capabilities for improving content discovery, automating repetitive operations, and ensuring repositories are secure, up-to-date, and user-responsive.

2. Increasing focus on open science and research data management.

An important step in increasing the accessibility, reproducibility, and impact of knowledge is the emphasis on open science and strong research data management. These methods will help create a future in which science functions as a public good that benefits society by encouraging openness, cooperation, and creativity. In order to accomplish these objectives, Open Access Repositories, technology developments, and international policy alignment will be essential.

Case Studies and Best Practices

1. Some of the successful open-access repositories

Europe PMC: Europe PMC is a free database for life sciences and biomedical research supported by 37 funders across Europe. It includes research

articles, preprints, and datasets and is integrated with ORCID for researcher identification and metadata enrichment. Europe PMC enables text mining and advanced search functionalities for data-driven research.

DASH (Digital Access to Scholarship at Harvard): DASH is Harvard University's institutional repository, providing open access to the university's scholarly articles and research outputs. It includes peer-reviewed articles, theses, and working papers across disciplines. It has a User-friendly interface with advanced search and browsing features and Open licensing options for authors to control their content's reuse.

Shodhganga (India): Shodhganga is a digital repository for theses and dissertations submitted to Indian universities, maintained by the Inflibnet Centre under the University Grants Commission (UGC). It hosts over 400,000 theses and dissertations in multiple languages and offers plagiarism detection services for contributing universities. It also provides structured metadata to enable easy discoverability.

2. Strategies for engaging researchers and stakeholders

Effectively engaging researchers and stakeholders is essential for the success and sustainability of Open Access Repositories (OARs).

Educational Campaigns: To educate researchers on the advantages of OARs, including enhanced visibility, citation impact, and funder mandate compliance, hold workshops, webinars, and training sessions.

Awards and Acknowledgements: Establish institutional awards or recognitions for researchers who actively contribute to the repository.

Stakeholder Benefits: Demonstrate the societal impact of open access research on industries, policymakers, and communities, motivating stakeholder investment.

Funder Collaboration: Partner with funding agencies to align open access mandates with repository policies and workflows.

Global Alliances: Join international open access initiatives (e.g., OpenAIRE, COAR) to align repository efforts with global standards and practices.

3. Lessons learned from repository implementation and management

Developing and managing Open Access Repositories (OARs) has given important insights into institutional problems and best practices. The repository's sustainability, usefulness, and efficacy are enhanced by these lessons learnt.

An OAR's success depends on strong institutional support at the operational and leadership levels. Institutional regulations need to encourage open

access practices by explicitly instructing writers to deposit their work in repositories.

An intuitive user interface is crucial for motivating contributors and end users to interact with the repository. Difficult search features, complicated submission procedures, and inadequate navigation deter participation.

Discoverability, interoperability, and long-term usage of repository information depend on properly structured and standardized metadata (such as Dublin Core, MARC). Poor or inconsistent metadata makes finding and indexing more difficult.

For maximum exposure and impact, repository material must be indexed by international discovery tools (such as Google Scholar, OpenAIRE, and CORE). If content is not properly integrated, it can remain concealed from scholars and the general public.

Many academics find that copyright and licensing concerns are a major deterrent to uploading content to OARs. Clear instructions on copyright regulations and open access licenses (such as Creative Commons) make addressing concerns and expediting deposit procedures easier.

Researchers and repository managers need continual education and training to use repositories efficiently, comprehend open access concepts, and handle the submission procedure. Underuse may result from ignorance of or unfamiliarity with the system.

Maintaining access over time requires ensuring the digital preservation of repository content for an extended period. Digital preservation is complicated by the speed at which file formats and technologies develop.

Future of Open Access Repositories

1. **Global collaboration: The role of international organizations like UNESCO in promoting OARs**

In order to improve access to information worldwide, UNESCO's initiatives to support Open Access Repositories are essential. OARs are produced in a way that benefits the international research community thanks to UNESCO's technical assistance, policy direction, and promotion of international collaboration. In order to make research findings publicly available and promote fair access to knowledge, especially in under-resourced areas, their efforts to raise awareness, promote open science, and resolve ethical and legal issues are crucial. UNESCO contributes substantially to the democratization of knowledge through these initiatives, influencing the direction of international research accessibility and cooperation.

2. **Technological advancements: AI, machine learning, and blockchain in repository management:**

Integrating AI, ML, and Blockchain can greatly improve the management and operation of open access repositories. Blockchain guarantees security, transparency, and integrity, while AI and ML provide cutting-edge technologies for boosting user engagement, automating content curation, and improving searchability. These technologies enable OARs to develop into more effective, safe, and intuitive systems, promoting increased cooperation, accessibility, and dependability throughout the international research community.

3. **Evolving policies: Impact of mandates like PlanS on OAR growth:**

The development and expansion of Open Access Repositories (OARs) have been greatly impacted by mandates such as PlanS. PlanS's clear standards and robust incentives for open access have increased repository deposits, improved infrastructure for repositories, and fostered international cooperation. Additionally, these rules have benefited the worldwide open access movement, encouraged sustainable finance creation, and made embracing green open access models easier. However, issues with equality and funding methods must be resolved to guarantee inclusion and long-term success. PlanS has been a revolutionary force that has sped up the adoption of open access and promoted the expansion of OARs globally.

4. **Emerging trends:**

The methods used to obtain and distribute scholarly knowledge change with technology and research requirements. A number of new trends are shaping the future of open access repositories (OARs), increasing their effectiveness, security, and usability. Cloud-based repositories, blockchain technology in academic writing, and other developments that tackle scalability, transparency, and user involvement are some examples of these themes.

Conclusion

Open Access Repositories are essential for advancing scholarly communication by making research more accessible, transparent, and impactful. They promote knowledge sharing, facilitate collaboration, support compliance with open access policies, and contribute to the long-term preservation of academic work. As open science grows, OARs will

remain central to fostering a more inclusive, efficient, and innovative global research community.

The future of Open Access Repositories is one of global inclusion, where all researchers can engage in the knowledge economy regardless of their resources, geography, or background, and research is disseminated without restrictions. The advancement of academic communication and the free and transparent flow of knowledge across all spheres of society will be made possible by OARs' integration of developing technologies, promotion of collaboration, and support for equitable access. In order to address urgent global issues and spur innovation for future generations, this vision of open, equitable access to knowledge will enable people, communities, and institutions.

In this era, knowledge will be a right rather than a privilege, and OARs will be essential to realizing this goal. As we work toward this goal, we must keep making investments in the technology, laws, and infrastructure that will enable everyone to have fair access to knowledge.

References

1. Ahmad Mir, A. (2022). Growth and development of open access institutional repositories in Africa. *International Journal of Information Science and Management (IJISM)*, *20*(1).
2. Antelman, K. (2004). Do open-access articles have a greater research impact?. *College & research libraries*, *65*(5), 372-382.
3. Bashir, A., Mir, A. A., & Sofi, Z. A. (2019). Global landscape of open access repositories. *Library Philosophy and Practice*, 1-21.
4. Bhat, Mohammad Hanief. "Open access repositories: a review." *Library Philosophy and Practice* 12, no. 2 (2010): 1-8.
5. Björk, B. C. (2014). Open access subject repositories: An overview. *Journal of the Association for Information Science and Technology*, *65*(4), 698-706.
6. Christian PhD, G. (2009). Issues and challenges to the development of open access institutional repositories in academic and research institutions in Nigeria. *Available at SSRN 1323387*.
7. Ghosh, S. B., & Kumar Das, A. (2007). Open access and institutional repositories—a developing country perspective: A case study of India. *IFLA journal*, *33*(3), 229-250.
8. Nwokedi, V. C., &Nwokedi, G. I. (2018). Open access institutional repositories in academic and research institutions in Nigeria: A review of benefits and challenges.

9. Pinfield, S. (2005). A mandate to self-archive? The role of open access institutional repositories. *Serials*, *18*(1).
10. Roy, B. K. (2018). Opportunities and barriers of Indian open access repositories. *International Research: Journal of Library and Information Science*, *8*(1), 24-33.
11. https://en.wikipedia.org/wiki/Institutional_repository
12. https://latrobe.libguides.com/open-access-publishing/repositories

Digital Library Revolution: Challenges and Opportunities

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Abstract
The way we consume information has changed irreparably since the start of the digital revolution. It has presented serious obstacles to traditional libraries and reading culture, even as it has created new channels for the spread of knowledge. The revolution in digital libraries has completely changed how we obtain and use information. We now have access to a great amount of knowledge thanks to the development of new technologies. But there are also a lot of opportunities and challenges associated with this change. The reduction of physical reading, the rise of digital distractions, and the requirement for changing library services are just a few of the many issues that libraries confront in the digital age. It explores tactics that libraries might use to adjust to the shifting environment and protect the enduring value of reading.

Keywords
Library automation, Digital Library, Reading distraction, Social media, Digital literacy

Introduction

As archives of culture and knowledge, libraries have been the cornerstone of human civilization. However, the traditional role of libraries is being redefined in the current period brought about by the rapid expansion of digital technologies. Digital resources have made information more accessible, but they have also sparked worries about how to preserve reading culture.

Numerous facets of our lives have been transformed by the introduction of technology, and libraries are no exception. By improving efficiency, accessibility, and user experience, library automation—the use of computers and software into library operations—has revolutionized traditional library services.

The Evolution of Library Automation

The march toward library automation began in the mid-1900s with the introduction of punched card systems for categorization and circulation. However, it wasn't until the 1970s and 1980s that library automation became widely accepted, despite the growing usage of computers and the development of integrated library systems (ILS). ILS software packages offer a wide range of tools for managing various library operations, including acquisitions, circulation, cataloging, serials, and reference services.

Positive Impacts of Digital Revolution:

The management and services provided by the library underwent a significant transformation with the introduction of computers. Many mundane tasks were converted into digital services. Automatic work replaced the old manual labor. The benefits of this digital transition are as follows.

Enhanced Accessibility: Reading is now more accessible than ever thanks to digital platforms. Regardless of geography or physical constraints, people all around the world may now access a wider variety of reading materials thanks to e-books, online libraries, and audio books.

Diverse Reading Material: From modern blogs and articles to classic literature, the internet provides a wide range of reading materials. Numerous hobbies and reading habits are catered to by this diversity.

Improved Reading Experience: Many people find reading more pleasant and convenient thanks to features like text-to-speech capabilities, dictionaries built in, and changeable font sizes found in e-readers and digital reading apps.

Interactive Reading: To improve understanding and interaction with the text, digital platforms frequently include interactive features like annotations, hyperlinks, and multimedia content.

Social Reading: Discussion boards and online book clubs help readers connect with one another and exchange ideas and experiences.

Negative Impact of digital revolution:

The digital revolution has enormous benefits for all fields of study. Man has gotten addicted to automation as a result of the machine that lets him transform his labor into intelligent work. This modernization has a number of disadvantages.

Distractions: It might be challenging to concentrate on reading for prolonged amounts of time due to the continuous barrage of notifications and other electronic distractions. Long-term use of screens can cause eye strain and fatigue, which lowers the enjoyment of reading.

Decline in Deep Reading: Because short-form content is so common online,

people may prefer reading quickly and superficially than doing in-depth research and thinking critically.

Copyright Issues: Because digital distribution is so convenient, there are now worries regarding copyright violations and author protection.

Potential for Information Overload: It might be difficult to prioritize reading material and identify reliable sources due to the abundance of information available online.

All things considered, reading culture has undergone complicated changes as a result of the digital revolution. Digital and traditional reading should be balanced to provide a well-rounded reading experience, even if it has clearly improved accessibility and convenience.

Readers' Obstacles in the Digital Age: Both good and bad effects of the digital revolution have been felt in the culture of reading. Below is a summary of the main effects:

The Decline of Physical Reading

1. **Rise of E-books:** As e-books gain popularity, fewer people are reading physical books.

2. Screen Fatigue: Extended use of screens can cause eye strain and short attention spans.

3. Loss of Tactile Experience: E-books are unable to completely replace the distinct sensory experience that physical books provide.

4. As social media sites vie for users' attention, less time is spent reading.

5. Playing video games online can distract readers from reading books.

6. The popularity of short-form content on websites such as YouTube and TikTok can shorten readers' attention spans for longer-form reading.

Digital Divide

It's still very difficult to guarantee that everyone has fair access to digital resources, especially in developing nations.

1. Copyright and Licensing: The distribution of digital content may be impeded by intricate copyright and licensing difficulties.

2. Data Security and Privacy: It's critical to protect private data and defend against intrusions.

3. Technical Difficulties: It can be difficult to maintain and update digital infrastructure while also making sure it is compatible with new and developing technologies.

Opportunities for Libraries:

1. **Preservation of Digital Content:** To prevent information loss, it is crucial to make sure that digital formats and metadata are preserved for the long term.
2. Digital Literacy: To enable users to access and use digital libraries efficiently, it is essential to promote digital literacy skills.
3. Global Accessibility: Users from all over the world may access knowledge and resources thanks to digital libraries, which remove regional restrictions.
4. Preservation of Cultural Heritage: By preserving historical records, manuscripts, and cultural objects, digitization helps to ensure that they are protected for upcoming generations.
5. Improved Research Capabilities: Researchers can quickly locate pertinent information thanks to the sophisticated search and retrieval methods offered by digital libraries.
6. Personalized Learning: Individuals' learning experiences can be improved by adaptive learning systems and customized recommendations.
7. Collaborative Research: By allowing researchers to exchange ideas, information, and resources, digital platforms promote collaboration.

Evolving Role of Libraries
1. **Adapting to Digital Services**: To stay current, libraries need to make investments in digital resources and technology.
2. Balancing Digital and Physical: It's critical to strike a balance between digital and physical offerings.
3. Digital Literacy: To empower patrons in the digital world, libraries must encourage digital literacy.
4. Comfortable Reading Areas: Physical reading can be promoted by creating welcoming and cozy environments.
5. Book Clubs and Literary Events: Planning these gatherings can encourage reading and provide a sense of community.
6. Programs for Digital Literacy: Providing tutorials and workshops to assist users in navigating the digital environment.
7. Services for e-books and audio books: offering a variety of digital forms.
8. Personalized Recommendations: Algorithms are used to recommend books based on user interests.
9. Reading Contests and Challenges: Promoting reading through entertaining and interesting exercises.
10. **Partnerships with Community Organizations and Schools:** Joining forces to advance literacy and reading.
11. Publicity and Outreach: Spreading the word about the advantages of

reading via social media and other channels.

Conclusion

Libraries face both opportunities and challenges as a result of the digital revolution. Libraries may continue to play a crucial role in promoting reading culture by embracing technology while maintaining the core of in-person reading. Libraries can guarantee that the love of reading continues for many generations to come by adjusting to the shifting environment and putting creative ideas into practice.

References

1. Anuradha, P. (2018). Digital transformation of academic libraries: Opportunities and challenges - IP Indian Journal of Library Science and Information Technology. Retrieved December 20, 2024, from https://www.ijlsit.org/article-details/6499
2. Bhattacharya, M. P. (2017). Digital Information Services: Challenges and Opportunities.
3. Current Challenges and Opportunities in Digital Libraries. (n.d.). Retrieved December 20, 2024, from https://www.researchgate.net/publication/378792059_Current_Challenges_and_Opportunities_in_Digital_Libraries
4. Dr. S. Sujatha. (2024). Current Challenges and Opportunities in Digital Libraries. International Journal of Advanced Research in Science, Communication and Technology, 293–295. https://doi.org/10.48175/IJARSCT-15650
5. N., Sudhakara. (2023). Digital Library: Processes, Services and Challenges. International Journal of Research in Library Science, 9(2), 80–84. https://doi.org/10.26761/ijrls.9.2.2023.1653(PDF) Digital libraries: Challenges, opportunities and implications. (n.d.). Retrieved December 20, 2024, from https://www.researchgate.net/publication/290268387_Digital_libraries_Challenges_opportunities_and_implications
6. Sharma, V., & Chauhan, S. (2019). Digital Library Challenges and Opportunities: An Overview. Library Philosophy and Practice (e-Journal). https://digitalcommons.unl.edu/libphilprac/3725
7. Sonker, S. K., & Mahawar, K. L. (2007). Digital library: Process, services, challenges and opportunities. Retrieved December 20, 2024, from https://drtc.isibang.ac.in/ldl/handle/1849/390 Zotero | Your personal

research assistant. Retrieved December 20, 2024, from https://www.zotero.org/download/

The Role of Open Science in Shaping the Indian Research Landscape

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Abstract
This study examines the evolution and impact of Open Science (OS) practices in India through a scientometric analysis of scholarly literature indexed in Scopus from 2015 to 2024. Open Science fosters transparency, inclusivity, and global collaboration in research, making India's contribution crucial given its significant research output. Using tools like VOSviewer and Tableau, the study investigates growth trends, prolific contributors, key funding agencies, and emerging research themes. Results show a steady rise in OS publications, led by STEM disciplines, particularly Computer Science and Engineering. However, citation impact has declined, indicating a need for enhanced visibility and collaboration. The Department of Science and Technology and international agencies dominate funding, while topics like IoT, AI, and cloud computing emerge as hotspots. Despite the progress, OS adoption in Arts and Humanities remains minimal. The findings provide actionable insights for strengthening India's OS ecosystem and broadening its academic and societal impact.

Keywords
Open Science, Open Access, network visualization, Scientometrics, VosViewer, research trend

Introduction

In the present time, science is gradually shifting towards Open Science (OS) to promote global collaboration and transparency in research, as evidenced by the European Commission's adoption of open access in 2012 (European Commission, 2012). The term ‘Open Science’ refers to a set of practices aimed at making scholarly research, including code, data, and research papers, accessible to all. The emergence of OS is driven by technological advancements, rising research costs, and the push for transparency in

publicly funded research. Moreover, OS serves as an umbrella term encompassing various related concepts, such as Open Data, Open Source, Open Access, Open Peer Review, Open Educational Resources, and Open Methods (Bertram et al., 2023). These concepts together enhance a more inclusive and democratic scientific process, promoting innovation and accelerating the pace of discovery (Tennant et al., 2020). Cole et al. (2024) claim that OS creates societal impact across several domains, such as education and awareness, climate and environmental issues, policy and governance engagement, equity and empowerment, health, and the trust and attitudes toward research. India, being one of the top contributors to global research output, making its adoption of Open Science impactful on a worldwide scale. Hence, trace its contribution to Open Science (OS) in the scientific field will strengthen its engagement with OS practices to enhance transparency, collaboration, and global visibility in research. Thus, the present study aims to understand the initiatives and contribution by the Indian researchers on Open Science through the lens of Scopus database.

Review of Literature

A number of previously published studies have discussed the prospects and applications of OS in different geographical regions. For instance, De Filippo and Sastrón-Toledo (2023) reveal that Spanish government agencies fund and apply OS research in policymaking, showcasing its influence beyond academia through international collaboration and open access publications. Ferguson et al. (2023) found that scholars in North America held largely favorable attitudes toward the widespread use of OS practices, particularly supporting the posting of data or code online throughout their careers. In 2019, the French Ministry of Higher Education, Research, and Innovation launched the French Open Science Monitor to assess the progress of OS in France (Bracco, 2022). However, very limited studies have explored research trends on OS through the application of scientometric and bibliometric tools. Shettar and Hadagali (2022) conducted a scientometric study on open data and found that the USA is the highest contributing country, with conference papers being the most frequently published type of work on open data. Ahmed et al. (2023) identified emerging topics such as artificial intelligence, metadata, and ethics in Open Science, while also highlighting lessons from Open Science practices during the COVID-19 pandemic. Despite the global momentum towards Open Science (OS) as a transformative framework for fostering transparency, inclusivity, and collaboration in research, India's contribution to OS remains underexplored in the academic discourse. As per

author's best knowledge, no study has been found mapping the Indian scientific scenario on Open Science through application of metric tools.

Thus, the present study aims to fill this gap by assessing Indian scholarly literature on Open Science published between 2015 and 2024 in the Scopus database. The study aims to analyze research growth, prolific contributors, collaboration patterns, active funding agencies, and emerging research topics in OS. The findings will provide actionable insights for policymakers, researchers, and institutions, helping to strengthen India's OS infrastructure and enhance its global presence.

Research Questions

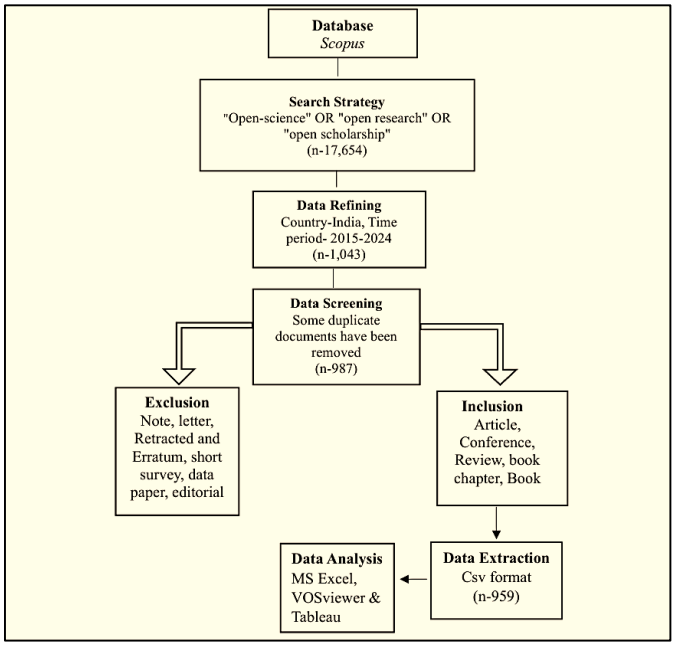
1. How has the adoption of Open Science practices evolved globally over the last decade?
2. Which are the most productive researchers and sources in Open Science?
3. Which disciplines lead in Open Science, and what factors contribute to their success?
4. Which are the active funding agencies in India to support Open Science research?
5. What are the research hotspots on Open Science identified through keyword analysis?

Data and Methodology

To obtain the results of the present study, standard scientometric tools have been employed to evaluate Indian research on Open Science. Scientometrics is a powerful tool used to analyze the patterns of scholarly literature, including growth trends, prolific authors and sources, institutional affiliations, national and international collaborations, and emerging key themes (Saikia et al., 2024). These tools also facilitate the generation of various visual representations, such as research trends, collaboration networks, and research hotspots.

The primary data for this study was collected from the Scopus database on 6.12.2024. The data was searched using the appropriate search terms: TITLE-ABS-KEY = "Open Science" OR "Open Research" OR "Open Scholarship." The search results were limited to studies conducted in India during the time period 2015–2024 and included only specific document types such as articles, conference proceedings, reviews, book chapters, and books. After refining and filtering, the search resulted in a total of 959 documents, which were extracted in .csv format (see Figure).

The data was further analyzed using MS Excel, Tableau and VOSviewer (for visual representation).



Data Analysis and Data Interpretation

Research Growth

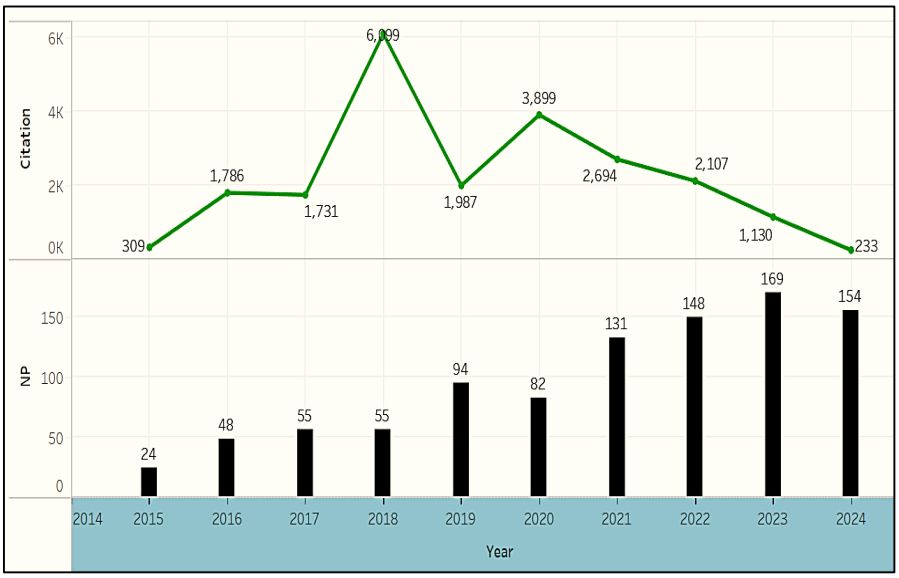


Figure 2: Yearwise growth of research and citation

Assessing the research growth on a specific subject field is necessary to know its importance in the current period. Figure 2 shows the growth of research on Open science from India over the time by showing its growing significance

in the field and the citation growth to understand the evolution of research impact. Initially, the number of publications and citations remained relatively low, with a gradual increase in both indicators up to 2018. However, a marked flow in both citations and publications occurred in 2019, with citations peaking at nearly 7,000, signaling a high level of attention and impact in that year. Following this peak, while citations decreased, the number of publications continued to rise steadily, reaching 154 in 2024. This indicates a sustained growth in Open Science research output in India, even as the immediate impact in terms of citations declined. Overall, the data demonstrates the growing engagement of Indian researchers in Open Science, highlighting an upward trend in research activity and collaboration in this field.

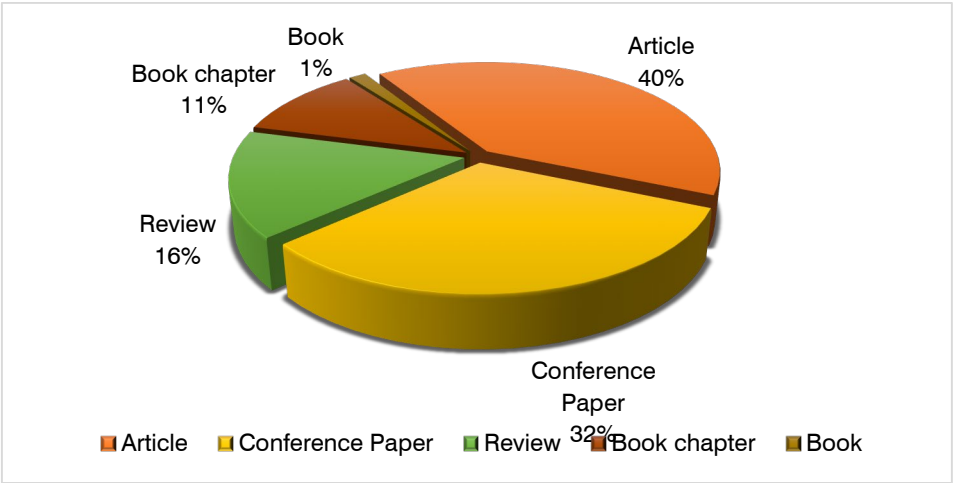


Figure 3: distribution of document type of OS research

Identifying the document type will help reveal the preferred modes of research dissemination, such as journal articles, conference proceedings, and other formats, within the Indian Open Science ecosystem. Figure 3 shows that most research is published in the Article format (40%), indicating a strong preference for peer-reviewed journal publications. The Conference paper format (32%) is also prominent, highlighting the value of presenting preliminary findings and fostering collaboration. Review articles (16%) emphasize the synthesis of existing knowledge, while Book chapters (11%) suggest a focus on specialized topics within broader edited volumes. Notably, the Book format accounts for only 1%, underscoring the limited appeal of long-form publications in a rapidly evolving field. These trends demonstrate a clear emphasis on timely dissemination and academic dialogue, aligning with the dynamic and collaborative nature of Open Science.

Top ten prolific author

Table 1: top ten prolific author on Open Science research

Author	NP	H-index	Affiliation
Neeraj Satish Kumar	16	112	Thapar Institute of Engineering & Technology
Arvind Selwal	14	13	Central University of Jammu
Sudeep Tanwar	11	66	Nirma University, Institute of Technology
Sushil Praveen kumar	7	32	Jawaharlal Nehru University
Kamakhya Prasad Ghatak	6	37	Institute of Engineering and management, kolkata
Rajesh Gupta	6	34	Nirma University, Institute of Technology
Ambreen Sabha	6	4	Central University of Jammu
Ram Krishna Sarkar	6	48	Jadavpur University
Deepika Sharma	6	5	Central University of Jammu
Bharat Bhushan	6	37	Sharda University

Table 1 displays the list of the top ten prolific authors based on the number of publications on Indian OS research. Neeraj Satish Kumar from the Thapar Institute of Engineering & Technology leads with 16 publications and an impressive H-index of 112, demonstrating both high productivity and significant scholarly impact. Arvind Selwal from the Central University of Jammu follows with 14 publications, although his H-index of 13 indicates a relatively lower citation impact. The diversity of institutional affiliations among the authors reflects the widespread engagement of Indian researchers in Open Science across various types of institutions, including technical universities, central universities, and private institutions. However, it is noteworthy that most of the highly prolific authors are from the Central University of Jammu, indicating its significant engagement OS research.

Top ten Prolific Journals

Table 2: Top ten prolific journal on OS research

Sl No	Journal	NP	Publisher	CiteScore	ISSN
1	IEEE Access	22	IEEE	9.8	2169-3536
2	Multimedia Tools and Applications	11	Springer Nature	7.2	1380-7501
3	Archives of Computational Methods in Engineering	10	Springer Nature	19.8	1134-3060
4	International Journal of Communication Systems	10	John Wiley & Sons	5.9	1074-5351

5	Wireless Personal Communications	9	Springer Nature	5.8	0929-6212
6	Transactions on Emerging Telecommunications Technologies	8	John Wiley & Sons	8.9	2161-5748
7	Computer Science Review	7	Elsevier	32.7	1574-0137
8	Journal of Network and Computer Applications	6	Elsevier	21.5	1084-8045
9	Journal of Advanced Research in Dynamical and Control Systems	6	Institute of Advanced Scientific Research, Inc.	NA	1943-023X
10	International Journal of Recent Technology and Engineering	6	Blue Eyes Intelligence Engineering and Sciences Publication	NA	2277-3878

The table 2 highlights the top ten prolific journals publishing Open Science research from India, highlighting a diverse range of publishers and citation metrics. It is found that *IEEE Access* leads with 22 publications, establishing itself as a significant platform for Indian Open Science research with a strong CiteScore of 9.8. Springer Nature journals also feature prominently, with *Multimedia Tools and Applications, Archives of Computational Methods in Engineering*, and *Wireless Personal Communications* in key positions. Their varied focuses, ranging from multimedia to computational methods, underscore the interdisciplinary nature of Open Science research in India.

Subject distribu on of open Science research in India

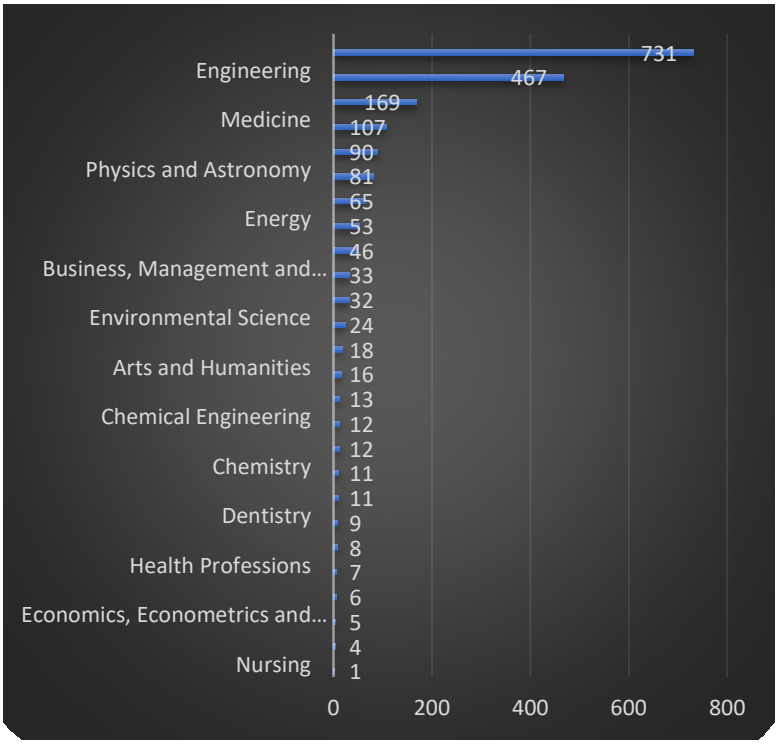


Figure 4: subject distribution of Open Science research

The subject distribution of Open Science research papers from India shown in fig 4 reflects a strong dominance of STEM fields, with *Computer Science* (731 papers), *Engineering* (467), and *Mathematics* (169) leading the output, reflecting the critical role of technology, data science, and computational methods in Open Science. This trend aligns with the growing significance of digital tools, platforms, and technologies in facilitating Open Science. Fields such as data sharing, open-source software, and computational methods are heavily rooted in Computer Science. Disciplines like *Medicine* (107) and *Decision Sciences* (81) also indicate growing adoption, particularly in healthcare and interdisciplinary research. However, areas such as *Arts and Humanities* (16), *Earth and Planetary Sciences* (18), and *Economics* (5) show minimal representation, highlighting the need for broader adoption across disciplines.

Top ten ac ve funding agencies suppor ng Open Science research in India
Table 3: Top ten ac ve funding agencies suppor ng Open Science research in India

No.	Funding Agency	NP
1	Department of Science and Technology (DST)	27
2	National Science Foundation	16
3	European Commission	15
4	Science and Engineering Board	12
5	National Institutes of Health (NIH)	11
6	Ministry of Electronics and Information Technology	10
7	U.S. Department of Health and Human Services	10
8	National Natural Science Foundation of China	8
9	Horizon 2020 Framework Programme	7
10	National Research Foundation of Korea	7

The top ten active funding agencies supporting Open Science research in India as shown in table 3 highlights both strong national leadership and significant international collaboration. The Department of Science and Technology (DST) leads with 27 projects, underscoring its pivotal role in advancing Open Science initiatives within the country. International agencies like the National Science Foundation (16), European Commission (15), and National Institutes of Health (NIH) (11) reflect India's growing research partnerships with global entities, facilitating cross-border knowledge exchange. National bodies like the Science and Engineering Board (SERB) (12) and the Ministry of Electronics and Information Technology (10) emphasize India's focus on scientific and technological development. Additionally, contributions from agencies such as the National Natural Science Foundation of China (8) and the Horizon 2020 Framework Programme (7) highlight the global interconnectedness in Open Science funding. This mix of national and international support accelerates India’s progress in Open Science, fostering innovation, inclusivity, and accessibility in research.

Emerging research areas through keyword analysis

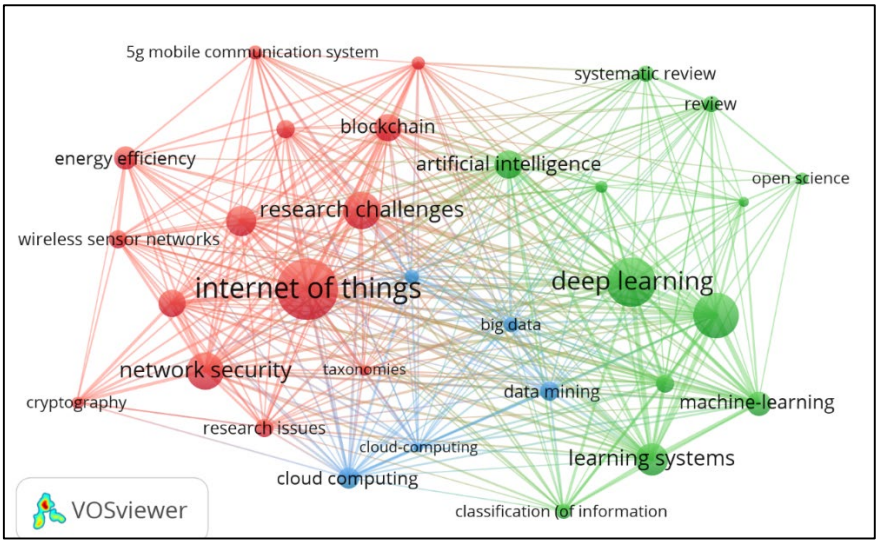


Figure 5: Emerging research hotspots through keyword analysis

Fig 5 displays the keyword analysis of open science research in India. The figure has been created using VosViewer software by considering minimum number of 20 occurred keywords where 45 keywords meet the threshold. The size of the cluster indicates the frequency of keyword occurrence and the connecting lines indicates the link between each cluster. Therefore, the analysis reveals a technology-driven landscape with three major thematic clusters: IoT and network security, AI and machine learning, and data infrastructure. The dominance of keywords like Internet of Things, deep learning, and cloud computing highlights the integration of advanced technologies for data-driven research, secure data sharing, and robust digital infrastructure. The red cluster focuses on technological enablers like IoT, 5G, and network security, while the green cluster emphasizes AI-driven approaches with terms like deep learning and learning systems, showcasing their role in data analysis and systematic reviews. The blue cluster highlights cloud computing and data mining as essential tools for managing and analyzing research data. Overall, this reflects India's emphasis on leveraging technology to facilitate open science while addressing challenges related to data security and infrastructure.

Findings of the study

1. The growth of research on Open science from India is found to be gradually increasing over the time but the rate of citation was found declining.

2. Regarding the document type, most of the research output on OS is published in the form of Article (40%), followed by Conference paper (32%), Review articles (16%), Book chapters (11%) and only 1% in book format.
3. Neeraj Satish Kumar from the Thapar Institute of Engineering & Technology leads with 16 publications and an impressive H-index of 112, followed by Arvind Selwal from the Central University of Jammu follows with 14 publications on OS.
4. The journal *IEEE Access* has made the maximum contribution with 22 publications on Open Science research with a strong CiteScore of 9.8 followed by Springer Nature journals i.e., *Multimedia Tools and Applications* and *Archives of Computational Methods in Engineering.*
5. The subject distribution of OS research reflects a strong dominance of STEM fields, with *Computer Science* (731 papers), *Engineering* (467), and *Mathematics* (169) leading the output reflecting the critical role of technology, data science, and computational methods in Open Science.
6. The Department of Science and Technology (DST) (22) has provided the highest funding support to OS research in India followed by International agencies like the National Science Foundation (16), European Commission (15), and National Institutes of Health (NIH) (11).
7. The keyword analysis of OS research reveals that concepts like IoT, deep learning, network security has put a lot of emphasis on Open Science indicating integration of advanced technologies for data-driven research, secure data sharing, and robust digital infrastructure.

Conclusion

This study highlights India's growing engagement with Open Science (OS), showcasing a decade-long upward trajectory in research output. While the consistent rise in publication numbers underscores researchers' commitment, the decline in citation impact calls for strategies to amplify the visibility and influence of Indian OS contributions. The dominance of STEM fields, particularly Computer Science and Engineering, emphasizes technology's integral role in advancing OS practices. However, the underrepresentation of the Arts, Humanities, and Social Sciences presents an opportunity to expand OS adoption across diverse disciplines. The present study has certain limitations. The findings cannot be generalized as the data is confined to the Scopus database. Future

research could address this by including other databases, such as Google Scholar, Web of Science, and Dimensions, and by analyzing publication trends over a broader time frame. Further investigations could focus on cross-disciplinary OS adoption strategies, particularly in the Humanities and Social Sciences, and assess the effectiveness of policy interventions in promoting OS practices. These efforts would enhance the understanding of OS's role in India and guide policymakers and researchers in fostering a more inclusive and impactful OS ecosystem.

References

1. Ahmed, M., Othman, N. R. B., & Noordin, M. F. (2023). Trends in open science: a bibliometric analysis of research topics, citations, journals, and productive entities. *Deleted Journal*, *5*(2), 170–193. https://doi.org/10.31436/jisdt.v5i2.422
2. Bertram, M. G., Sundin, J., Roche, D. G., Sánchez-Tójar, A., Thoré, E. S., & Brodin, T. (2023). Open science. *Current Biology*, *33*(15), R792–R797. https://doi.org/10.1016/j.cub.2023.05.036
3. Bracco, L. (2022). Promoting Open Science through bibliometrics. *LIBER Quarterly the Journal of the Association of European Research Libraries*, *32*(1), 1–18. https://doi.org/10.53377/lq.11545
4. Cole, N. L., Kormann, E., Klebel, T., Apartis, S., & Ross-Hellauer, T. (2024). The societal impact of Open Science: a scoping review. *Royal Society Open Science*, *11*(6). https://doi.org/10.1098/rsos.240286
5. De Filippo, D., & Sastrón-Toledo, P. (2023). Influence of research on open science in the public policy sphere. *Scientometrics*, *128*(3), 1995–2017. https://doi.org/10.1007/s11192-023-04645-1
6. European Commission. (2016). Europa líder mundial da economia baseada nos dados, graças à ini ciativa europeia para a computação em nuvem. Comunicado de imprensa. Retrieved from http://europa.eu/rapid/press-release_IP-16-1408_pt.htm
7. Ferguson, J., Littman, R., Christensen, G., Paluck, E. L., Swanson, N., Wang, Z., Miguel, E., Birke, D., & Pezzuto, J. (2023). Survey of open science practices and attitudes in the social sciences. *Nature Communications*, *14*(1). https://doi.org/10.1038/s41467-023-41111-1
8. Saikia, S., Gul, S., & Verma, M. K. (2023). Are libraries ready to serve gamification tools for teaching and learning? A review based on computational mapping. *Global Knowledge Memory and Communication*. https://doi.org/10.1108/gkmc-04-2023-0114

9. Saikia, S., Maurya, A., & Verma, M. K. (2024). Emerging trends and performance measurement of cryptocurrency research during 2013–2022: a systematic review based on computational mapping. *Global Knowledge Memory and Communication*. https://doi.org/10.1108/gkmc-09-2023-0343
10. Shettar, I. M., & Hadagali, G. S. (2022). Global Research Publications on Open Data: A Scientometric Analysis. *RBU Journal of Library and Information Science, 24*, 112–119.
11. Tennant, J. P., Agrawal, R., Baždarić, K., Brassard, D., Crick, T., Dunleavy, D. J., Rhys Evans, T., Gardner, N., Gonzalez-Marquez, M., & Graziotin, D. (2020). A tale of two'opens': intersections between Free and Open-Source Software and Open Scholarship. https://doi.org/10.31235/osf.io/2kxq8

A study of changed reading habits among students in digital era: trends and behavior.

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Librarian, Shri Muktanand College,Gangapur, SambhajiNagar

Abstract
The revolution of technology placed a significant role of unpredictable changes and pervasive effect that has transformed the society nowadays. it can fundamentally change the reading habits and indirectly boost efforts in maintaining lifelong reading practices.The study was conducted among 200 students of English medium schools of Nashik. All the students were from 13 years to 16 years age group. Amongst those 60% mail and 40% female participants were there.This survey gives the insight that Reading trends can get affected by the socio- technical development but still student's social economic condition, their peer groups,their inborn likings for the particular genre, their need for reading and their comfort regarding language or their comfort mode of books affects their reading trends and behaviors. Findings of the study also reveals that Maximum students procure the books or reading material from their library so academic libraries need to impower their roles continuously to come up with variety of initiative to reinforce the reading habits among the students so that students will make their Minds to read regularly.

Keywords
Reading trends, Reading behavior, Digital era, reading habits

Introduction

Traditionally reading was done in a print format books,magazines, newspapers and generally readers where limited to obtaining them at libraries and Book stores. According to Shamsuddin et al. (2019),"Reading is a method of getting data and engaging information." Now data is also consumed digitally via ebooks,audio Books, videos, blogs and social media. Songhui (2008) points out that ," Traditional reading habit is supposed reading of books published within the sort of paper only hence the traditional students reading habit has slowly changed and transformed in line with the current technological developments."But Abdul Karim and

Hassan(2007) provide evidence that ,"the trend and behaviours will be transformed to a digital reading habits which is completely different from the traditional definition of reading."Reading trends have changed significantly in today's scenario.Technological advancements shifts in media consumption habits, growing diversity at content formats have great impact on people's readership. Reading has become more digital, social in variety of formats beyond traditional prints. Increasing trend of e-books, audio books, online articles & blogs, audio visual books are influencing students reading habits too. One of the survey by Dayang Azima(2021) found that the rise of information and technology has extensively changed the trends and behavior of students reading habits. Zemalman,(1998)The Expert in reading agrees that the best way to learn to read is to practice reading.But, Knowlton (2016)examined the popularity of electronic books compared to print books in a University setting and found the overall preference for print, combined with the drawbacks of ebooks for preservation and resource sharing leads to a recommendation that most monographic purchases be in print. Educators may assume that creating a peaceful environment and giving students choices would be enough to create a positive reading experience. However after Covid pandemic,many factors are there which may affect students reading habits,reading behaviour and there reading experience while reading.

Statement of research problem

The study aims to evaluate students changed reading trends and behaviour in today's scenario. Understanding the readership of students will help library professionals to improve their collections and services to better serve the needs and preferences of their students.

Objectives of the study

1. To analyze change reading trends of students.
2. To know students' favorite genre of literature
3. To observe students comfort language of reading.
4. To understand why today is generations students want to read (purpose of reading).
5. To find out student's motivation or inspiration for reading.
6. To understand new generation student's favorite topic for reading.

Methodology and scope of the study

For this study, objective type of questionnaire was prepared and survey method was followed. The study was conducted in English Medium schools

of Nashik city. Total 200 students were participated in the study. The data for this research has been collected through questionnaire from these 200 respondents and collected data was calculated with the help of Microsoft Excel and the results below were are shown by using the pie chart. The detailed results are tabulated in the following sections too.

Results and findings

The results of the experiment found clear support to identify and major the reading habits among students along with students and behaviours towards reading now a days.

1. **For this study, total 200 students were participated, from those 119 students were Male and 81 Students are Female.**

Male students – 119

Female Students – 81

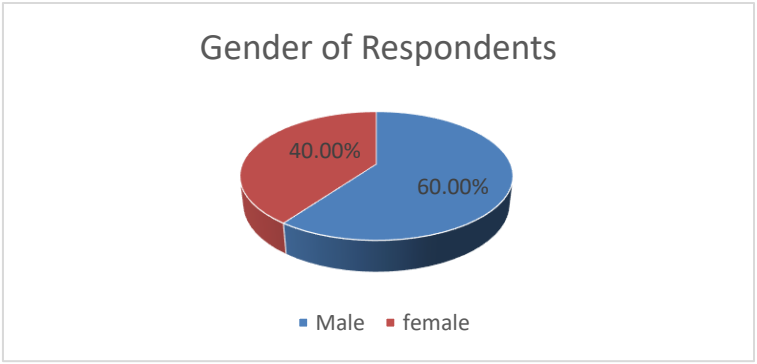

Fig.1 Gender of the respondents

Table.1 Gender of the respondents

Gender	No. Of respondents	Percentage
Male	119	60.00%
Female	81	40.00%

2. Since this Survey was conducted among std VIII and Std. IX students, it is found that most of the respondents belonged to the age of 13 years to 16 years and above. 42 students of them were of 13 years old. 100 students of 14 years old. 44 students of 15 years old 14 students of 16 years and above were there as respondents.

Table.2 Age group wise respondents

Age Group	Number of Respondents	Percentage
13 Years	42	21%
14 years	100	50%
15 Years	44	22%
16 Years	14	7%

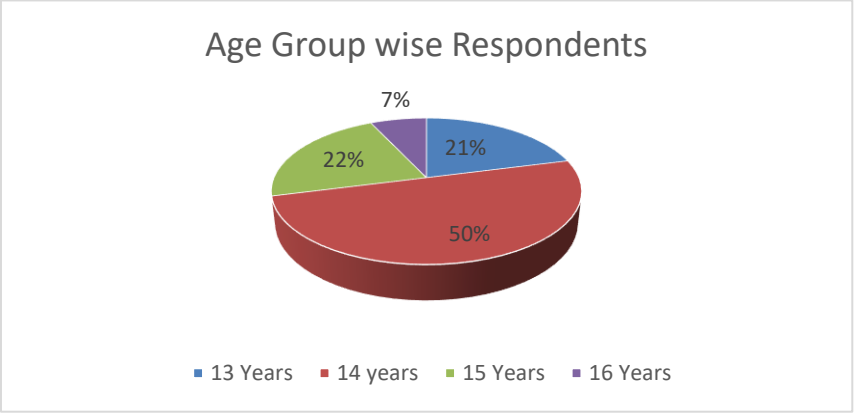

Fig. 2 Age group wise respondents

3. **Have you joined any public/ Private library for extra reading? (other than textbooks)**
   Key respondents replied that they have not joined any public / Private library for extra reading while 54 respondents have or are members of public/ private libraries.

Table 3. No of respondents who joined or not joined public /private libraries.

Variables	No. Of respondents	Percentage
Yes	149	74.50%
No	51	25.50%

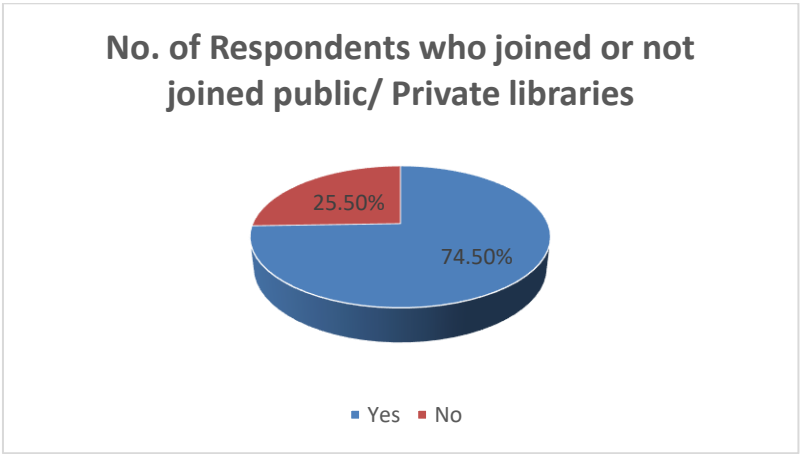

Fig. 3 No. of Respondents who joined or not joined public/ private libraries

4. **In which language do you prefer to read the books?**

155 Students liked to read most in English Language maybe they are from English Medium schools. So, the English language they feel most comfortable to read. After that 34 students liked to read in Marathi language again may be it is mother tongue comfort. 8 students like to read in Hindi Language while 3 students like to read in other language.

Table 4 Respondents preferred language to read the books

Variables	No of Respondents	Percentage
Marathi	34	17%
English	155	77.50%
Hindi	8	4%
Other	3	1.50%

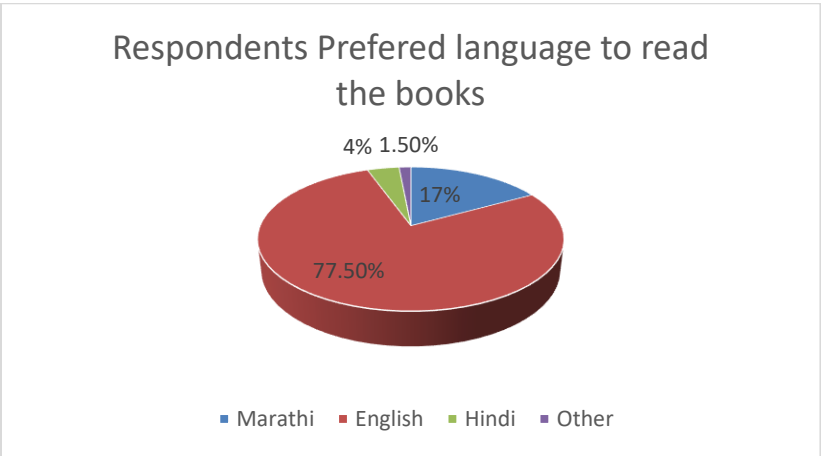

Fig. 4 Respondents preferred language to read the books

5. **Which genres of literature you like to read the most?**

Here students could choose multiple options as their favorite genre of literature 54 students like to read short stories, 53 students like detective stories, 46 students like autobiographies and informative books. 36 students like to read science fictions, 37 students like to read plays/dramas, 29 students like to read historical books, 28 students like to read novels while 14 students like to read poetry books and 16 students replied that they like to read other reading material.

Table.5 Respondents most favoritegenres of literature.

Variables	No. Of respondents	Percentage
Poetry	14	7%
Short Stories	54	27%
Novels	28	14%

Autobiographies	46	23%
Historical Books	29	15%
Plays/ Dramas	37	19%
Informative Books	46	23%
Science Fictions	36	18%
Detective Fictions	53	27%
Other	16	8%

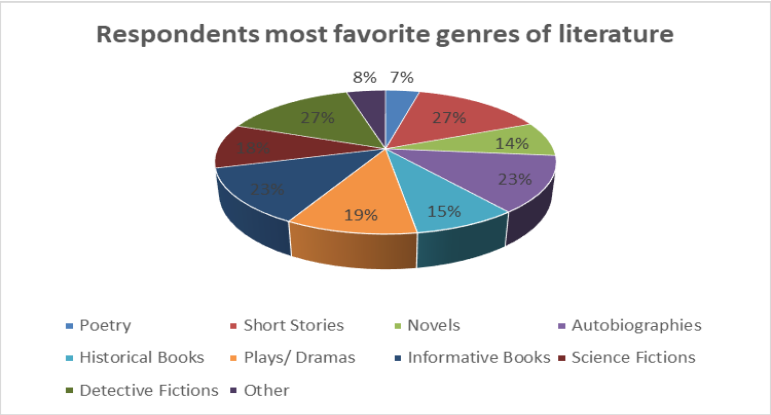

Figure 5. Respondents most favorite genres of literature.

6. **How do you get / procure the books for reading?**

Various option are given to students from where they can get the books for reading 140 students replied that they are getting from libraries, 42 students purchase books for reading or parents are purchasing for them. 10 students get books as a gift while 8 students borrow books from their friends to read.

Table 6. Various option to procure the books for reading.

Variables	No. Of respondents	Percentage
Buying books	42	21%
From Friends	8	4%
From school Libraries	140	70%
as a Gift	10	5%

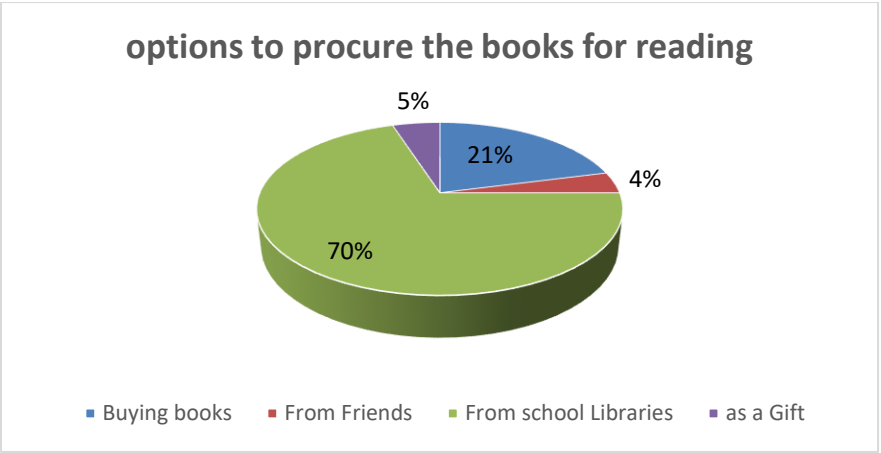

Fig. 6 various options to procure the books for reading

7. **What motivates/ inspire you the most to read books?**
   Here respondents were allowed to choose 2 options which motivates or inspire them a lot to read books.so, 104 students feel that need for information motivates them to read the books. 120 students are biblioholic. They enjoy a reading a lot. So, they read books. 32 students read books for their school assignments. 19 students get inspiration to read from their libraries while 16 students get inspiration to read from their parents. 74 students feel that they get relaxed while reading so they read books.

Table 7. Various option which motivates/ inspire most to read books.

Variables	No. Of respondents	Percentage
School Assignments	32	16%
Need for Information	104	52%
Enjoy Reading	120	60%
recommendation from Libraries	19	10%
recommendation from parents	16	8%
Need for Relaxation	74	3%

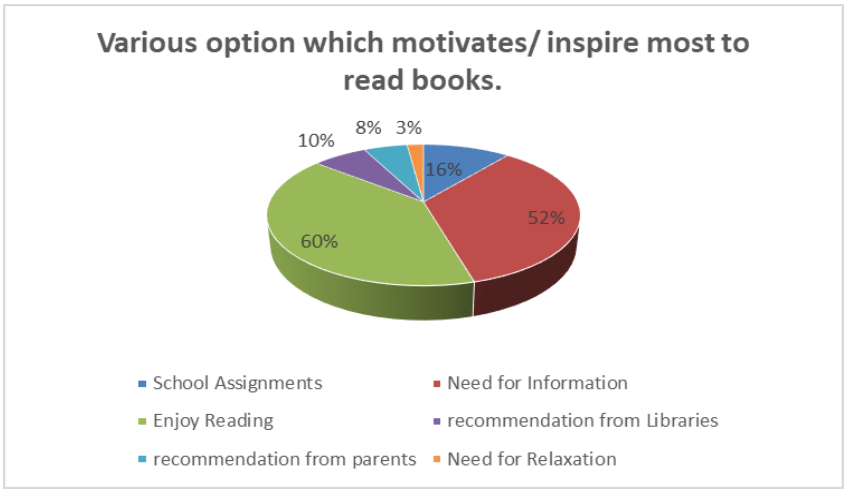

Fig. 7 Various option which motivates/ inspire most to read books.

8. **Frequency of reading**

While judging frequency of reading by the students, 55 students responded that they read once in a week and many a times in a week for both.43 students read sometimes in a week.37 students read a book everyday while 9 students read very rarely and only 1 student never read a book.

Table 8.Frequency of reading

Variables	No. Of respondents	Percentage
Everyday	37	18.50%
Once in a week	55	27.50%
Many a times in a week	55	27.50%
Sometimes in a week	43	21.50%
Rarely	9	4.50%
Never'	1	0.50%

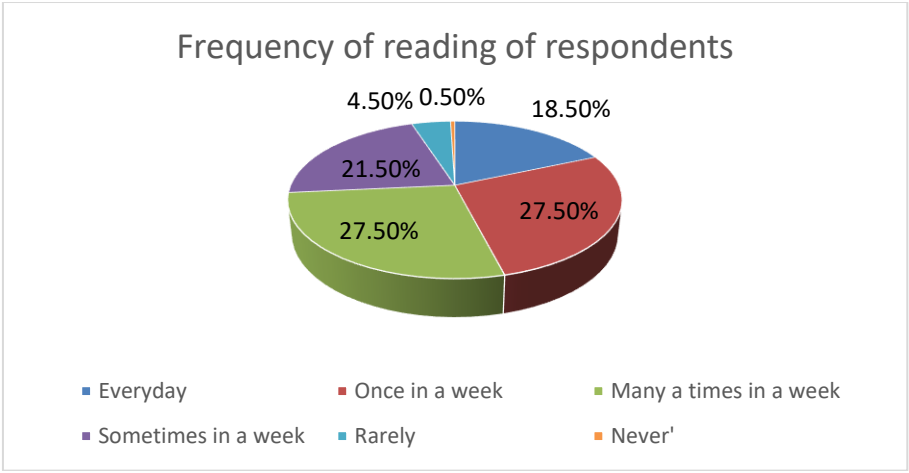

Fig. 8 Frequency of reading of respondents

9. **As per your opinion, what is the main purpose of your reading?**

Here students could choose multiple options 178 students feel that they read to gain knowledge. 99 students feel that their main purpose reading is mental satisfaction and relaxation. 44 students read to get reading pleasure. 20 students read when they want material for the discussions while 13 students read, when they are forced to read.

Table 9. Respondent's main purpose of reading

Variables	No. Of respondents	Percentage
To gain Knowledge	178	89.00%
For the Discussions	20	10.00%
Mental Satisfaction & relaxation	99	50.00%
Reading Pleasure	44	22.00%
Forced reading	13	7.00%

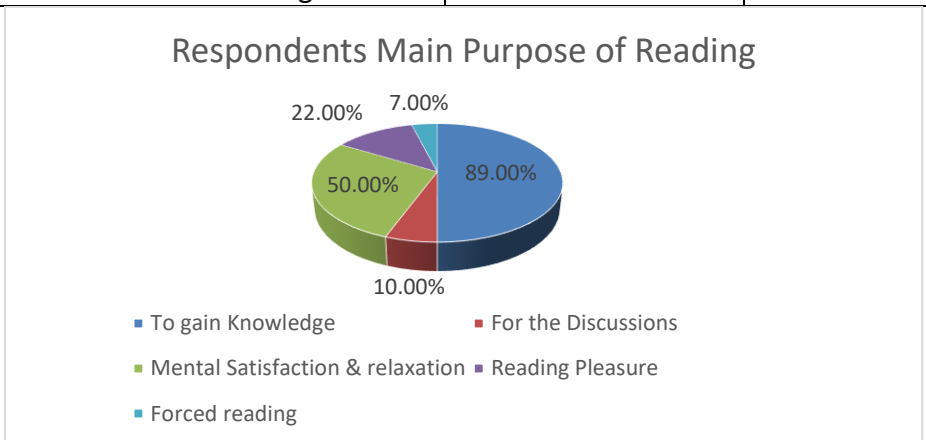

Fig.9 Respondents main purpose of your reading

10. **Which is your favorite topic for reading?**

Respondents could choose more than one option to choose their favorite topic for reading. 83 student's favourite topics for reading is science. 74 student's favourite topics for reading is sports. 56 students like to read general topics and surprisingly 54 students have chosen religious reading as a favourite topic.49 students like to read entertainment-based topics/ Books. While 30 students like to read on social topics.

Table 10. Respondents' favourite topic for reading

Variables	No. Of respondents	Percentage
Social	30	15.00%
Political	31	16.00%
Religious	54	27.00%
Science	83	42.00%
Sports	74	37.00%
Entertainment	49	25.00%
General	56	28.00%

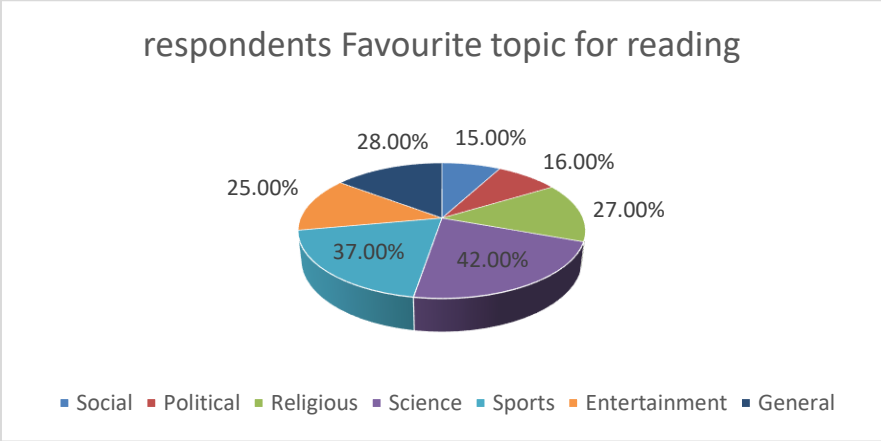

Fig.10 Respondent's favorite topic for reading

11. **Which mode of reading you like the most?**

139 students that is maximum students like to read print books in a traditional way. 14 Students like to read e- books, audiobooks are preferred by 17 students, while 30 students like the audio-visual format of books the most.

Table 11. Respondents most like mode of reading

Variables	No. Of respondents	Percentage
Print Books	139	69.50%
E- Books	14	7.00%
Audiobooks	17	8.50%
Audio Visual Books	30	15.00%

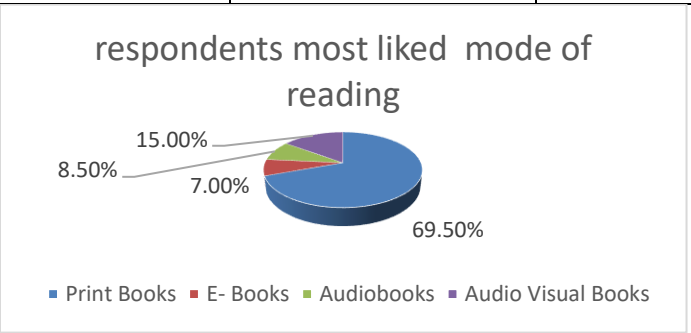

Fig. 11 Respondents most like mode of reading

Conclusion of findings

The Result of this survey found clear support to identify and measure the reading habits among students. It clears their reading trends and behaviors towards reading in today's scenario.

1. While analyzing changed reading trends in students, actually it was assumed that after pandemic students are more technosavy, and they are exposed to social media content too much. So maybe they are not much liking print books for reading. They have shifted their likings towards other mode of reading. But it is proved that the magic of print books is still attracting the new generation. 69.5% students still like to read books in printed form. Very few students are feeling comfortable with e-books, audiobooks and audio-visual books. But still,it is the beginning of the change. May be in future scenario will change.

2. Students between the age of 13 years to 16 years and above are at the adolescence stage. But their response for the favourite genre of literature is mixed. May be as per their personality, as per their upbringing, their surroundings, peer groups they are deciding their likings for the genre of literature. But as the age impacts, most of them like to read detective stories and short stories most. While few of them who are more goal oriented may be chosen autobiographies and informative books as a favourite genre. Otherwise for other option there is a mixed response.

3. it is found that all respondents were from English medium schools, so they were more comfortable in English books reading and few of them with Marathi language because their mother tongue was Marathi, so it is clear that the mother tongue and students educational language decides their comfort regarding reading.

4. It is concluded from the survey that maximum students those who enjoy reading, they get reading pleasure read a lot. In this era of information, those who want to seek more and more information also like to read. 52%students read to get knowledge, while 74% students read to relax their mind and body. Very few students are getting inspired from their librarian and parents. But again, that factor also we can't neglect. Role of these people in giving motivation to their students or wards is also very important.
5. It is proved by the survey that (89%) maximum students in this era of information, read books to gain knowledge, which they can use in their various fields, since students can choose their multiple options, (50%) many of them read for mental satisfaction and relaxation, it is proved. Those who may be not at all like reading are forced to read and so they are reading. But that is negligible (7%).
6. It is observed that students are having mixed choices for their favourite topic for reading. Maximum 42% students preferred to read on science topics while 37% students like to read about sports, remaining students are reading according to their personal likings on all other topics, so there is no specific conclusion we can confirm for it.

References

1. Abdul Karim, N.S. &Hasan,A (2007), Reading Habits and attitude in the digital age: Analysis of Gender and academic program differences in Malaysia. 'Electroniclibrary, 25(3), 285 – 298.
2. Dayang Azimah abong yusof (2021), Reading habits among students in the digital era: Changes of Trends and Behaviours. Journal of Academic Library management Vol.1, No.1, 15th July 2021.
3. Knowlton, S.S. (2016). A Two Step model for assessing relative interest in e-books compare to print college and research libraries, 77(1), 20-33.
4. Samsuddin, S.F. (2019), Understanding the reading habit and attitudes among the rural community in low literacy rate areas in Malaysia. Rural Library perspectives Library Management, 41 (1), 39-52
5. Songhui, Z. (2008), The influence of traditional reading Habits on the construction of digital libraries in developing countries electronic library, 26(4), 520-529.
6. Zemdman, S. Daniels, H.Hyde, A.(1998) Best Practices: New Standards for teaching and learning in America's schools, Postsmouth: NH Heinemann.

The Rise of Sustainable Learning: Bridging the Gap between Green Library Standards and the Indian Scenario with E-Learning

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Abstract
This paper investigates the convergence of green library standards and e-learning within the Indian context, examining how digital learning can contribute to sustainable practices within libraries. Indian libraries face unique challenges in adopting green initiatives, including limited resources, infrastructure constraints, and a predominantly print-based learning culture. This paper analyzes how e-learning can address these challenges by reducing paper consumption, improving energy efficiency, enhancing resource sharing, and expanding accessibility. The paper emphasizes the need for a multi-pronged approach, including policy support, infrastructure development, capacity building, and collaborative efforts, to effectively integrate e-learning into the Indian library landscape and foster sustainable learning environments.

Keywords
Green Libraries, E-Learning, Sustainability, India, Environmental Challenges, Digital Literacy, Resource Sharing, Capacity Building

Introduction

The concept of green libraries has gained significant traction globally, emphasizing environmentally conscious practices within library operations. These practices encompass various aspects, including energy conservation, waste reduction, and the use of eco- friendly materials. However, the adoption of green library standards in India faces unique challenges, including limited resources, infrastructure constraints, and a deeply ingrained print-based learning culture. This paper argues that e-learning can serve as a powerful catalyst in bridging the gap between green library ideals and the Indian reality, fostering a more sustainable and equitable learning environment.

Challenges Faced by Indian Libraries in Adopting Green Initiatives

Indian libraries, particularly those in rural and remote areas, encounter several obstacles in their pursuit of green initiatives:

- **Limited Resources:** Financial constraints pose a significant challenge. Many libraries lack the necessary funds to invest in energy-efficient infrastructure, such as solar panels or LED lighting, and to procure eco-friendly materials and equipment.
- **Infrastructure Constraints:** Inadequate infrastructure, including unreliable electricity supply and limited internet connectivity, hampers the implementation of digital initiatives. This restricts access to online resources and hinders the effective utilization of e-learning platforms.
- **Print-Based Learning Culture:** A strong preference for print materials among students, faculty, and researchers presents a significant hurdle. This deeply ingrained culture necessitates a gradual shift towards digital resources, requiring concerted efforts to promote the benefits of e-learning.
- **Lack of Awareness:** Limited awareness among library staff and users about green library practices and the environmental benefits of e-learning poses a significant challenge. Effective awareness campaigns and training programs are crucial to foster a culture of environmental consciousness within the library community.
- **Digital Divide:** Unequal access to technology and digital resources can exacerbate existing inequalities. Students from disadvantaged backgrounds may lack access to computers, internet connectivity, and digital literacy skills, hindering their ability to fully benefit from e-learning opportunities.

The Potential of E-Learning in Fostering Sustainable Learning

E-learning offers a compelling solution to many of the challenges faced by Indian libraries in their pursuit of sustainability:

- **Reduced Paper Consumption:** By shifting from print to digital resources, e- learning significantly reduces paper usage. This minimizes the need for printing books, journals, and other materials, thereby conserving forests and reducing the environmental impact associated with paper production and transportation.
- **Enhanced Resource Sharing:** E-learning platforms facilitate the sharing of digital resources across geographical boundaries. Libraries can collaborate to create a network of shared digital collections, providing students and researchers with

access to a wider range of resources without the need for multiple physical copies. This not only reduces the environmental impact of resource duplication but also enhances access to information for students in remote areas.

- **Improved Energy Efficiency:** Digital libraries require less energy for maintenance and operation compared to traditional libraries. By minimizing the need for extensive physical infrastructure, such as large buildings and extensive shelving systems, e-learning can significantly reduce energy consumption.
- **Increased Accessibility:** E-learning can provide access to educational resources for students in remote areas with limited access to physical libraries. Online platforms can bridge geographical divides, ensuring that students in underserved communities have access to the same quality of education as their urban counterparts.
- **Reduced Travel:** E-learning can minimize the need for physical travel to access library resources. Online courses and virtual libraries can be accessed remotely, reducing transportation emissions and promoting a more sustainable mode of learning.

Bridging the Gap: A Framework for Implementation

To effectively leverage e-learning for sustainable learning in India, a multi-pronged approach is necessary:

1. **Policy Support:**
   - Government initiatives and institutional policies should prioritize the adoption of e-learning and green library practices.
   - Financial incentives and tax breaks can encourage libraries to invest in sustainable technologies and infrastructure.
   - National e-learning initiatives can promote the development and dissemination of high-quality digital learning resources.
2. **Infrastructure Development:**
   - Investments in robust internet infrastructure are crucial to ensure equitable access to e-learning resources across the country.
   - Focus on expanding broadband connectivity in rural and remote areas to bridge the digital divide.

- Establish public Wi-Fi hotspots in libraries and community centers to provide affordable internet access.

3. **Capacity Building:**
   - Training programs for library staff on green library practices, e-learning technologies, and digital literacy skills are essential.
   - Workshops and seminars can help library staff develop the necessary skills to effectively manage digital resources, curate online collections, and provide technical support to users.
   - Digital literacy programs for students and faculty can equip them with the necessary skills to effectively utilize e-learning resources and navigate the digital learning environment.
4. **Collaboration and Partnerships:**
   - Collaboration between libraries, educational institutions, technology providers, and government agencies is crucial for successful implementation.
   - Partnerships can facilitate resource sharing, knowledge exchange, and the development of shared digital platforms.
   - Collaboration can also help to address the challenges of infrastructure development, capacity building, and digital literacy.
5. **Creating Awareness:**
   - Awareness campaigns can be conducted to educate library staff, students, faculty, and the general public about the environmental benefits of e-learning and green library practices.
   - Disseminate information through workshops, seminars, publications, and online platforms.
   - Utilize social media and other online platforms and digital channels to promote awareness and engage with the target audience.

Examples of Successful E-Learning Initiatives in India

- **National Programme on Technology Enhanced Learning (NPTEL):** This initiative provides access to high-quality online courses from leading Indian institutions, offering a wide range of subjects and disciplines.

- **Swayam:** A platform for online courses, interactive sessions, and video lectures from top educational institutions across India.
- **Digital Libraries of India (DLI):** A network of digital libraries that provides access to a vast collection of digital resources, including books, journals, and manuscripts.

Conclusion

E-learning presents a unique opportunity to bridge the gap between green library standards and the Indian scenario. By embracing digital technologies, Indian libraries can not only reduce their environmental impact but also enhance access to education, foster a more equitable learning environment, and contribute to the sustainable development of the nation. However, the successful integration of e-learning requires a multi-pronged approach, including policy support, infrastructure development, capacity building, and collaborative efforts. By addressing these critical factors, India can harness the power of e-learning to create a greener, more sustainable and more inclusive learning ecosystem for all.

References

1. Aminu Umar, Usman & Khamidi, Dr. Mohd Faris & Tukur, Hassan. (2012). Sustainable Building Material for Green Building Construction, Conservation and Refurbishing.
2. Brilli, F, Fares, S, Ghirardo, A, de Visser, P, Calatayud, V, Muñoz, A, et al. Plants for Sustainable improvement of indoor air quality. Trends Plant Sci 2018; 23:507–12. https://doi.org/10.1016/j.tplants.2018.03.004
3. Dr. Vaidya, S. (January 2018). Green Libraries in India: A Status Report. "Knowledge Librarian" An International Peer Reviewed Bilingual E-Journal of Library and Information Science, 250-257.
4. Green Library - New World Encyclopedia www.newworldencyclopedia.org. Retrieved September 22, 2021, From Https://Www.Newworldencyclopedia.Org/Entry/Green_Library
5. Ingole, A., & Kumari, S. (December 2021). Green Library: Concept, Sustainable Development, Features, Importance, Standards and Overview In Indian Scenario. International Journal of Creative Research Thoughts, 373-386.
6. Kulkarni, P. (2018). Green Library: Concept, Features and Elements. Journal of Emerging Technologies and Innovative Research (Jetir), 5(1), Pp 1456-1460.

7. Meher, P., & Parabhoi, L. (2017). Green Library: An Overview, Issues with Special Reference to Indian Libraries. International Journal of Digital Library Services, 7(2), Pp 62-69.
8. Pangail, R. (2015). Green Libraries: Meaning, Standards and Practices. Episteme: An Online Interdisciplinary, Multidisciplinary & Multi-Cultural Journal, 4(3), Pp1-9
9. S. Bangar, M. (2018). Green Libraries in India: An Overview. Knowledge Librarian An International Peer Reviewed Bilingual E-Journal of Library and Information Science, special issue, 223–230. Retrieved from http:// www.klibjlis.com
10. Shah, L., Kumar, S., & Kumar Shah, M. (2015). Green Libraries in Academic Institutions: Need of The Hour. International Journal of Research - Granthaalayah, 3(9se), 1–5. https://Doi.Org/10.29121/Granthaalayah.V3.I9se.2015.3129
11. Shirley, D., Ramachandran, S., Pillai, M., & Franklin, J. (August 2022). Green Library Initiatives of Academic Colleges in Kerala for Sustainable Eco-Friendly Libraries. International Journal Of Innovative Research In Technology, 844-849.
12. http://conference.ifla.org/ifla77
13. http://www.globallibraryconsulting.com
14. http://in.usgbc.org/leed
15. http://igbc.in/site/igbc/index.jsp).

Aspects of Collection Management in College Libraries

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Abstract
Collection Development is an important part of library work. It plays a vital role in maintaining and providing good service to library users. Various collection development policies and methods are pursued in libraries worldwide. This article provides some of the aspects and issues related to collection development.

Key Words
Collection Management, Collection, Development, Journal, Materials

Introduction

The number and size of academic institutions especially colleges, were deficient prior to the year 1947. Since the year 2010, the colleges have increased and grown in size, and also the libraries attached to them. The change in emphasis from collection development to collection management (CM) has been witnessed in college libraries over the last five decades. Collection management (CM) goes beyond the acquisition of library documents. It encompasses the systematic management of the library's collection including, bibliographic control, conservation, manipulation of stock storage, and Delegation. The management of the college library collection comprises a coordinated program pervading all areas of the library.

Definition

Collection

A library collection is the sum total o f library materials like books, manuscripts, and serials. government publications, pamphlets, catalogues, reports, recording microform reels, micro cards and microfiche, punched cards, computer tapes, etc. that make up the holding of a particular library.

Collection Development

The "Collection Development "describes a cluster of functions, which together shape the holdings of materials in a library funding, self study and evaluation. Selection, weeding and maintence.

Collection Management:

It is the selection and acquisition of documents and allocation of books fund; journals and conservation; the disposition of stock between open and closed access, between different media monitoring and encouragement of use of the collection.

It is clear from the above definitions that collection development and collection management, even though appears to be synonymous terms there is a distinction between the two. Thus collection development is the Selection and Acquisition of Documents. Collection management also includes issues concerned with conservation and disposal and is aimed more at the presentation of the collection to the user. To make it further more clear collection management is the day to day implementation of Collection Development policies extending to cover those aspects of library operations and services concerned with making the collection available to the library clientele.

Review of Literature

Kumar examine the concepts and issues of collection development activities and management with the changing environment of electronic documents in management libraries (Kumar, 2018).

Author described the different types of resources present their own challenges to librarians. While focusing on individual types of resources, libraries need to have a collection development strategy in place to properly manage the collection as a whole so that staff and users understand how to do it. This chapter discusses collection management and overall collection development rather than focusing on type collections. It also guides how librarians will deal with some of the macro and micro issues related to how to maximize the best use of collections (Chowdhury, 2018) .

In this book, the author discussed how to prove useful and informative for LIS professionals, academicians, academic administrators, higher education researchers, students, and those interested in modern librarianship. Also has been devoted mainly to developing countries irrespective of the reasons of the world (Thanuskodi, 2015).

At present, information available electronically is supplementing traditional media such as books and microfilm. Library collection should be developed

by applying various criteria for information selection. This paper discusses the evolving concepts and issues of digital librarianship (Goswami, 2023).
The author confined the study to the libraries of the High Courts of India. A survey of Judges, Bar Associations, and Advocate General Libraries was used in that study. The entire population of all three types of libraries was used for data collection using a structured questionnaire. This study studied the annual budget of libraries, collections, e-resources, services, management systems, etc., and made a model outlining how to manage legal information. The model describes various processes like budgeting, acquisition, institutional storage, services, preservation and conservation, collections, digital repositories, and resource sharing to implement the plan. It was concluded that comprehensive library development is necessary even today in various areas of these three types of libraries (Jagtap, 2020).

Objective of collection management

The library engages in various resource-sharing initiatives that widen the range of materials available to the college community. Therefore, library resources include a wide variety of general information resources, the subject of which is not covered in classroom instruction, but which generally support the learning environment. Members whose scholarly or research needs are beyond the scope of the library collection are catered for through interlibrary loans. There are limitations in the availability of funds, facilities, collection and development policies and procedures for maintaining the quality of collection and information resources, and proper information management can provide quality service to readers.

Principle for selection of resources

The following guidelines are presented to assist library staff, faculty, and administrators in selecting quality materials for inclusion in the library collection.

- Relevance to program based needs for students - It is important to study the program-based needs of the students and provide them with a material collection that is compatible with the syllabus planned.
- Relevance to instructional needs for the faculty - Libraries play an important role in providing relevant information to professors by updating their knowledge and providing it to the students.
- Probable need based on existing programs and collections - Each library plans the future library collection keeping in view the ongoing

program and availability of existing resources such as funds and user demand of the parent institution.

Need of collection development

Collection development indicates the acquisition and evaluation of the library collection to see that both print and non-print resources that are available in a library are really useful to the user. The collection development purpose is to find out the user's information needs to

- Find out clientele information needs
- Adopt systematic and judicious spending on information collection, keeping the objectives of the service in mind
- Fulfil the library's duties to the user community to provide relevant and basic information

An intensive search is carried out with the help of LISA, LISTA, and some of the online resources available in the web world to know the related literature for the above-mentioned subject. The search is carried out and retrieved More References on the Article Title as Collection Development rather Than the Terms Collection Management.

Issues in Collection Management

Subject Specialists

In the Indian context such specialists even though may be present in certain special libraries are not seen in college libraries. However, it is important to have subject specialists and technical competencies. The greatest advantage is that library personnel who have subject knowledge can originate book recommendations better than others and also can moderate the inspiration of academic staff.

Involvement of academic staff

Many colleges have a member of academic staff nominated for liaison with the library. This practice is seen more in special libraries and is the decline in the case of college libraries. It resulted in the whimsical growth of the library collections in most cases. The tendency has to be discouraged. Academic staff were no better at book selection than library staff opines peas good the same is the case with journals too. A faculty member may insist that a journal is essential to the library and should be purchased. This may be only for his use. The way a librarian views is from a different angle. The librarian can indicate that the journal has no use except the lone journal is little related to the curriculum. Sometimes the same journal may be available in the nearby library, maybe in the same locality, or maybe in the same campus. It can also happen that it is never cited by other published

articles or is published by a local organization with a poor reputation. Thomson and Carr discussed that it seems universally agreed that responsibility for selection is best shared between library staff and academic staff.

Accountability

Although the library is a non-profit organization, the demand for performance measurement is gradually coming from the payers i.e. the government side. It is fair from the government's point of view to assess the value of the money they have spent. Similarly, the demand arises from the user's point of view. Nowadays students are treated as consumers of services. Therefore, they have the right to expect certain standards of quality and facilities in college libraries. A tendency that one observes is that students normally accept what they are given. However, this is not the case with self-financing students. Thus accountability in college libraries is increasing. This accountability as stated earlier is towards the students, thus if college libraries are to be accountable, their collection management should be strengthened.

Role of vendors

Libraries depend on vendors for the supply of resources and services. Vendors have also embarked on an automated vendor inventory system. The reason for this is the increase in the number of publications as well as competition among themselves. Today, the trend is towards online ordering, dissemination of bibliography and invoice data, etc.

Many vendors have computerized their internal processes and can offer computer-related services. The introduction of vendor and library personal computers has led to the creation of specialized computer packages for book ordering.

Now, some vendors print monthly status reports of all outstanding library orders and mail them to libraries. In India, it is not yet time to provide an option to download the vendor's database to library computers to assist retrospective searchers for collection development (CD).

Non-Book Materials

Non-book materials are widely available in many college libraries. Wherever they are, if present, show the signs of good teaching practice and research. Further, it is found that there is no policy for purchasing audio-visual

materials and thus many of our College library collections are predominantly print-based.
Resources-based learning & varieties of learning styles are essential in the present educational setup. For this active and informed management of library services are materials found in colleges

Sound Recordings
It consists of three types of audio cassettes and compact discs found in college libraries. Among these, audio cassettes are mainly for graduates and language students.

Video Recordings
Video recordings are now widely available. They are all user-friendly and generally have a wide range of less expensive topics.

Graphics
The term graphics includes photographs, photographic slides, pictures, postcards, etc.

CD-ROM
Many bibliographic tools—dictionaries, census data, encyclopaedias, and now entire texts—are available on CD-RAM. These enable students not only to search for detailed topics but also to skip and print the text for their assignments/seminars.
Non-book materials are not more expensive than traditional materials. Collection management of non-book materials is similar to that of print materials. But when it comes to college libraries in India, their collections are almost non-existent.

Conclusion
Collection development is a very essential key to the success of any library and is a very difficult task. The collection manager's job extends to finding the answer to the question of how the collection can best be managed. The role of collection development is not only to plan the stock acquisition program but also to make it relevant to the immediate and future needs of users. It has been observed that closer collaboration has developed between departments as evaluated by librarians to ensure that the current and future needs of students and scholars are met through the evaluation of

library collections. Coordination and sharing of resources are two positive steps in the face of shrinking budgets.

References

1. Atkinson, R. (n.d.). Old Form to New Form- The Challenge of Collection Development College and Research Libraries .
2. Bryant, B. (n.d.). The Organizational Structure of Collection Development. In *Library Resources and Technical Services.*
3. Chowdhury, G. G. (2018). Collection Managment and Collection Development. Cambridge University Press.
4. Cogs, W. J. (n.d.). The Organization of collection Management Functions in Academic Research Libraries. *Journal of Academic Librarianship*.
5. Fothergill, F. /. (n.d.). IC: Non -Book Materials in Libraries-A Practice Guide.
6. Goswami, M. (2023). Collection Development and Management in the Academic Libraries in the Modern Era: An Overview. *Journal of Multidisciplinary Cases*, 35-45.
7. Jadhav, A. V. (2022). Collection development Policy for E- Resources in The Universities Libraries of Western India.
8. Jagtap, U. (2020). *Study of Legal Information Management in High Court Librares in India.* Mumbai : SNDT Women's University.
9. K., H. M. (n.d.). *Collection Development in the Eighties - Where are we now? Library Acquisition Practice and Theory.*
10. Kumar, S. /. (2018). Collection Development and Managment in Librariaes of Management Institutions. *International Journal of Librarianship and Administration, 9*(1), 1-8.
11. Lansour, K. /. (n.d.). Encyclopedia of Library and Information Science.
12. Libraries, T. A. (n.d.). *Collection:Their Development, Management, Preservation and Sharing.* York.
13. M., W. (n.d.). Collection Development in non Print Materials in Academic Libraries. *Library Trends*.
14. Pease, G. (1997). An Acquisition / Selection Librarians - Academic Libraries Proceding .
15. S., B. (n.d.). Current Initiate and Issues in Collection Management . *Journal of Academic Librarianship*.
16. Thanuskodi, S. (2015). In *Handbook of Research on Inventive Digital Tools for Collection Managment in Modern Libraries.* Information Science Reference.

17. Thomson, J. R. (n.d.). An Introduction to University Library Administration .
18. Woodhead, P. A. (n.d.). Subject Speculation in British University Libraies: A Survey. *Journal of Librarianship* .

Special Library Services: Special Effect on Medical Library

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Abstract
Medical libraries often provide a range of **specialized services** tailored to support healthcare professionals, researchers, students, and patients. These services go beyond traditional library offerings to meet the unique needs of the medical and healthcare fields. Here are some examples:

Keywords
Medical Library, Healthcare Services, Technical Service, Archiving and Knowledge Management

Introduction

A special library is a type of library designed to meet the specific needs of a particular group of users. Special libraries focus on a specific subject or organization, providing tailored resources and services. Among these, special medical libraries stand out due to their critical role in supporting medical professionals, researchers, and students. This article explores the services offered by special medical libraries, their importance, and how they cater to the unique demands of their users.

Role of Special Medical Libraries

Special medical libraries are integral to the healthcare ecosystem, serving as repositories of medical knowledge. They provide access to specialized resources, including journals, textbooks, research papers and databases. The primary users of these libraries include:

- **Healthcare professionals**: Doctors, nurses, and allied health staff rely on these libraries for evidence-based practice.
- **Researchers**: Special medical libraries offer tools for conducting in-depth research in medical and health sciences.
- **Students**: Medical students use these libraries for their academic and clinical training.

Key Services

- **Access to Specialized Resources:**
  - Subscription to medical journals, both print and electronic.
  - Access to medical databases such as PubMed, Cochrane Library, and MEDLINE.
  - Rare and historical collections of medical texts and manuscripts.
- **Reference and Research Assistance:**
  - Personalized assistance for complex medical queries.
  - Support in systematic reviews and meta-analyses.
  - Bibliographic services to help users identify relevant materials.
- **Technology Integration**:
  - Digital library services, including remote access to e-resources.
  - Use of artificial intelligence for advanced search capabilities.
  - Implementation of telemedicine and decision-support tools.
- **Educational and Training Programs:**
  - Information literacy training for effective use of resources.
  - Workshops and webinars on research methodologies.
  - Continuing education opportunities for healthcare professionals.
- **Interlibrary Loan and Document Delivery**:
  - Access to resources from other libraries through interlibrary loan systems.
  - Rapid document delivery services for urgent medical information needs.
- **Archiving and Knowledge Management**:
  - Preservation of institutional research outputs.
  - Development of knowledge repositories for organizational use.
- **Information Retrieval and Literature Searches**
  - Customized literature searches for clinical, educational, and research purposes.
  - Systematic review support, including identifying high-quality sources and data extraction.
- **Clinical Decision Support**
  - Integration with clinical decision-support tools (e.g., UpToDate, DynaMed)..
  - Point-of-care resources tailored for healthcare professionals.

- **Evidence-Based Practice Support**
  - Training and resources for evidence-based medicine (EBM) techniques.
  - Assistance with formulating clinical questions using PICO (Patient, Intervention, Comparison, Outcome).
- **Specialized Databases and Access**
  - Subscriptions to specialized medical databases such as PubMed, Cochrane Library, Embassy, and CINAHL.
  - Full-text journal retrieval and document delivery services.
- **Research Data Management**
  - Guidance on data sharing, storage, and compliance with funder mandates.
  - Help with research data repositories and metadata standards.
- **Patient Education Resources**
  - Curated collections for patient and caregiver education, often in plain language.
  - Support for clinicians in creating or finding patient education materials.
- **Specialized Technology and Tools**
  - Access to medical imaging software, anatomy applications, and simulation tools.
  - Support for bibliometric analysis and research impact assessment.
- **Library Liaison Services**
  - Dedicated librarians assigned to specific departments or specialties.
  - Personalized consultations and resource recommendations.
- **Health Literacy Initiatives**
  - Programs to improve health literacy among patients and communities.
  - Collaboration with public health organizations on outreach projects.
- **Open Access and Publishing Support**
  - Guidance on choosing open-access journals and meeting funder requirements.
  - Help with journal selection, manuscript preparation, and compliance with ethical guidelines.
- **Virtual and Remote Access**

    - Online portals for accessing library resources remotely.
    - Telehealth-related resources and virtual reference services.
- **Customized Services for Healthcare Teams**
    - Evidence summaries and updates for clinical teams.
    - Journal club facilitation and support.

Challenges and Innovations: Despite their critical role, special medical libraries face several challenges, including budget constraints, the high cost of subscriptions, and the need for skilled personnel. To address these challenges, libraries are adopting innovative approaches, such as:

- Open access initiatives to provide free access to research.
- Partnerships with academic and research institutions.
- Leveraging data analytics to understand user needs and improve services.

Conclusion

Special medical libraries are indispensable in advancing healthcare, education, and research. By offering specialized resources and services, they empower users to make informed decisions, conduct ground-breaking research, and enhance learning outcomes. As technology continues to evolve, these libraries must adapt and innovate to meet the growing demands of the medical community.

References

1. Bandy, M. (2020). "Medical Libraries in the Digital Age." Journal of Library and Information Science, 56(4), 12-24.
2. Kahn, C. E., & Channin, D. S. (2019). "Knowledge Management in Medical Libraries." Medical Reference Services Quarterly, 38(2), 45-60.
3. National Library of Medicine. (2023). "Resources and Tools for Medical Research." Retrieved from https://www.nlm.nih.gov
4. Smith, J. D. (2021). "Challenges in Special Libraries: The Case of Medical Libraries." Health Information and Libraries Journal, 38(3), 152-161.
5. World Health Organization. (2022). "Health Information Services and Medical Libraries." Retrieved from https://www.who.int

Engaging Library Users: A Comprehensive Approach

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Abstract
As libraries continue to evolve in the digital age, finding effective ways to engage users has become increasingly important. This study explores the various strategies libraries use to connect with their users, both online and in person. By using a mix of surveys, interviews, and an extensive review of scholarly literature from platforms like Google Scholar, the research identifies what works best in engaging library users, highlights user satisfaction, and offers recommendations for improving engagement. The study combines both traditional methods and newer, digital strategies that are changing the library landscape.

Keywords
User studies, Social Media, Digital resources

Introduction

Libraries have come a long way from being quiet places just for borrowing books. Today, they serve as vibrant community centers, offering everything from digital resources to workshops, lectures, and social programs. Because libraries are now hubs of information, knowledge sharing, and community, understanding how to effectively engage users is essential for keeping these spaces relevant. Engaging users well can boost library usage, encourage deeper connections, and improve overall educational outcomes.

This research aims to explore different strategies libraries use to engage users, whether it's through digital tools, in-person programs, or personalized services. We'll evaluate the effectiveness of these strategies based on data from surveys, interviews, and a review of academic literature gathered from resources like Google Scholar.

Literature Review

To get a better understanding of how libraries engage their users, we looked at existing research on the topic. Drawing from studies on Google Scholar, the literature review highlights several key themes:

- **Technology and Digital Tool**
  Many libraries have embraced digital tools like online catalogs, digital libraries, and mobile apps to make their resources easily accessible. Researchers like Smith (2022) and Johnson & Lee (2021) suggest that these platforms have significantly boosted engagement by allowing users to access library resources anytime and anywhere.
- **Community Programs**
  Libraries have also leaned into offering community-focused programs, such as workshops and public events. According to Harris (2019), these programs play a huge role in encouraging users to interact with the library and connect with others in the community.
- **Personalized Services and User Experience**
  Libraries that offer personalized services—like custom book recommendations or one-on-one help—are more successful at building stronger relationships with users. Davis (2020) points out that libraries focusing on personalized experiences tend to see higher user satisfaction and greater engagement.
- **Social Media and Online Outreach**
  Libraries are increasingly using social media platforms like Facebook, Instagram, and Twitter to promote events and engage users. Park & Nguyen (2021) found that social media allows libraries to interact with users in a more informal and engaging way, helping to keep people connected to their services.

Research Methodology:

This study uses a mixed-methods approach to gather data. It combines both qualitative (descriptive) and quantitative (numeric) research techniques.

- **Survey**
  A survey was created to gather information from library users about their experiences with library services, how they prefer to engage with the library, and their use of digital tools. The survey included multiple-choice questions as well as open-ended questions to give respondents the chance to express their thoughts in more detail.
- **Interviews**
  In-depth interviews were conducted with both library staff and users. Staff provided insights into the strategies libraries use to engage users, while the users shared their experiences and preferences.

- **Google Scholar Review**
  Along with the surveys and interviews, we reviewed academic articles using Google Scholar to gather insights from peer-reviewed studies published between 2015 and 2024. This helped ensure the research is up-to-date and supported by existing literature.

Data Collection and Analysis

- **Survey Data**
  The survey was sent out to 500 library users, with 80% responding. We analyzed the survey data using descriptive statistics to identify trends in user engagement. For example, we looked at how often users accessed digital tools, attended community programs, and followed the library on social media.
- **Interview Insights**
  Interviews were conducted with library staff and users and transcribed for analysis. We used thematic analysis to look for patterns in the responses, focusing on recurring strategies and feedback.
- **Google Scholar Review**
  Over 30 academic articles were reviewed to gain a broader understanding of current trends in library user engagement. The insights from these studies helped contextualize the data and enrich the overall findings.

Results

- **Survey Findings**
  - **Digital Tools:** 70% of respondents reported frequently using the library's website or mobile app to access resources. This suggests that digital tools are a significant factor in user engagement.
  - **Community Programs:** 55% of respondents had attended at least one community event or program hosted by the library. This highlights the importance of face-to-face programs in engaging users.
  - **Social Media:** 40% of respondents followed the library's social media accounts, finding them useful for staying updated on events and resources.

- **Interview Insights**
    - Library staff emphasized the importance of offering personalized services, like book recommendations and one-on-one help, to strengthen connections with users.
    - Users noted that while digital tools are convenient, there's room for improvement in areas like user interface and personalized features.
    - Both staff and users agreed that community programs were the most effective way to foster long-term engagement with the library.

Discussion

The findings suggest that libraries are using a variety of strategies to keep users engaged, with some methods being more effective than others. Digital tools, such as apps and websites, are vital for providing users with convenient access to library resources. However, programs that encourage in-person interaction—like workshops and community events—still play a crucial role in creating lasting engagement.

The research supports the idea that the best approach combines digital tools with community-oriented programs and personalized services. This hybrid strategy seems to be the most effective way to engage users and encourage them to use the library regularly.

Libraries should also continue to evaluate their engagement strategies. Ongoing feedback from users can help libraries adapt and improve their services to meet evolving needs.

Conclusion

This study shows that engaging library users requires a combination of traditional and modern strategies. Digital tools and social media are essential for reaching a wide audience, but personalized services and community programs remain key to building deeper connections with users. Future research could explore the impact of emerging technologies, such as artificial intelligence and virtual reality, on user engagement. Additionally, it would be valuable to study how libraries can tailor their services to different demographic groups, ensuring that everyone has access to the resources they need.

References

1. Davis, M. (2020). *Personalizing Library Services for Better User Engagement.* Journal of Library Innovation, 15(2), 45-60.
2. Harris, J. (2019). *The Role of Community-Based Library Programs in User Engagement.* International Journal of Library Science, 12(4), 120-135.
3. Johnson, K., & Lee, S. (2021). *Digital Tools and Library User Engagement: A Review.* Journal of Digital Libraries, 8(1), 78-92.
4. Park, T., & Nguyen, P. (2021). *Using Social Media to Engage Library Users.* Social Media in Libraries, 3(1), 22-38.
5. Smith, A. (2022). *The Future of Library Engagement in the Digital Age.* Library Technology Reports, 18(3), 50-66.

Library Katta: A Best Practice Initiative at Rajarambapu Institute of Technology Central Library for Enhancing Student Engagement and Learning

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Abstract

This study studies how the Library Katta initiative impacts students' academic and personal growth at an engineering college. Data was gathered from 105 students across various academic years and disciplines, including primarily undergraduate and BBA students. Participants shared their experiences with the initiative and its effect on different aspects of their education. Male students made up 58.1% of the respondents, with undergraduates being the largest group (46.2%), followed by BBA students (24.5%). Most students reported moderate to high engagement with Library Katta activities, with study sessions (58%) and group discussions (45%) being the most popular. Over half of the participants (52%) noticed improvements in their academic performance, pointing to a better understanding of course materials (49%) and enhanced critical thinking skills (58.8%). Beyond academics, the initiative also boosted students' social awareness, public speaking, and presentation skills, with 55.7% agreeing that it heightened their awareness of social issues. Overall, students expressed high satisfaction with the Library Katta experience, with 56.1% satisfied and 10.2% very satisfied. These findings highlight Library Katta's role in fostering collaboration, skill- building, and social engagement, making it a valuable platform for students' overall development.

Keyword:

Library Katta; Engineering Students; Social Awareness; Extracurricular Activities; Discussion Forums.

Introduction

Libraries in educational institutions are no longer just quiet spaces filled with books and academic resources. They've transformed into vibrant hubs that encourage student engagement, collaboration, and personal growth. At Rajarambapu Institute of Technology (RIT), the Central Library has introduced an innovative initiative called Library Katta. Inspired by the traditional concept of a "Katta"—a popular gathering spot—this initiative creates a lively, interactive space where students can participate in a variety of academic and extracurricular activities. The goal of Library Katta is to bridge the gap between academics and social interaction. It offers students opportunities to engage in group discussions, workshops, study sessions, and social events, all aimed at fostering collaboration, building communication and presentation skills, developing critical thinking, and raising awareness of social issues. Additionally, Library Katta promotes peer-to-peer learning by encouraging students from different disciplines to share ideas, collaborate on projects, and learn from each other in a supportive environment. This study evaluates how effective Library Katta is in engaging students and contributing to their academic and personal development. It looks at the impact of the initiative on various aspects of student growth, including academic performance, understanding of course material, public speaking, critical thinking, and social awareness. The research also explores participation trends across different academic years, disciplines, and genders, offering a comprehensive view of how students are interacting with this unique library program. The findings are based on feedback from 105 students who have taken part in Library Katta activities. This paper analyses their experiences to understand how the initiative has influenced their education and personal development. The insights aim to showcase best practices for libraries in higher education and highlight the potential of student-focused library programs to drive academic success, social engagement, and skill enhancement.

Library katta: best practice

The Library Katta is a forward-thinking initiative that reimagines library

spaces as informal yet resourceful hubs for collaboration, engagement, and knowledge-sharing among students. Rooted in the Marathi word Katta, which refers to a gathering spot for conversations and community, this concept brings the spirit of connection and interaction into the library setting. At the Rajarambapu Institute of Technology (RIT) Central Library, the Library Katta transforms traditional study spaces into vibrant, multifunctional areas where students can exchange ideas, work on projects, and access various resources. The Library Katta provides engineering students with a relaxed yet intellectually stimulating environment to connect with peers and faculty. Activities such as group discussions, study sessions, workshops, and informal gatherings are designed to enrich their learning experience. Equipped with resources like books, digital tools, and comfortable seating, the Katta encourages both academic exploration and social interaction. What sets the Library Katta apart is its ability to bridge the gap between formal education and social learning. By fostering collaboration and peer-to-peer engagement, it helps students develop crucial skills like teamwork, communication, and critical thinking. This initiative exemplifies how libraries can adapt to the evolving needs of students, offering spaces that not only support academic growth but also prepare them for future challenges. Ultimately, the Library Katta empowers students to thrive academically, socially, and professionally in today's dynamic educational landscape.

Literature review

Numerous studies have explored how library initiatives like reading clubs, discussion forums, and collaborative learning spaces contribute to students' intellectual and social growth. These activities are shown to deepen engagement with academic content, foster critical thinking, and promote peer interaction. Hase, V.L. and Kulkarni, S.S. (2023)[4], This study evaluated a faculty-focused reading club at Rajarambapu Institute of Technology in India. The findings revealed that participation enhanced communication skills, personality development, and self-growth among faculty members. The study highlighted the role of book reading in academia as a tool for improving interpersonal, research, and communication abilities,

emphasizing the potential of collaborative library activities to boost intellectual engagement. Nurul Puspita (2021)[9], Puspita's research examined an extensive reading program integrated with book club discussions in a first-semester academic writing class. The program significantly improved students' vocabulary, grammar, and writing skills. The collaborative discussions fostered critical thinking and demonstrated the positive impact of peer learning, underscoring the value of library spaces like Library Katta in supporting academic development and intellectual exchange. Beneyat-Dulagan, Maryjul T. and Cabonero, David A. (2022)[2], This study investigated library activities, learning spaces, and challenges faced by students at the Mountain Province State Polytechnic College Library in the Philippines. Students preferred physical and virtual collaborative spaces, such as group study rooms, for sharing knowledge and working together. However, challenges like insufficient interactive spaces highlighted the importance of initiatives like Library Katta, which create engaging environments for collaboration and learning. Dhawle, G.U. (2014)[3], Dhawle focused on the transformation of libraries in the digital era through ICT and digital tools. While his study emphasized digital reference services like email, chat, and web forms, it illustrated how digital tools can complement physical initiatives like Library Katta by extending resources and discussions beyond the library's physical boundaries. These studies collectively emphasize the transformative role of library initiatives in fostering academic excellence, critical thinking, and social learning. Libraries, once seen as quiet spaces for study, are evolving into dynamic hubs for interaction, discussion, and skill development. Initiatives like Library Katta at RIT Central Library exemplify this shift by providing a vibrant platform for students to engage, collaborate, and grow intellectually and socially.

Objective

- To study how the Library katta initiative enhances student engagement among engineering students at RIT Central Library.
- To study the impact of Library katta on the academic performance and learning outcomes of engineering students.

- To study how effectively the 'Library Katta' activity engages students with social and current issues.
- To analyze the impact of 'Library Katta' on students' personal and intellectual growth, focusing on developing public speaking, critical thinking, and presentation skills.
- To analyze the perceptions and experiences of engineering students regarding the Library katta initiative and its influence on their educational journey

Scope and limitation of the study

This study examines the Library Katta initiative at the RIT Central Library, focusing on its impact on engineering education and student engagement at Rajarambapu Institute of Technology (RIT), Islampur. The institute is affiliated with Shivaji University, Kolhapur, Maharashtra, India. The research specifically targeted RIT students, excluding the influence of similar initiatives in other colleges or institutions. Data collection relied on students' personal experiences, which introduced an element of subjectivity to the findings. Despite this limitation, the study provides a detailed analysis of how the Library Katta initiative contributes to the academic growth and overall development of engineering students at RIT.

Research methodology

This study adopts a survey-based approach to evaluate the impact of the Library Katta initiative on students' academic, social, and personal development. The primary objective is to gauge the involvement of engineering students at RIT College, assess the initiative's influence on their intellectual and academic growth, and understand their overall experiences with the program. To collect data, a structured questionnaire was designed, incorporating both open-ended and closed- ended questions to capture diverse student perspectives. The survey focused on key areas, including participation in Library Katta, its effects on academic performance, and contributions to personal development. In October 2024, the questionnaire, consisting of 15 questions divided into three sections, was distributed to students via an online Google Form. The survey aimed to gather

comprehensive insights into students' engagement, the program's impact on their academic and intellectual growth, and their personal experiences with the initiative. The collected data was analyzed using MS Excel, employing statistical tools such as percentages, averages, and distribution tables. This analysis provided a detailed evaluation of student participation, the initiative's influence on academic progress, and its role in fostering personal and intellectual development. The findings successfully met the study's objectives, offering a clear understanding of how the Library Katta initiative contributes to the holistic growth of students at RIT College.

Data Analysis and Interpretation

The study gathered responses from 105 students across different academic years, ranging from first-year to final-year engineering students. All participants actively engaged in various activities organized as part of the Library Katta initiative, providing a diverse representation of experiences and perspectives.

Table 1- Gender wise Distribution

Gender	Respondents	Percentage
Male	61	58.10%
Female	44	41.90%

(Source: Primary Data)

Table 1 shows that male students slightly outnumbered female students among the respondents, making up 58.10% of the sample compared to 41.90% for females. This could reflect the general gender distribution of the student body at RIT, though further analysis would be needed to confirm if this is truly representative of the entire population. It would also be interesting to explore whether male and female students experienced any significant differences in their level of engagement or learning outcomes through the Library Katta initiative.

Table 2- Wing wise Respond

Wing	Response	Percentage
Diploma	12	11.30%
UG	49	46.20%
PG	5	4.70%
BBA	26	24.50%
BCA	0	0
MBA	10	9.40%
MCA	4	3.80%

(Source: Primary Data)

Table 2 shows that undergraduate students made up the largest group of respondents (46.20%), followed by BBA students (24.50%). Smaller numbers of MBA students (9.40%), MCA students (3.80%), and diploma students (11.30%) participated. The high proportion of undergraduates engaging with the Library Katta initiative suggests that they are more likely to benefit from or be aware of library programs. This is likely because undergraduates spend more time on campus and are more involved in academic activities. On the other hand, postgraduate students, particularly those in MBA and MCA programs, had lower participation, which could indicate a lack of awareness or that the initiative's current offerings do not fully meet their needs. Although diploma students made up a notable portion of the responses (11.30%), their lower representation compared to undergraduates could point to potential gaps in engaging students from non-degree programs.

Table 3: Frequency of Participation in Library Katta Activities

Response	Frequency	Percentage
Never	19	18.40%
Rarely	15	14.60%
Occasionally	28	27.20%
Frequently	20	19.40%
Always	21	20.40%

(Source: Primary Data)

Table 3 shows a diverse range of participation levels in Library Katta among students. The largest group, 27.20%, participates occasionally, while 19.40%

attend frequently, and 20.40% attend regularly. These figures suggest that many students engage with Library Katta activities on a regular basis. Only 18.40% and 14.60% of students reported never or rarely participating. This indicates that Library Katta is an important part of students' lives, with the majority being involved in its events and activities to some extent.

Table 4: Types of Activities Engaged in at Library Katta

Activity	Frequency	Percentage
Group discussions	45	45%
Workshops	16	16%
Study sessions	58	58%
Social events	38	38%
Other	14	14%

(Source: Primary Data)

Table 4 shows that a variety of activities are held at Library Katta, with study sessions being the most popular (58%), followed by group discussions (45%) and social events (38%). Although workshops are less frequent, they still attract a participation rate of 16%. These results suggest that Library Katta offers a well-rounded mix of academic and social activities, encouraging both collaborative learning and extracurricular engagement. The high level of participation in study sessions highlights the platform's role as a valuable space for academic collaboration.

Table 5: Overall Engagement Level at Library Katta

Response	Frequency	Percentage
Very Low	2	2%
Low	2	2%
Moderate	51	51%
High	31	30.40%
Very High	15	14.70%

(Source: Primary Data)

Table 5 shows that most respondents (51%) rated their overall engagement at Library Katta as moderate, while 30.40% reported high engagement, and 14.70% rated their engagement as very high. This suggests that Library Katta

successfully encourages significant involvement, with many students feeling meaningfully connected to its activities. Only 4% of respondents reported low or very low engagement, further highlighting the initiative's success in capturing student interest.

Table 6: Change in Academic Performance After Participating in Library Katta

Response	Frequency	Percentage
Significantly Decreased	3	2.90%
Decreased	1	1%
No Change	29	28.40%
Increased	53	52%
Significantly Increased	16	15.70%

(Source: Primary Data)

Table 6 shows that more than half of the students (52%) felt their academic performance improved after participating in Library Katta, with another 15.70% reporting a significant increase. This highlights the positive impact the platform has on students' academic growth. While 28.40% saw no change, only a small percentage (1%) reported a decrease in performance, suggesting that participating in Library Katta generally has a beneficial or neutral effect on students' academic outcomes.

Table 7: Improvement in Understanding of Course Materials

Response	Frequency	Percentage
Strongly Disagree	3	3%
Disagree	3	3%
Neutral	31	31%
Agree	49	49%
Strongly Agree	14	14%

(Source: Primary Data)

Almost half of the respondents (49%) agree that Library Katta has helped them better understand their course materials, with an additional 14% strongly agreeing. This indicates that Library Katta plays an important role in

improving academic comprehension. While 31% of students were neutral, only a small percentage (6%) disagreed, showing that the initiative has a generally positive impact on academic learning for most participants.

Table 8: Discussions on Social or Current Issues

Response	Frequency	Percentage
Never	9	9.10%
Rarely	13	13.10%
Occasionally	33	33.30%
Frequently	25	25.30%
Always	19	19.20%

(Source: Primary Data)

Discussions on social or current issues are a common feature at Library Katta, with 77.80% of participants noting that these topics are addressed occasionally, frequently, or always. This shows that Library Katta is not just an academic space, but also one that encourages students to engage in important societal conversations from the table. However, a smaller group (22.20%) mentioned that these discussions happen rarely or never, suggesting there is potential to increase the focus on social issues within the initiative.

Table 9: Influence on Awareness of Social Issues

Response	Frequency	Percentage
Strongly Disagree	2	2.10%
Disagree	2	2.10%
Neutral	26	26.80%
Agree	54	55.70%
Strongly Agree	13	13.80%

(Source: Primary Data)

A majority of students (55.70%) agree that engaging in Library katta discussions has increased their awareness of social issues, and 13.80% strongly agree. With over two-thirds of students affirming that Library katta has had a positive impact on their social awareness, the initiative's role in promoting social consciousness is clear. While 26.80% remain neutral, only 4.20% disagree, indicating that the discussions are largely viewed as beneficial in fostering an understanding of societal concerns.

Table 10: Improvement in Public Speaking Skills

Response	Frequency	Percentage
Strongly Disagree	13	13.40%
Disagree	2	2.10%
Neutral	30	30.90%
Agree	52	53.60%
Strongly Agree	13	13.40%

(Source: Primary Data)

Table 10 shows that more than half of the students (53.60%) feel that participating in Library Katta has helped improve their public speaking skills, with an additional 13.40% strongly agreeing. This suggests that the platform offers valuable opportunities for students to develop their communication abilities. About 30.90% of participants were neutral, indicating that while many students benefit, there's still room to further enhance public speaking activities. Only a small percentage (15.50%) disagreed with the idea of improvement, highlighting the overall positive impact of Library Katta in this area.

Table 11: Changes in Critical Thinking Ability

Response	Frequency	Percentage
Significantly Decreased	4	4.10%
Decreased	2	2.10%
No Change	19	19.60%
Increased	58	58.80%
Significantly Increased	15	15.50%

(Source: Primary Data)

The majority of respondents (58.80%) reported an improvement in their critical thinking skills thanks to their participation in Library Katta, with 15.50% experiencing a significant boost. This highlights the initiative's strong role in fostering intellectual growth, as more than 74% of students noticed positive changes in their critical thinking. Only a small group of students (6.20%) felt their critical thinking ability decreased, while 19.60% saw no change. Overall, this shows that Library Katta has great potential as a platform for cognitive development.

Table 12: Contribution to Presentation Skills

Response	Frequency	Percentage
Not at All	3	3.20%
A Little	13	13.70%
Somewhat	23	24.20%
Mostly	39	41.10%
Completely	17	17.90%

(Source: Primary Data)

A large proportion of students (41.10%) reported that the Library katta has mostly contributed to improving their presentation skills, while 17.90% feel that it has completely helped them. These figures suggest that Library katta is an effective platform for building presentation skills. While some students (24.20%) reported a moderate impact, only 16.90% felt it had little or no effect on their presentation abilities. These insights demonstrate Library Katta's role in enhancing not only academic but also practical skills, like public speaking and presentations.

Table 13: Overall Experience with Library Katta

Response	Frequency	Percentage
Very Unsatisfied	5	5.10%
Unsatisfied	0	0%
Neutral	0	0%
Satisfied	55	56.10%
Very Satisfied	10	10.20%

(Source: Primary Data)

A majority of students (56.10%) expressed satisfaction with their experience in Library Katta, and 10.20% reported being very satisfied. Interestingly, no students said they were neutral or dissatisfied, highlighting the overall positive feedback. This suggests that Library Katta has met or even exceeded student expectations. However, a small group (5.10%) mentioned being very unsatisfied, pointing to areas that may need improvement for certain participants. The responses show that Library Katta has played a significant role in enriching students' educational experiences. Many students appreciated its contribution to developing communication skills, public speaking, and confidence. The platform has also facilitated

discussions on a range of issues—social, cultural, national, and international—helping students broaden their perspectives on global and Indian affairs. Additionally, several students reported gains in critical thinking, general knowledge, and presentation skills, with others highlighting improvements in personal development and collaborative learning. Some students also valued access to resources like reference materials and digital databases, which supported their research and academic growth. In general, students view Library Katta as an important space for self-expression, skill-building, and intellectual development, with many expressing gratitude for the opportunities it provided throughout their academic journey.

Findings and discussion

The study's findings highlight that Library Katta has become a key initiative in boosting student engagement and supporting both academic and personal development at Rajarambapu Institute of Technology (RIT). In terms of gender distribution, slightly more male students (58.10%) participated compared to female students (41.90%), reflecting the overall gender demographic at the institution. Undergraduates made up the largest group of participants (46.20%), followed by BBA students (24.50%), while postgraduate and diploma students showed lower levels of involvement. This suggests that Library Katta is especially effective for undergraduates, who are typically more active in campus life. The study also revealed a wide range of engagement levels, with 27.20% attending occasionally and 39.80% attending frequently or always. This shows that Library Katta has broad appeal and is successfully engaging a large number of students on a regular basis. The most popular activities were study sessions (58%) and group discussions (45%), reflecting students' preference for academic collaboration and peer learning. Workshops (16%) and social events (38%) saw less participation, indicating that these activities may need better promotion or adjustments to align with student needs. When it comes to academic outcomes, over half of the students (52%) reported an improvement in their academic performance, with an additional 15.70% noting a significant increase. This demonstrates the positive effect Library

Katta has on academic success, particularly through collaborative study sessions and group discussions. Additionally, 49% of respondents said the initiative improved their understanding of course materials, further solidifying its role as an academic support platform. Beyond academics, Library Katta also contributed to the development of critical soft skills. A significant portion of students (53.60%) reported improvements in public speaking, and 41.10% said their presentation skills had been enhanced. The initiative also helped sharpen critical thinking skills, with 58.80% of students acknowledging an increase in their ability to think critically. Library Katta also played a vital role in raising students' awareness of social issues. More than half of the respondents (55.70%) agreed that the platform increased their awareness, and 77.80% reported frequent or consistent discussions on current issues. This suggests that Library Katta serves not only as an academic space but also as a platform for promoting social consciousness and encouraging students to engage with broader societal issues. The majority of students were highly satisfied with their experience in Library Katta, with 56.10% reporting satisfaction and 10.20% being very satisfied. This reflects the initiative's success in meeting students' expectations and its positive impact on their educational and personal growth. However, the lower engagement from postgraduate and diploma students suggests that tailoring activities to their specific needs could further enhance the program. In addition, there may be opportunities to boost participation in workshops and social events to further diversify the initiative. Library Katta at RIT has proven to be an effective model for student engagement and learning. It plays a significant role in academic success, the development of essential skills like public speaking and critical thinking and fosters social awareness. This initiative offers valuable insights for other institutions looking to enhance student engagement and support holistic development through innovative library programs.

Conclusion

The Library Katta initiative at Rajarambapu Institute of Technology (RIT) has proven to be a highly effective platform for boosting student engagement, academic performance, and personal growth. By offering a range of

activities like study sessions, group discussions, workshops, and social events, Library Katta has given students valuable opportunities for collaborative learning, skill-building, and gaining exposure to broader social and global issues. The study's findings highlight that Library Katta has positively impacted students' academic success, with more than half of the participants reporting improvements in their academic performance. Beyond academics, the initiative has played a key role in developing important soft skills, including public speaking, critical thinking, and presentation skills—skills that are crucial for both academic achievement and future career success. Library Katta has also proven to be a powerful tool for raising awareness of social issues, with a majority of students saying they became more aware of societal concerns through participation in discussions. This emphasizes Library Katta's role not only as an academic support system but also as a platform for nurturing social consciousness and encouraging global engagement. While the overall satisfaction with Library Katta is high, the study revealed lower participation rates among postgraduate and diploma students. This suggests an opportunity to make the initiative more inclusive by tailoring activities to meet the specific needs and interests of these groups. Additionally, efforts to boost participation in workshops and social events could further enhance the program's diversity and impact. Library Katta serves as an inspiring example of how library programs can transcend traditional academic roles to become a comprehensive platform for student development. Its ability to engage students, support academic growth, and foster critical life skills makes it a valuable model that other institutions could adapt to enhance student engagement and learning outcomes. For continued success, Library Katta will need to stay flexible and responsive to the evolving needs of students, ensuring it remains a relevant and dynamic resource for future generations.

Reference

1. Aida, S. N., & Widiyati, E. (2020). Extensive reading to improve students' writing of explanation text. *EduLite: Journal of English Education, Literature and Culture, 5*(1), 109–117. https://doi.org/10.30659/e.5.1.109-117

2. Beneyat-Dulagan, M. T., & Cabonero, D. A. (2022). Evidence-based library and information practice. *Evidence Based Library and Information Practice, 18*(1), 3–23. https://doi.org/10.18438/eblip30164
3. Dhawle, G. U., Hase, V. L., & Dahibhate, N. B. (2014). Reference and information services in the digital era. *Asian Journal of Multidisciplinary Studies, 2*(6), 18–25.
4. Hase, V., & Kulkarni, S. (2022). Reading Club: An alternative framework for academic enhancement. *International Journal of Advance and Applied Research, 10*(1), 16–22.
5. Hase, V., & Gaikwad, M. (2024). Research Productivity of Rajarambapu Institute of Technology, Islampur,(Maharashtra), India: A Bibliometric Analysis. *Journal of Engineering Education Transformations*, *38*(1).
6. Mukherjee, M. (2017). A review of research design. *International Journal of Advanced Engineering and Management, 2*(3), 56. https://doi.org/10.24999/ijoaem/02030016
7. Noah, J. B. (2018). Cultivating responses from students through literature circle.
   International Journal of Research in English Education, 3(1), 1–10.
8. Patel, J. (2021). A methodological study on online discussion forum. *International Journal for Research in Applied Science & Engineering Technology (IJRASET), 9*(12), 2296–2304.
9. Puspita, N., Hasyim, U. A., & Suhono. (2021). Book club discussion: An extensive reading program in writing class. *Attractive: Innovative Education Journal, 3*(2), 113–123.
10. Shana, Z. (2009). Learning with technology: Using discussion forums to augment a traditional-style class. *Journal of Educational Technology &*

Society, 12(3), 214–228. http://www.jstor.org/stable/jeductechsoci.12.3.214

11. Song, L., & McNary, S. W. (2011). Understanding students' online interaction: Analysis of discussion board postings. *Journal of Interactive Online Learning, 10*(1), 1–14.
12. Vijayavalsalan, B. (2018). Students' impressions on the effectiveness of online discussion forums. *Research in Social Sciences and Technology (RESSAT), 3*(1), 86–108.

Best Practices for Quality Improvement in College Libraries

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Abstract
This paper explores the best practices implemented in the library of NKSPT's Arts, Science, and Commerce College, Badnapur, Dist. Jalna. It focuses on ways to enhance library processes, make better use of resources, and provide excellent services to users. The discussion covers the meaning of best practices and their application in various areas, including traditional methods, ICT-based innovations, library extension activities, and general practices. Key initiatives highlighted include book exhibitions, orientation sessions, book displays, dedicated library hours, staff-user interactions, and library brochures, training on e-resources, book review programs, readers' clubs, awards for best library users, and counseling services for competitive exams. This paper offers valuable insights for other libraries, presenting practical ideas to improve their management and create a user-friendly environment.

Keywords
Best Practices, Quality Enhancement, Library Services, College Libraries, ICT-Based Practices, E-Resources, User Engagement, Resource Optimization, Library Management.

Introduction

In today's rapidly changing educational environment, libraries have become essential hubs for continuous learning and development. They are no longer limited to being just repositories of books; instead, they have transformed into dynamic centers that play a crucial role in enhancing the educational experience. In this era of information overload, libraries serve as a bridge between knowledge seekers and vast pools of information, often becoming just as important, if not more so, than traditional classrooms.

The influence of Information and Communication Technology (ICT) on libraries has been revolutionary. ICT has not only changed how libraries operate but has also shaped user expectations. Modern libraries are expected to provide quick, seamless access to information through

innovative tools and practices. For college libraries, this role becomes even more significant as they link teaching and learning, supplementing classroom resources with a wide range of information beyond what is typically available.

Libraries are vital to the academic growth of students and faculty alike, offering resources and support tailored to their unique needs. However, to remain effective, libraries must continually adapt to the changing needs of their users. This requires proactive strategies and practices that are both innovative and user-centric.

The focus on quality in higher education has also highlighted the importance of robust library services. Institutions across India, under the guidance of the National Assessment and Accreditation Council (NAAC), are working towards maintaining and improving their educational standards. Libraries, as an integral part of academic institutions, play a pivotal role in achieving these goals by adopting best practices that align with the evolving expectations of their users.

This paper explores the various best practices implemented in the library of NKSPT's Arts, Science, and Commerce College, Badnapur. These initiatives aim to optimize library operations, enhance user satisfaction, and ensure that the library remains a cornerstone of quality education in the institution.

Definition Analysis

Best Practice

Best practices are proven methods or strategies that are widely accepted as the most effective way to achieve good results. In libraries, they include innovative ideas and procedures that improve services, make the best use of resources, and meet users' needs efficiently.

Library Services

Library services are the various resources, activities, and support provided by libraries to meet the informational, educational, and recreational needs of users. These include access to books, digital resources, research assistance, and programs for learning and development.

College Libraries

College libraries are learning centers that provide students and faculty with access to books, digital resources, and other materials to support

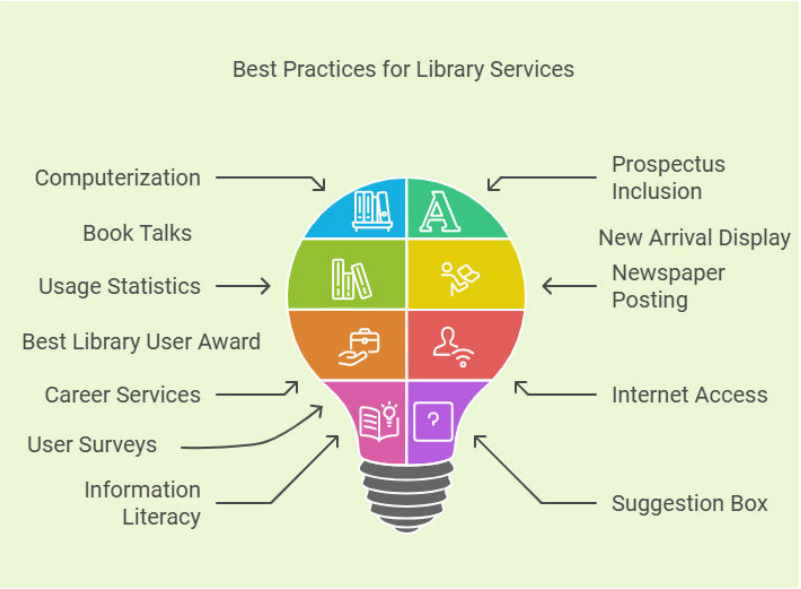
education, research, and personal development. They serve as vital links between teaching and learning within the academic environment.

ICT-Based Practices

ICT-based practices refer to the use of Information and Communication Technology tools and methods to improve efficiency, accessibility, and quality of services. In libraries, these include online catalogs, e-resources, digital libraries, and automated systems to enhance user experience and resource management.

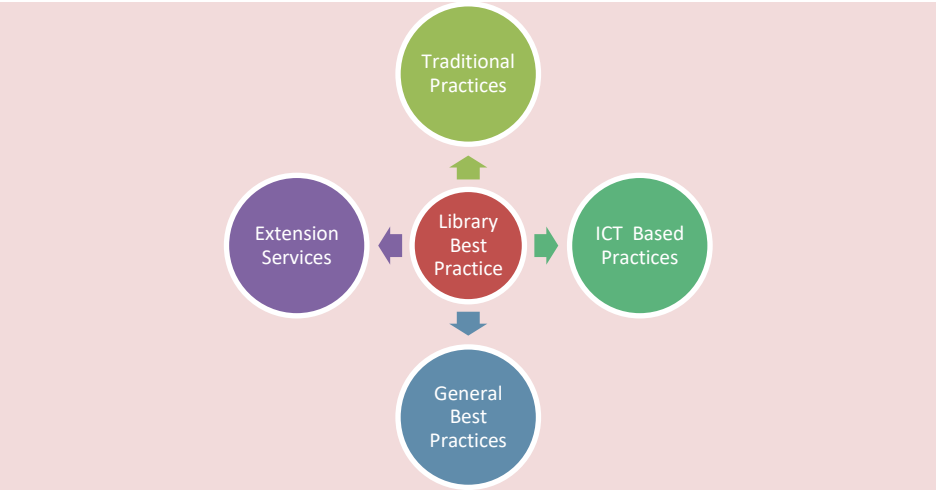
NAAC Recommended Best Practices for Library Services

The National Assessment and Accreditation Council (NAAC) recommends several best practices to improve the quality of library services:



By adopting these best practices, libraries can significantly enhance their services, ensuring they meet the needs of their users and contribute positively to the educational environment.

NKSPT'S Arts, Science and Commerce College Library:



Traditional Best Practices

1. **Collection Development**: Regularly assess and update the library's collection to ensure it meets the needs of the community. This includes acquiring diverse materials that reflect various cultures, languages, and interests.
2. **User Education**: Conduct workshops and training sessions to educate users on how to effectively use library resources, including catalog systems, databases, and digital resources.
3. **Community Engagement**: Foster relationships with local schools, organizations, and community groups to promote library services and encourage collaborative programs.
4. **Customer Service**: Train staff to provide excellent customer service, ensuring that all patrons feel welcome and supported in their library experience.

Library Extension Services

1. **Outreach Programs**: Develop programs that reach underserved populations, such as mobile libraries, book drops, and community events that bring library services directly to the community.
2. **Partnerships**: Collaborate with local businesses, schools, and non-profits to create programs that benefit the community and promote library resources.
3. **Special Collections**: Create specialized collections that cater to specific community interests, such as local history, genealogy, or cultural heritage.

4. **Reading Programs**: Implement reading initiatives, such as summer reading challenges or book clubs, to encourage literacy and foster a love for reading among all age groups.

ICT Based Best Practices

1. **Digital Resources**: Invest in a robust collection of digital resources, including e-books, audiobooks, and online databases, to provide users with access to information anytime and anywhere.
2. **User-Friendly Interfaces**: Ensure that the library's website and online catalog are easy to navigate, with clear instructions and search functionalities.
3. **Social Media Engagement**: Utilize social media platforms to promote library events, share resources, and engage with the community in real-time.
4. **Technology Training**: Offer training sessions on digital literacy, helping patrons to navigate technology and access online resources effectively.

General Based Best Practices

1. **Feedback Mechanisms**: Establish channels for patrons to provide feedback on library services, allowing for continuous improvement and adaptation to user needs.
2. **Staff Development**: Invest in ongoing professional development for library staff to keep them informed about the latest trends and technologies in library services.
3. **Sustainability Practices**: Implement eco-friendly practices within the library, such as reducing paper usage, recycling, and promoting sustainable resources.
4. **Inclusive Services**: Ensure that library services are accessible to all individuals, including those with disabilities, by providing necessary accommodations and resources.

By adopting these best practices, libraries can enhance their role as vital community resources, fostering a culture of learning, engagement, and inclusivity.

Conclusion

The adoption of best practices plays a crucial role in enhancing the quality of library services. The ASC Badnapur college library, located in a rural area, has effectively implemented information literacy and user awareness

programs, contributing to its growth and development. These initiatives have not only improved the library's operations but also helped in shaping a positive image of the library among students and the local community. By embracing best practices, the library continues to foster a supportive and enriching learning environment for all its users.

References

1. Austin, P. C., & Stuart, E. A. (2015). Moving towards best practice when using inverse probability of treatment weighting (IPTW) using the propensity score to estimate causal treatment effects in observational studies. Statistics in medicine, 34(28), 3661-3679.
2. Borde Nirmala G, GolwalMadansing D. (2023) NAAC based practices in academic libraries and knowledge resource centers: at glance, Library Scholar, International Peer reviewed Journal of Library Science, vol.3 (1), 23-30.
3. Flynn, M. A. T., McNeil, D. A., Maloff, B., Mutasingwa, D., Wu, M., Ford, C., & Tough, S. C. (2006). Reducing obesity and related chronic disease risk in children and youth: a synthesis of evidence with 'best practice'recommendations. Obesity reviews, 7, 7-66.
4. Gajbe, S. S., & Chaware, N. M. (2024). Open Access Advocacy: Librarians Best Practices in Educating the Academic Community. Available at SSRN 4979633.
5. Gajbe, S. S., Gajbe, S. S., &Golwal, M. D. (2024).Lotka's Law and Author Productivity in HIV/AIDS Vaccine Research: Evidence from PubMed (2001-2020).
6. Graybill, J. O., Carpenter, M. T. H., Offord, J., Piorun, M., & Shaffer, G. (2013). Employee onboarding: Identification of best practices in ACRL libraries. Library Management, 34(3), 200-218.
7. Haddow, G., &Klobas, J. E. (2004). Communication of research to practice in library and information science: Closing the gap. Library & Information Science Research, 26(1), 29-43.
8. information centers: at a Glance. International journal of librarianship and Administration,8(1), 7-15.
9. Jotwani, D. (2008). Best Practices in a Modern Library and Information Center-The Case of Central Library, IIT Bombay.
10. Katsirikou, A., &Sefertzi, E. (2000).Innovation in the every day life of libraries. Technovation, 20(12), 705-709.
11. Khandare, R. B., Sonwane, S. S., &Gajbe, S. S. (2011). Marketing of Academic Libraries.

12. King, R. A., Read, D. S., Traugott, M., & Symondson, W. O. C. (2008). INVITED REVIEW: Molecular analysis of predation: a review of best practice for DNA-based approaches. Molecular ecology, 17(4), 947-963.
13. NAAC.(2006) Best Practices in Library and Information Services. [online] Available from:http://www.naac.gov.in/best_practices
14. Prabhakar SVR, Manjula Rani SV (2017) Best practices adopted in Academic libraries and
15. Rubin, R. E., & Rubin, R. G. (2020). Foundations of library and information science.American Library Association.
16. SatheVivek S (2015) Best practices in the college libraries. Knowledge librarian- an international peer reviewed bilingual e-journal of library and information science, 2(1), 2947. www.klibjlis.com
17. Soomro, T. R., &Hesson, M. (2012).Supporting best practices and standards for information technology Infrastructure Library.
18. Van der Auwera, G. A., Carneiro, M. O., Hartl, C., Poplin, R., Del Angel, G., Levy-Moonshine, A., ...&DePristo, M. A. (2013). From FastQ data to high-confidence variant calls: the genome analysis toolkit best practices pipeline. Current protocols in bioinformatics, 43(1), 11-10.
19. Wadje Kailas N (2012) Best Practices in Library of Indira Gandhi Senior College (IGSC), Nanded,1(2), 97-107. www.researchvistas.com

Best practices in rural academic library using ICT: A study of MIT ACS College Library

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Abstract
This study explores some best practices for academic libraries to create high-quality library services using ICT.This paper examines the MIT ACS Central Library's initiative to implement best practices for ICT-based library services. This study highlights the ICT-based Best Practices adopted by the MIT ACS College Library. This study briefly examines the Best Practices other than ICT utilised in central library.

Key word: ICT, Best Practices, MIT ACSC, Academic Library, Rural area

Introduction
In today's era, the use of ICT is increasing rapidly, and it is imperative that libraries are aware of it. In today's computer age, every library user is caught up in the web of ICT, so he has no choice but to use it. ICT simplifies, speeds up, lowers expenses, and improves efficiency in library operations. Computerized technologies make information retrieval easier, which aids in the management of information overload. Remote access is available via networked systems. Computerizations save space and paper. ICT stands for information and communication technology, which includes all of the technical tools and resources required to produce, transfer, distribute and managing information with store. Academic library plying vital role education sector and Library should be provide ICT based best services to the user.
Now day's maximum rural areas are coved with the Information Communication Technology. In the rural areas education sector also use ICT for the students' development. ICT encompasses all communication equipment and applications, including Computers, television, satellite, mobile phones, network gear, and software systems, and related services such as videoconferencing and distant learning. Email alerts, social media

use, diverse internet-based services, SMS alerts, electronic document delivery, and more are examples of ICT-based services. As more people utilise contemporary technology for their studies, these ICT- library services are highly used and it is most important to their academic achievement.

About MIT ACSC

MIT Arts, Commerce, and Science College were founded on Alandi (Devachi) rural area in Pune in 2007 by the Maharashtra Academy of Engineering and Educational Research (MAEER), which is affiliated with SPPU and has received Maharashtra government approval. The peaceful environment of the college is conducive to the exchange of information. The institution strives to attain excellence in teaching and research with committed, passionate, creative, and experienced instructors through active learning, field excursions, expert help, training programs, research direction and support, and continuous assessment. An excellent infrastructure with the most recent technological advancements, including first-rate and modern library facilities, is made available to ensure seamless academic operations.

Bachelor of Arts, Bachelor of Commerce, Bachelor of Business Administration, Bachelor of Business Administration-International Business, Computer science bachelor's degree, Bachelor of Science in Computer Applications, Bachelor of Administration-Computer Application, The following are some of the lucrative undergraduate and graduate programs offered by the college: Animated Bachelor's Degree, Computer Science Master's Degree, Computer Application Master's Degree, Industrial Mathematics with Computer Application Master's Degree, Commerce Master's Degree, Mass Communication and Journalism Master's Degree, and German Certificate Course.The institution has won several important medals, prizes, and honours for its outstanding work in information transfer, life skills instillation, research skill development, and placement.

About Central Library

The Library plays a very important role in curricular development & to satisfy the reader's thirst for knowledge. MIT ACS College library is to participate actively in the educational mission of college through the collection and dissemination of information to meet the curricular and general student’s needs, faculty and staff.

CentralLibrary of MIT ACSC system support to use of ICT and the teaching-learning program of the college. The Library has an computerize system with exceptional collection of textbooks, reference books, general books,

journals and magazines, bound volumes, CD-ROMs, online resources, Automation, Digitalization and other reading material. It has excellent infrastructure to meet its requirements, all its operations are computerized using KOHA 24.11 software. Web OPAC available 24*7 to the user. The open access method used by the library gives patrons immediate access to its holdings.The built-up area of the library is 7,446 sq. ft. The reading hall facility with 200 seating capacity is available for the students and faculty members. It consists of a Digital library, Journal, Reference, Circulation, Stack, Acquisition and Technical Sections.

Best Practices

- **According to Oxford English Dictionary**

Describes "best practices" to mean "the appropriate, advantageous, highly improved, outstanding, par excellence services or the customary or expected procedure or way of doing something that is usual or expected way in a particular organization or situation," in addition to "the best or desirable type of quality." When we create best practices, we develop our skills and act rather than merely having brilliant ideas.

- **According to National Board of Accreditation and Assessment (NAAC)**

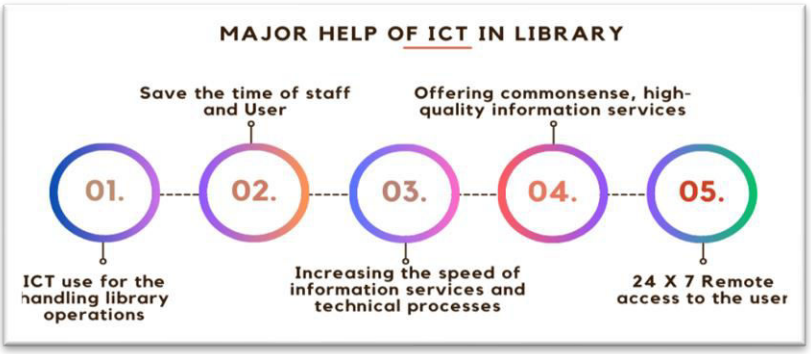
"An innovative concept, policy, strategy, program, method, or practice that solves a problem or opens up new opportunities and has a beneficial effect on businesses might be considered a best practice. The sum of the best practices used across various institutional operations is known as institutional excellence.

ICT in the Library Services

Information and communication technology essentially enhance library workflow, which reduces human labour and expands library services. It is most prominent advantages of ICT is its ability to meet user demands through information services based on ICT.

Information and communication technology, or ICT for short, is the word used to describe how libraries utilize computers and other technologies to run their operations. Computers, printers, scanners, the internet, telecommunications, satellite systems, videoconferencing, and broadcasting technologies are all examples of ICT.

Major help of ICT in Library Service



Components of ICT:

The list of ICT components is extensive and constantly expanding. Two examples of gadgets for a long time are computers and phones. Currently developments are digital TVs, smartphones, and robotics.

- Devices (hardware).
- Software.
- Middleware.
- Data.
- Wired networks.
- Wireless networks.
- Communication technologies.
- Cloud Space
- Communications protocols and interfaces.
- Information security and governance policies.

The best Method in Library using ICT:

ICT based best practices by the MIT ACSC CENTRAL LIBRARY

1. **Automation Software:** Libraries utilize KOHA software to monitor different library operations and processes. KOHA software is integrated and has modules for the several tasks or activities carried out in the library, including statistics, acquisition processes, cataloguing, serial control, etc. Many software applications with a variety of applications in the fields of libraries and information management.
2. **Library Website:** Library web site is important medium of providing information to user. MIT ACSC Central Library have separate library web site. The library website is included all library details and guideline about the library use as well as E-database link and details, exam paper, previous project report, Library program photos and video.
3. **Web OPAC:** It is a library online document database. It gives users access to a library's catalogs via the internet, local intranet, or extranet. Library provides KOHA catalogue, WEB OAPC is available 24*7 to all library users with login.
4. **Institutional repository (IR):** Library used 7.0 new version of Dspace. An Institutional Repository is an online storage that collects, preserves, and distributes digital copies of intellectual works created by an institution's faculty, staff, and research researchers. The user community can access dissertations, reports, conference and seminar papers, notes, career guidance question papers, syllabuses, and other materials.
5. **CAS & SDI:** Abstracts, research compendiums, news clips, dissertation indexing services, contents alerts, and listings of newly published Books and Journals are just a few of the many current awareness services the library provides. The techniques and resources used to alert a user to fresh resources on particular subjects are referred to as selective dissemination of information.
6. **Electronic Mail:** Libraryprovide individual e-mail to user for the communication. All rules and regulation, notices, Check In and Check Out details, advance notice of books due date, Books due remainder with fine.
7. **Digital Library:** E-database, IR service, Internet Service, etc. facility is available through the digital library.
8. **E-Database:** A full-text database is a collection of documents or information is store in database format where the entire text of each linked document is available for viewing, printing, or downloading online. INFLIBNET N – List, DELNET etc., Standard e-database are available for the users.

9. **E- Notice Board:** E notice board can provide on- line notices and any kind of instruction to users. It is available on Library website and WEB OPAC for the 24*7.
10. **Cloud Space:** Cloud storage is very important part of ICT, Library is using Cloud space for the 24*7 worldwide or on-line services to the users.
11. **Barcode:** A bar-coding system is essentially a sequence of bars depicting numbers and characters. When utilizing a LMS, every barcode image is tagged with the book's title, author, item number, volume number, and so on. Coding allows all of this data to be shown as a single barcode**.**
12. **QR Code:** If a link to an interactive feature or other media is provided, more people will read and gain more knowledge. A QR code can be used to access a book trailer. Transcode text from print to audio. You may put a QR code on the inside cover of your books to allow readers choose between reading and listening.
13. **Plagiarism tools:** Plagiarism detection software detects duplicated information in text to guarantee that the writing is original and correctly referenced. They can compare the content to published literature, databases, and the internet.
14. **Workstation:** Advance computer system is provided to the users through the Digital Library.
15. **E – Publications:** Every year library takes the initiative for the publish e - Magazine for the user skill development and develop the thinking ability and writing skill.
16. **Internet Service:** The Internet is the foundation of all information and communication technology-based services. It necessitated a move from collection management to information management, which modifies the nature, limits, and structure of information, as well as its delivery mechanism. Internet services provide academic communication and worldwide access through remote applications such as data repositories, catalogs, search, teaching, and student/financial administration systems. The Internet is the foundation of all information and communication technology-based services. It necessitated a move from collection management to information management, which modifies the nature, limits, and structure of information, as well as its delivery mechanism. Internet services enable intellectual communication as well as distant access to data banks and catalogues, among other advantages.

Conclusion

Best practices using ICT in the rural colleges is necessary for the providing best services. There are so many challenges but it also important to survive in ICT environment. MIT ACSC Central Library is taken good efforts for the proving ICT base services and implement best practices using ICT. The excellent practices described above help every academic institution's library build a good ICT services to the Users. The students' natural propensity is to pose as library professionals, namely knowledge managers. ICT is the best practices are more helpful for the Academic and other library also.

References

1. Darandale, D. S., &Thorwe, R. H. (2022). Best Practices and Quality to Library Services In Academic Libraries. International Journal of Advance and Applied Research, 10(01), 75-80.
2. Kumara B, Ravivenkat B. (2015). Use of ICT and best practices for Tumkur university library: a study. Indian Journal of Science, 21(74), 622-628.
3. Devi, P. (2024). Role Oflct In Innovative Academic Library Services. Anveshana's International Journal Of Research In Education, Literature, Psychology And Library Sciences, 9(5), 1-15. Retrieved from www.anveshanaindia.com
4. Hiremath, S. S., &Lalasangi, S. (2021). ICT based best practices in the medical college libraries. IP Indian Journal of Library Science and Information echnology, 6(2), 61-65. Retrieved from https://www.ijlsit.org/
5. Gamit, R. (2015). Impact of ICT based E Resource Library Services to Users of Faculty and Researchers in Agricultural University Libraries of Gujarat State. International Journal of Allied Practice, Research and Review, 2(10), 35-46.
6. Ahmad, N. and Fatima, N (2009), Usage of ICT products and services for research in social sciences at Aligarh Muslim University, DESIDOC j LibrInftechnol, 29(2):25-30.
7. Patel. R. P, ICT based best practices in library, Indian j LibrSciinf techno. 2018;3(2):101-105
8. http://naac.gov.in/docs/Guidelines/Guidelines-Colleges-Library.pdf. https://mitacsc.ac.in/

Marketing strategies used by academic libraries to engage students

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Abstract

This study explores the marketing strategies employed by academic libraries to engage students With the rapid integration of technology and shifting educational trends, academic libraries face the challenge of remaining relevant and accessible to students. By adopting targeted marketing approaches, libraries aim to promote their resources, services, and programs effectively. This article examines various strategies such as digital marketing, social media campaigns, event marketing, and collaboration with academic departments. Additionally, the role of branding, user-centric approaches, and student feedback in shaping these strategies is analyzed. The study highlights the importance of creating personalized, engaging, and innovative library experiences to foster student engagement and ensure that academic libraries continue to play a vital role in higher education. Insights from this research can inform best practices for library management and offer a framework for developing more dynamic and student-centered marketing efforts.

Key words Academic Libraries, social media, marketing strategies, higher education, library management, Academic Students

Introduction

In today's digital age, academic libraries are transforming from traditional resource centers into dynamic spaces that promote student engagement, learning, and collaboration. As institutions work to remain relevant in a constantly evolving educational landscape, effective marketing strategies are crucial for connecting students with library resources, services, and opportunities. By employing innovative marketing techniques, academic libraries not only showcase their physical and digital collections but also enhance their visibility, improve user engagement, and address the diverse needs of their student populations.

This paper examines the different marketing strategies that academic libraries can use to engage students. It highlights the importance of understanding student preferences, leveraging digital platforms, and developing interactive, customized campaigns. These strategies aim to build lasting relationships between students and libraries, helping students to recognize the library as an essential academic resource. By implementing targeted marketing, academic libraries can enhance awareness, increase the usage of library services, and support the broader academic mission of their institutions.

Academic Libraries

Libraries are essential repositories of knowledge and information, playing a vital role in societal development. They collect, organize, and provide access to both print and digital resources for those seeking to learn. Various types of libraries exist, including public, special, and academic libraries. According to S.R. Ranganathan (1940), a library is a public institution dedicated to making books accessible to those who need them. Academic libraries, integral to colleges and universities, address the information and research needs of students, faculty, and staff (ODLIS, 2002). They have shifted their focus from physical collections to digital resources, supporting learning, teaching, and research. The library's primary goal is to offer reliable information in a precise and accessible manner. The advent of Information and Communication Technology (ICT) has transformed the accessibility and use of library resources.

Marketing Strategies

Academic libraries play a crucial role in supporting students' learning, research, and academic success. However, many students may not be fully aware of the wide array of services and resources available to them. To address this issue, academic libraries implement marketing strategies aimed at engaging students, raising awareness, and fostering a sense of community. These marketing strategies involve promoting library services, resources, and events to enhance user engagement and support the institution's educational and research missions. The foundation for these strategies is based on marketing principles that have been adapted to the unique context of academic libraries.

Review of Related Literature

Academic libraries are facing the challenge of engaging students in an environment increasingly dominated by digital resources and social media. Effective marketing strategies are crucial to attract and retain student engagement, ensuring that the library remains relevant to its user base. This literature review explores the various marketing strategies employed by academic libraries to engage students, highlighting both traditional and modern approaches.

One of the most significant shifts in library marketing is the use of digital platforms and social media. Studies such as Aharony (2012) highlight that libraries are increasingly using platforms like Facebook, Instagram, Twitter, and LinkedIn to engage with students. These platforms provide libraries with direct access to students, allowing for real-time interaction and the promotion of library resources and events. According to Delgadillo (2019), libraries use these platforms to share information about new acquisitions, upcoming workshops, and research tips, creating a dynamic relationship with students.

Collaborating with other campus departments and student organizations is another marketing strategy employed by academic libraries. Libraries often partner with faculty, student government, and various student clubs to promote resources and services. Dempsey (2014) discusses how academic libraries integrate themselves into the academic and social fabric of the campus through joint activities, such as organizing academic workshops, offering research support during exams, and co-hosting cultural events. This outreach fosters relationships between students and library staff, positioning the library as a critical academic resource.

Experiential marketing in academic libraries focuses on creating engaging, interactive environments that attract students. Kim and Kim (2015) demonstrate how libraries use physical space redesigns to cater to students' needs for quiet study, collaborative work, and creative exploration. For instance, incorporating study lounges, media labs, and maker spaces increases student interest and engagement by offering a variety of environments that support academic and social needs. Additionally, virtual spaces such as interactive library websites and virtual tours of the library further enhance student engagement.

Hosting workshops, lectures, and events is an essential part of library marketing strategies. Libraries organize skill-building workshops on topics like citation management, research methodologies, and academic writing, which are advertised to students through multiple channels. As discussed by Johnson (2016), events like book fairs, author talks, and special exhibitions

not only draw students into the library but also promote student involvement in the academic community.

Providing personalized services is another key strategy for academic libraries to engage students. With the rise of data analytics, libraries can tailor services to individual student needs. Robinson and Smith (2017) explored how libraries use data from library management systems and academic databases to track students' usage patterns and offer personalized book recommendations, study resources, and research support. Personalizing communication and services not only increases engagement but also helps build a sense of community within the library.

Branding has become an essential part of library marketing. Durrance (2018) emphasizes the importance of creating a distinct library identity that resonates with students. Libraries are increasingly developing unique logos, slogans, and visual identities to create an appealing image. This helps students feel a connection to the library, enhancing its presence in their academic and social lives. Creating a strong library brand also fosters student loyalty and advocacy, making the library an integral part of the academic experience.

Email marketing continues to be a vital tool for engaging students. Libraries use email newsletters to keep students informed about library services, events, and new resources. According to Becker (2018), a study on email marketing in libraries showed that personalized and well-targeted emails are effective in improving student engagement and resource utilization. Libraries use emails to send reminders about due dates, promote library events, and offer personalized reading suggestions based on student interests or course requirements.

Libraries increasingly use gamification to enhance engagement. By incorporating elements of games such as challenges, rewards, and competitions, libraries make the learning process more interactive and fun. According to Bounia (2020), gamification strategies like library scavenger hunts, trivia contests, and reading challenges help stimulate student interest and increase participation in library events. Students earn rewards for participating, which can include recognition or library benefits like extended loan periods.

Future research should explore the effectiveness of these strategies in diverse institutional settings and investigate student feedback on the types of engagement that resonate most with them.

Marketing Strategies for Academic Libraries

Marketing Strategies for Academic Libraries

Academic libraries use a variety of marketing strategies to engage students, raise awareness about library services, and promote their resources. Here are some effective strategies:

1. Social Media Marketing

- Academic libraries frequently use social media platforms like **Instagram**, **Twitter**, **Facebook**, and even **YouTube** to connect with students. These platforms provide a quick, visual way to reach students and keep them informed.
- Libraries post a wide range of engaging content, including **upcoming events**, **new book acquisitions**, **special collections**, and **study tips**. They also share **user-generated content** (like photos of students using the library), behind-the-scenes looks at library operations, or themed posts tied to national days (e.g., National Library Week).

➢ **Interactive Campaigns**:

- Libraries often run **contests** (e.g., "Win a library tote bag by tagging a friend") or **polls** to increase interaction. For example, they might ask students what new books they'd like to see added to the collection or run a **Library Selfie** campaign where students share photos of themselves in the library.

2. Email Newsletters

➢ **Regular Updates**:

- Libraries send out **regular email newsletters** to students to keep them informed about new books, library services, and upcoming events. These newsletters can be tailored to specific student needs or departments, making them more relevant.

➢ **Personalization**:

- Some libraries use **personalized emails** based on a student's program of study, giving recommendations on **research resources**, upcoming **workshops**, or **subject-specific resources** that might interest them.

3. Collaborations with Campus Departments

➢ **Cross-Department Partnerships**:

- Libraries partner with **faculty members** to embed library resources and services into their courses. For example, library staff may collaborate with professors to provide **custom research guides** for specific courses or assign library research tasks to students.

➢ **Classroom Visits**:

- Library staff might visit **classrooms** to introduce students to library services and resources. They may also give demonstrations on how to use the library's **online databases** or show students how to access **journal articles**, **e-books**, and other digital resources.

4. Workshops and Skill-Building Sessions

- **Research Skills Workshops**:
- Academic libraries frequently offer **workshops** on a variety of topics such as **research methods**, **citation management tools** (e.g., Zotero, EndNote), **academic writing tips**, and **using library databases** effectively.
- **Special Events**:
- Workshops may include **one-on-one research consultations** or **hands-on training sessions**, where students learn how to use advanced library tools to enhance their academic work.
- **Promotion**:
- These workshops are often promoted through **posters**, **digital ads**, and social media campaigns. Email reminders are also sent out to relevant groups of students, such as those in certain departments or programs.

5. Events and Programs

- **Community-Building Events**:
- Libraries host **events** to engage students in a social, non-academic environment. For example, during **finals week**, libraries might organize **stress-relief programs** like **pajama reading nights**, **meditation sessions**, or even **therapy dog visits** to help students decompress.
- **Themed Events**:
- Libraries may also organize **book clubs**, **author talks**, **themed movie nights**, or **writing competitions** to engage students in more interactive or fun activities.
- **Promotional Materials**:
- Events are often advertised using **posters**, **flyers** on campus, and **digital campaigns**. The library might also collaborate with campus organizations to spread the word.

6. Library Ambassadors and Peer-to-Peer Engagement

- **Student Ambassadors**:

- Many libraries recruit **student ambassadors** who help promote library services to their peers. These students might lead **tours** for new students, host events, or even help staff library help desks.

➢ **Peer Mentorship**:

- Some libraries offer a **peer mentoring program** where senior students help new students navigate library resources and research tools, creating a more personalized and approachable experience.

7. Targeted Advertising

➢ **Campus-wide Digital Ads**:

- Libraries use **digital ads** on university websites, student portals, and email banners to promote events, resources, or services that are highly relevant to students.

➢ **Physical Advertisements**:

- Libraries use **posters**, **flyers**, and **banners** displayed around campus in high-traffic areas like cafeterias, dorms, and common spaces to draw attention to specific services, new book arrivals, or upcoming workshops.

8. User-Centered Design and Feedback

➢ **Regular Surveys**:

- Libraries often use **surveys** and **feedback forms** to assess students' satisfaction with the library's offerings and identify areas for improvement. This feedback helps the library tailor services to meet student needs.

➢ **Focus Groups**:

- Some libraries may also hold **focus groups** with students to gain deeper insights into what resources or services would improve their academic experience.

9. Gamification

➢ **Reading Challenges**:

- Libraries use **gamification** techniques to make learning fun. For example, they might run **reading challenges** where students receive points for reading certain books, participating in library events, or attending workshops.

➢ **Library Scavenger Hunts**:

- A popular gamification activity is the **library scavenger hunt**, where students are given clues that lead them to different parts of the library. This is often tied to **library orientation** or special events like National Library Week.

10. Digital and Virtual Tools

- **Virtual Services**:
- Many libraries offer **virtual reference services** via live chat, email, or video calls, allowing students to get assistance remotely.
- **Online Tutorials**:
- To engage students who may not visit the library in person, libraries produce **video tutorials** on how to use databases, access research materials, or cite sources effectively.
- **Virtual Tours**:
- Libraries provide **virtual tours** of their facilities, showcasing study spaces, special collections, and resources that may not be immediately visible to students in person.

11. Influencer Marketing

- **Campus Influencers**:
- Libraries often collaborate with **student influencers** on social media, such as campus bloggers or popular social media figures, to promote library resources, events, or new services.
- **Student Takeovers**:
- Libraries may also host **social media takeovers** where students or student organizations take over the library's social media accounts for a day to showcase their use of the library and share recommendations with their peers.

12. Content Creation

- **Library Blogs and Podcasts**:
- Libraries create **blogs** and **podcasts** that feature research tips, book recommendations, library events, or even interviews with faculty or alumni. These provide students with valuable content that they can engage with on their own time.
- **How-To Guides and Resource Pages**:
- Many libraries develop **how-to guides** or **resource pages** for students in need of research help. These guides might cover everything from **citation styles** to **subject-specific research tips**.

13. Promotions and Giveaways

- **Prize Drawings and Swag**:
  - To incentivize students to engage with library services, libraries often run **giveaways**. This could include prizes such as books, **library-branded swag** (e.g., tote bags, mugs), or **gift cards**.
- **Special Deals**:
  - Libraries may partner with local businesses to offer **discounts** or **promotions** for students who check out books, attend events, or complete certain tasks.

By implementing these varied strategies, academic libraries effectively create engaging and personalized experiences for students, ensuring that the library remains a valuable resource throughout their academic journey.

Conclusion

The marketing strategies utilized by academic libraries are essential for boosting student engagement, highlighting library resources, and cultivating a nurturing educational atmosphere. By implementing dynamic tactics such as vibrant social media campaigns, informative workshops, tailored services, and collaborative events, libraries can effectively position themselves as vital components of the academic experience in today's digital landscape. These strategies enable libraries to actively connect with students by tapping into their preferences and needs, allowing for the creation of customized marketing initiatives that not only raise awareness but also enhance the use of library resources and overall satisfaction among users. Furthermore, the continuous assessment and refinement of these approaches are critical for ensuring that academic libraries remain agile and responsive to the changing requirements of the academic community, ultimately supporting a rich and engaging learning experience for all students.

References

1. Aharony, N. (2012). Social media use in libraries: A cross-cultural perspective. Journal of Library Administration, 52(8), 823-839.
2. Anderson, P., Brown, S., & Carter, J. (2021). User-Centered Library Services: A Marketing Approach. Journal of Academic Libraries, 45(3), 123-145.
3. Becker, M. (2018). Effective email marketing strategies for academic libraries. Journal of Academic Librarianship, 44(2), 123-134.
4. Bounia, A. (2020). Gamification in academic libraries: Enhancing student engagement through play. Library Trends, 68(4), 456-472.

5. Brown, L., & White, K. (2017). Social Media Engagement in Academic Libraries. Library Trends, 65(2), 89-104.
6. Delgadillo, R. (2019). Engaging students through social media platforms: A library perspective. College & Research Libraries, 80(5), 432-450.
7. Dempsey, L. (2014). Campus collaboration: Integrating academic libraries into the university community. Journal of Higher Education Outreach and Engagement, 18(3), 89-105.
8. Durrance, J. C. (2018). Library branding: Building a strong identity for academic libraries. Library Management, 39(1), 35-48.
9. Garcia, M., & Patel, N. (2020). Building Academic Partnerships through Library Outreach. College & Research Libraries, 41(4), 256-278.
10. Harris, D., & Wong, F. (2022). Personalized Marketing in Academic Libraries: Trends and Practices. Journal of Information Science, 50(1), 56-78.
11. Johnson, A. (2016). Library events and student engagement: Creating meaningful academic experiences. College & Undergraduate Libraries, 23(2), 145-159.
12. Johnson, R., & Lee, T. (2020). Optimizing Library Resource Visibility through SEO Techniques. Digital Information Review, 38(2), 210-225.
13. Jones, M., & Kim, S. (2018). Social Media Strategies for Academic Library Marketing. Journal of Library Administration, 60(1), 34-57.
14. Kim, S., & Kim, H. (2015). Experiential marketing in academic libraries: Redesigning physical and virtual spaces. Journal of Academic Library Design, 21(4), 210-225.
15. Robinson, T., & Smith, L. (2017). Personalized library services through data analytics. Library & Information Science Research, 39(3), 278-291.
16. Rowley, J. (2016). Digital Marketing for Libraries: Principles and Practices. Library and Information Research, 32(1), 78-96.
17. Smith, A., & Taylor, G. (2019). Online Marketing in Academic Libraries: Challenges and Opportunities. Library Management Review, 47(3), 112-134.
18. Williams, R., & Martinez, L. (2019). Outreach Programs and Student Engagement in Academic Libraries. Academic Librarianship Journal, 39(4), 98-120.

The Evolving Role of Librarians: Empowering Future Researchers through Library-Led Sessions

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Abstract
This paper examines the evolving role of librarians as educators and collaborators in enhancing research competencies among students. With the growing emphasis on interdisciplinary learning, the AIKTC Central Library implemented tailored research training sessions for 107 final-year pharmacy students. These sessions addressed key areas such as literature review techniques, citation management, plagiarism awareness, and effective utilization of library resources, aligning with the Pharmacy Council of India's syllabus. Feedback from 97 participants revealed a 96% increase in research confidence and an average session rating of 4.27 out of 5. Assignments and hands-on activities solidified learning, while faculty feedback highlighted improved academic performance and ethical awareness among students. Despite challenges like time constraints and varying familiarity with research tools, recommendations for personalized learning pathways and extended practice sessions were proposed. This study highlights the transformative role of libraries in fostering a culture of research excellence and equipping students for academic and professional success.

Keywords
Information Literacy Programs, Library Research Sessions, Innovative Library Services, Extension Services, Librarian Role

1. Introduction
In an age defined by rapid technological progress and a growing emphasis on interdisciplinary learning, the role of librarians is undergoing a significant transformation. Once viewed primarily as custodians of information, librarians are now recognized as educators, collaborators, and innovators within the academic ecosystem. This shift aligns closely with the adoption of novel pedagogical strategies aimed at meeting the evolving needs of today's learners.

In its 543rd meeting held on August 9, 2019, the University Grants Commission (UGC) approved a Two-Credit Course on publication ethics and

misconduct, titled Research and Publication Ethics (RPE), to be made mandatory for all Ph.D. students as part of their pre-registration coursework. Supporting this initiative, many libraries and librarians have taken proactive steps to implement this course across universities and autonomous colleges. Ahuja & Baishya, (2024) contributed to this effort with their edited book, Research & Publication Ethics (RPE), which explores various aspects outlined by the UGC.

Students today require a strong foundation in research skills, particularly given the increasing reliance on evidence-based practices across disciplines. Traditional teaching methods often fall short in preparing students for the complexities of contemporary research environments. Libraries, as dynamic knowledge hubs, have the potential to bridge this gap through innovative teaching methodologies. By conducting tailored research sessions, librarians empower students to meet the demands of modern research landscapes effectively.

Librarians have a crucial role to play in educating researchers, students, and faculty on ethical research practices. By teaching effective literature reviews, paper evaluations, content writing in one's own words, and UGC policies on plagiarism and penalties, librarians help nurture academic integrity from the outset. Their expertise in citation practices, developed through their education in library and information science, also enables them to guide students on how to cite sources accurately using in-text citations and references, thus preventing plagiarism.

This paper presents the AIKTC Central Library as a model case study. Since the 2022-23 academic year, the library has implemented research sessions for final-year B.Pharm students (undergraduate) as part of the curriculum requirements set by the Pharmacy Council of India (PCI), specifically under the "Practice School" program. Over the past three years, this initiative has been highly successful, establishing the library as a best-practice example for other academic libraries to emulate. With its vision "To become the most sought-after Central Library, rich in academic and research-based resources with ingenious practices that others would wish to emulate," AIKTC Central Library has set a benchmark for innovative and impactful academic practices in the field of research and education.

This paper also explores a library-led research session conducted by AIKTC Central Library, examining its structure, objectives, and impact on students. It assesses how such initiatives contribute to the academic success and

professional preparedness of undergraduate (UG) students. By reimagining the librarian's role as a central component of the educational experience, this study underscores the potential of libraries to act as hubs for collaborative learning and knowledge creation in today's evolving academic landscape.

2. Review of literature

Librarianship has evolved significantly, transitioning from traditional roles focused on classification, cataloging, and shelving physical materials to more dynamic responsibilities as information scientists. Modern librarians now engage in digital resource management, metadata creation, data analytics, and the facilitation of access to complex information systems, reflecting the profession's adaptation to the digital age and emerging technologies. Here are some references based on academic and professional literature related to librarians and their evolving roles:

Hanif et al. (2024) from the study titled "Changing Role of Libraries and Librarians in the New Technological Era," explores the evolving functions of libraries and librarians in Islamabad's university landscape. This research highlights how technological advancements are reshaping the roles of librarians, the competencies they need to thrive, and the challenges they face in adapting to these changes. The study employs a quantitative approach, gathering data from both private and public sector universities through Google Survey forms.

Thiruppathi (2024) explores how librarians have transitioned from traditional custodians of physical collections to facilitators of digital access and information literacy in the digital era.

Chan et al. (2024) examined how a large academic library introduced a metadata librarian position focused on the description of open-access resources, highlighting the evolving role of librarians in the documentation and metadata management.

Patel et al. (2024) explored the understanding and views on artificial intelligence (AI) for library specialists in India by gathering responses from a total of 148 randomly chosen respondents.

Harding et al. (2023) examine how knowledge-sharing initiatives between librarians and learning advisors can enhance librarians' teaching practices. Their findings underscore the benefits of collaboration in improving librarians' pedagogical knowledge and teaching skills. The paper highlights the value of professional development, peer learning, and cross-departmental partnerships in enriching librarians' teaching approaches and advancing student learning experiences in higher education.

Gaitanou et al. (2022) explores the application of linked data in libraries, emphasizing the role of librarians in creating and managing taxonomies to enhance information retrieval and knowledge organization.

Brunskill & Hanneke (2022) analyze the documented role of librarians in published systematic reviews and meta-analyses, emphasizing their contributions as documentation analysts in the research process.

The AIP Publishing whitepaper survey emphasizes the diverse roles librarians play in promoting research. Notably, 84% of libraries prioritize enhancing discoverability, helping researchers increase the visibility of their work. Around 73% support researchers in managing professional profiles, such as ORCID, while approximately 64% facilitate sharing research across various platforms. Additionally, librarians prepare bibliometric reports that track publication metrics, aiding researchers in evaluating their impact. They actively promote institutional repositories and assist faculty with preprint uploads. Furthermore, librarians encourage the use of social media for broader dissemination and offer training on effective promotion strategies. The survey also reveals that librarians consider publishers vital partners in research promotion, suggesting that publishers could provide workshops and promotional materials. Overall, over 80% of libraries engage in promoting research, though the level of support varies based on institutional resources and librarian roles. (AIP Publishing, 2020)

Zanin-Yost (2018) investigates the role of liaison and embedded librarians in fostering academic collaborations and their impact on teaching and learning. The study reveals that librarian-faculty partnerships enhance student engagement, promote information literacy, and integrate library resources into the curriculum. Key findings emphasize the necessity of proactive communication, strong relationships, and sustained collaboration to effectively support educational initiatives in higher education.

Matacio & Clossor (2017) present a case study on collaborative efforts between librarians and instructors to enhance information literacy instruction. Their findings highlight the transformative impact of these partnerships on students' academic success, engagement with library resources, and information literacy skills. The paper emphasizes the necessity of continuous collaboration and communication between librarians and faculty to optimize information literacy education.

Lundstrom et al. (2014) focus on librarian-instructor collaboration in designing student learning outcomes using established frameworks. The study underscores the utility of frameworks in aligning instructional objectives with library resources. It highlights the significance of cooperative planning, clear communication, and shared decision-making to create impactful and effective learning outcomes for students.

Pan et al. (2014) assess the influence of library instruction and collections on student learning outcomes. Their findings demonstrate that library instruction significantly enhances students' information literacy and academic performance. The study emphasizes the importance of evaluating library services and instructional initiatives to highlight their contributions to student learning and success.

Loesch (2010) explores the shifting role of librarians as educators. The research demonstrates that librarians serving as professors positively influence student learning outcomes, foster greater collaboration with faculty, and promote the integration of information literacy across academic programs. The study advocates for acknowledging librarians as integral educators and role models in higher education settings.

Mullins (2009) discusses librarians' roles in e-science, highlighting their involvement in data management, digital scholarship, and the support of collaborative, networked science.

Helene Williams (1997) discusses the evolving role of librarians as partners in information literacy education. The study stresses the importance of collaboration between librarians and educators in developing effective information literacy programs. It highlights librarians' expertise in information retrieval and their role in fostering critical thinking and research

skills. The paper advocates for librarians' active involvement in instructional activities and close partnerships with faculty to integrate information literacy into the curriculum, ultimately supporting students' navigation of complex information environments.

3. Case study of aiktc central library

According to NEP 2020, "Knowledge creation and research are critical in growing and sustaining a large and vibrant economy, uplifting society, and continuously inspiring a nation to achieve even greater heights".

Anjuman-I-Islam's Kalsekar Technical Campus (AIKTC) Central Library plays a central role in promoting information literacy, which is a vital component of innovative pedagogy at AIKTC, New Panvel. They provide resources, instruction, and support to help students develop the skills necessary to locate, evaluate, and effectively use information to excel in their research journey.

Libraries today go beyond basic literacy orientations by offering specialized research workshops that delve into advanced techniques. These **Research Workshops** and **Research Skills Development Programs** play a pivotal role in equipping users with essential skills to effectively find, evaluate, and utilize information. Covering a broad range of topics such as **literature reviews**, **database searching**, **source evaluation**, **referencing**, **understanding plagiarism**, and **citation management** (including hands-on demonstrations of tools like Zotero, MS Word), these programs are tailored to meet the needs of graduate students, researchers, and faculty members who seek in-depth research knowledge and expertise.

Why with Pharmacy Students?

The new Pharmacy Council of India (PCI) syllabus for 2022-23 requires pharmacy students to complete a practice school comprising 150 hours of training evenly distributed throughout the semester. Students are expected to choose a domain for their practice school, as decided by the program committee. Upon completion, they must submit a detailed report, not exceeding 25 pages, in triplicate and a review paper. This report documents their experiences, knowledge, and skills acquired during the practice school and is evaluated, along with their Semester VII examination performance,

by subject experts at the college level. The evaluation contributes to the students' overall grade point.

To assist students in meeting these requirements, the library was tasked with developing sessions to streamline the research process. In response, six targeted sessions were designed as an Overview of Successful Research Pathways**:** focusing on effective research strategies; Literature Review Using Google**:** which covers advanced search techniques; Literature Review Using Library Resources & Services: providing guidance on leveraging library resources & tools; Copyright vs Plagiarism: educating students on ethical research practices; and a Referencing & Citation Workshop for Beginners: offering hands-on training in citation management. These sessions aim to equip students with critical research skills, ensuring they are well-prepared for their practice school requirements and future academic and professional challenges.

4. Objectives

1. To enhance students' research competencies by providing tailored training sessions on literature review techniques, citation management, and plagiarism awareness.
2. To evaluate the impact of library-led research sessions on the academic performance and professional preparedness of final-year pharmacy students.
3. To foster a deeper understanding of ethical research practices and effective utilization of library resources among students.

5. Research methodology

The study focuses on the design, implementation, and evaluation of research-focused library sessions tailored for final-year pharmacy students at AIKTC Central Library. A systematic methodology was adopted to assess the impact of these sessions on students' research skills, academic performance, and professional preparedness.

5.1. Session Design

The sessions were structured to align with the new Pharmacy Council of India (PCI) syllabus, emphasizing practical research training. Key topics included:

Session1: Pathway to Research

This session provided a step-by-step guide for initiating a research project, covering crucial stages such as identifying research questions, planning the research process, and effectively utilizing library resources.

- **Assignment:** Creation of a mind map on a topic of interest.

Session2: Literature Review Using Google Tools & Tricks

This session focused on strategies for conducting a thorough literature review, teaching students how to locate relevant studies, synthesize findings, and identify research gaps. Practical tips for organizing literature were also provided.

- **Assignment:** Submission of 10 literature reviews using Google tools and advanced search techniques.

Session3: Literature Review through Library Resources

A hands-on workshop aimed at equipping students with advanced skills in utilizing library databases and tools for effective literature reviews. Topics included resource categorization, advanced search techniques, and access to subject-specific materials.

- **Assignment:** Submission of 10 literature reviews using library databases and resources.

Session4: Citation Management

This session introduced tools like MS Word, Zotero, and AI tool Quillbot to streamline citation management. Students were trained to organize references, generate bibliographies in multiple citation styles, and integrate citations into research projects seamlessly.

- **Assignment:** Submission of citations in APA, MLA, or Vancouver format using tools such as MS Word or QuillBot.

Session5: Plagiarism vs Copyright Awareness

This session promoted academic integrity by educating students on recognizing and preventing plagiarism. It included proper paraphrasing techniques, adherence to citation requirements, and hands-on demonstrations of plagiarism detection tools like Turnitin and DrillBit.

- **Assignment:** Completion of a session outcome report and an eQuiz on plagiarism.

Each session aimed to equip students with the essential research skills needed for academic success while fostering a commitment to ethical research practices.

5.2. Sample:

The study involved 107 final-year pharmacy students. Participation in the sessions was mandatory, as they were integrated into the students' research methodology coursework.

5.3. Assessment Tools

Pre and post-session surveys, practical assignments, and focus group discussions were employed to evaluate the session's impact.

5.4. Findings & Analysis:

The research sessions had a positive impact, with students finding them engaging and relevant. They significantly enhanced the library's research assistance services and contributed to building new research relationships with emerging scholars. These initiatives also reflect the library's commitment to fostering a research-conducive environment and empowering users with advanced research capabilities.

5.4.1. Analysis Summary of Founding Sessions of 2022-23:

Flow of Research Sessions 2022-23

No. of Students (112)

Sr. No.	Research Sessions	No. of Attendee
1	Introductory Session "Pathways to Research for Beginners"	96
2	Literature Review: Smart Google Search	102
3	Literature Review: Library Resources & Services	95
4	Copyright vs Plagiaism: Tools & Techniques to avoid Plagiarism	91
5	Referencing & Citation for Beginers (APA, MLA, Chicago & IEEE) using Ms Word & Manually	104
6	MENDELEY: Reference Management Tool for Researchers	93

- **Target Audience:** Final Year B.Pharmacy Students
- 68 responded out of 112 students
- **Assignment s** were given through the **Google Classroom**
- Feedback of physical attendance - **Excellent**

Please indicate your level of satisfaction for each Session	No. of Students
Agree	15
Neutral	2
Strongly Agree	51
Grand Total	**68**
Average Satisfaction Level	**4.7**

Outcomes:
- Students found **it more interesting and relevant**
- **improves the library research assistance service**
- builds **new research relation** with new **emerging researchers**

Fig.1: Analysis of Summary Founding Sessions 2022-23

5.4.2. Analysis and Findings of 2024-25:

Table1: Flow of Sessions & Attendees No. of Students (107)

Sr. No.	Research Sessions	No. of Attendees
1	Introductory Session "Pathways to Research for Beginners"	77
2	Literature Review: Smart Google Search	96
3	Literature Review: Library Resources & Services	74
4	Copyright vs Plagiarism: Tools & Techniques to avoid Plagiarism	78
5	Referencing & Citation for Beginners using Ms Word & AI tools	73

Table1 shows that the average attendance across all research sessions in 2024-25 was approximately 80 students.

5.4.3. Participants Feedback:

Table2: Total 97 responded from 107 students

Indicators	Strongly Agree	Agree	Neutral	Strongly Disagree	Disagree
Relevance of sessions to your Research Journey!	36	42	12	6	1
Sessions were scheduled at the right time!	34	44	12	6	1
Flow of the session was rightly designed!	38	41	11	5	2
Instructor was lively & interactive!	40	39	11	7	0
Skill and responsiveness of the Instructor!	38	43	8	6	2
Quality of instruction was good!	40	39	11	7	0
Content was presented in an organized manner!	39	39	12	5	2
Question-Answer Session with participants was encouraged!	42	37	11	5	2
Assignments were aligned to the sessions!	44	34	11	6	2
Your confidence to step in "Research Journey" is increased/improved.	96 students responded YES				
How would you rate entire "Sessions"	Average rating is 4.27 out of 5				
How would you rate the Library Support in Research Journey?	Average rating is 4.32 out of 5				

The feedback from 97 students shows that the research sessions were highly appreciated. Most students found the sessions relevant, well-timed, and well-structured, with the instructor being lively, skilled, and interactive. The content was organized, and assignments aligned well with the sessions. Question-and-answer opportunities were encouraged, helping students engage better. Nearly all students (96) reported increased confidence in starting their research journey. The sessions received an average rating of 4.27 out of 5, while the library's support was rated even higher at 4.32 out of 5, reflecting overall satisfaction.

6. Outcomes

The objectives of the study were thoroughly addressed and achieved as follows:

Objective 1: To enhance students' research competencies by providing tailored training sessions on literature review techniques, citation management, and plagiarism awareness.
Sessions 2 to 5 were specifically designed to equip students with the necessary knowledge and skills. Students actively participated by completing assignments, which served as hands-on practice to reinforce their learning.

Objective 2: To evaluate the impact of library-led research sessions on the academic performance and professional preparedness of final-year pharmacy students.
As a result of these sessions, students prepared review articles and submitted them to their department. Many of these papers are expected to evolve into high-quality publications in reputed journals in the upcoming semester, reflecting improved academic performance and research readiness.

Objective 3: To foster a deeper understanding of ethical research practices and effective utilization of library resources among students.
Students gained a clear understanding of plagiarism and effectively utilized library resources, as demonstrated by their assignments from Session 3. Faculty feedback confirmed that students excelled in applying these skills in

real-world scenarios, showcasing their improved research ethics and resourcefulness.

7. Recommendations and suggestions

The success of the library's research sessions highlights the importance of integrating innovative teaching methods into research training. Libraries, with their vast resources and expertise, are well-suited to offer experiential learning opportunities that not only bridge knowledge gaps but also boost students' confidence in conducting independent research. These sessions enhanced both students' research capabilities and the library's approach to addressing research-related queries. Additionally, they provided an opportunity for library staff to deepen their understanding of research challenges faced by students.

However, challenges such as time constraints and varying levels of student familiarity with research terminology and digital tools were observed. To address these, future sessions could include personalized learning pathways and allocate more time for hands-on practice. The library could also collect details of student paper publications and feedback from research guides to evaluate the effectiveness of these sessions and identify areas for improvement.

Such sessions can also be tailored for students in degree and technical colleges in alignment with NEP 2020 and syllabus requirements, encouraging students to engage in ethical research practices. Additionally, introducing foundational lessons on plagiarism, citation, and research ethics at the school level would prepare students early for academic and professional research writing.

Conclusion

The findings from the research sessions underscore the effectiveness of library-led training in enhancing students' research skills and fostering a commitment to ethical research practices. The positive feedback and high satisfaction ratings indicate that such initiatives are crucial in preparing students for the demands of academic research and professional practice. The library's role as a facilitator of research competencies is vital in creating a supportive and enriching academic environment.

References

1. Ahuja, V. K., & Baishya, K. (Eds.). (2024). Research Publications & Ethics. National Law University and Judicial Academy.
2. AIP Publishing. (2020). Promoting Research: Importance of the Librarians Role.
3. Brunskill, A., & Hanneke, R. (2022). The case of the disappearing librarians: Analyzing documentation of librarians' contributions to systematic reviews. Journal of the Medical Library Association, 110(4), 409–418. https://doi.org/10.5195/jmla.2022.1505
4. Chan, J., Zhang, E., Vermeij, H., & Riemer, J. (2024). Metadata Librarians for Open Access: A Path Towards Sustainable Discovery and Impact for Open Access Resources. International Journal of Librarianship, 8(4), Article 4 https://doi.org/10.23974/ijol.2024.vol8.4.351
5. Gaitanou, P., Andreou, I., Sicilia, M., & Garoufallou, E. (2022). Linked data for libraries: Creating a global knowledge space, a systematic literature review. Journal of Information Science, 50(1), 016555152210846. https://doi.org/10.1177/01655515221084645
6. Hanif, S., Shah, S., Rehman, A., & Hassan, S. (2024). Changing Role ofLibraries and Librarians in the New Technological Era: An Evaluative Study of University Libraries of Islamabad. Bulletin of Business and Economics (BBE), 13, 448–454. https://doi.org/10.61506/01.00353
7. Harding, R., McWilliams, R., & Bingham, T. (2023). Developing librarians' teaching practice: A case study of learning advisors sharing their knowledge. Journal of Learning Development in Higher Education, 27. https://doi.org/10.47408/jldhe.vi27.1007
8. Helene Williams, A. Z. (1997). Redefining roles: Librarians as partners in information literacy education. Information Research, 3(1). https://informationr.net/ ir/3-1/paper24.html
9. Loesch, M. F. (2010). Librarian as Professor: A Dynamic New Role Model. Education Libraries, 33-37.(1), 31-. https://doi.org/10.26443/el.v33i1.287
10. Lundstrom, K., Fagerheim, B. A., & Benson, E. M. (2014). Librarians and Instructors Developing Student Learning Outcomes: Using Frameworks to Lead the Process. Library Faculty & Staff Publications, 42(3).
11. Matacio, L. R., & Clossor, B. (2017). Transforming Information Literacy Through Librarian/Course Instructor Collaboration: A Case Study. Journal of Adventist Libraries and Archives, 2(1), 1–16. https://doi.org/10.32597/jala/vol2/iss1/1
12. Mullins, J. L. (2009). Bringing Librarianship to E-Science. College & Research Libraries, 70(3), Article 3. https://doi.org/10.5860/0700212
13. Pan, D., Ferrer-Vinent, I. J., & Bruehl, M. (2014). Library Value in the Classroom: Assessing Student Learning Outcomes from Instruction and Collections. The Journal of Academic Librarianship, 40(3–4), 332–338. https://doi.org/10.1016/j.acalib.2014.04.011

14. Patel, K., Patel, B., Patel, P., & Patel, B. (2024). Intelligent Libraries: Perception and Proficiency in Artificial Intelligence among Knowledge Custodians. Library Progress International, 44(3), Article 3. https://bpasjournals.com/library-science/index.php/journal/article/view/2620
15. Thiruppathi, K. (2024). Librarian's Role in the Digital Age: Reimagining the Profession in the Era Of Information Abundance. International Journal of Library and Information Science, 13(1), 1–9. https://www.researchgate.net/publication/377817735_LIBRARIAN'S_ROLE_IN_THE_DIGITAL_AGE_REIMAGINING_THE_PROFESSION_IN_THE_ERA_OF_INFORMATION_ABUNDANCE
16. Zanin-Yost, A. (2018). Academic collaborations: Linking the role of the liaison/embedded librarian to teaching and learning. College & Undergraduate Libraries, 25(4), 1–14. https://doi.org/10.1080/10691316.2018.1455548

Mobile-Based Services for Indian Academic Libraries: Enhancing Access and Patron Engagement through Specific Tools

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Abstract
The integration of mobile-based services in academic libraries has significantly transformed how libraries engage with patrons, providing more flexible, convenient, and accessible means of accessing library resources and services. In India, where mobile technology penetration is rapidly increasing, academic libraries are adopting mobile applications and tools to enhance user experiences, streamline operations, and improve access to information. This paper explores the growing importance of mobile-based services in Indian academic libraries, focusing on how mobile applications facilitate easy access to library catalogs, e-resources, reservations, and real-time notifications for patrons. By examining specific tools such as Koha, LibSys, DSpace, and OpenBiblio, this paper highlights the advantages of these services, such as increased accessibility, improved resource management, and enhanced patron engagement. Furthermore, the paper discusses the role of mobile technologies in supporting the digital shift in academic libraries, allowing patrons to access library services from anywhere and at any time, thus fostering a more inclusive and flexible learning environment. While mobile-based services offer numerous benefits, the paper also addresses the challenges that Indian academic libraries face, including issues related to digital divide, data security, and the need for technical expertise. By reviewing case studies and analyzing the tools currently being used in these libraries, the paper provides insights into the effectiveness of mobile-based services and their potential to improve library services in the context of modern educational demands. Ultimately, this paper aims to underline the importance of adopting mobile-based solutions to enhance the delivery of library services and to highlight the opportunities and obstacles that come with their implementation.

Keywords
Mobile-based services, Indian academic libraries, patron engagement, mobile applications, library services, information retrieval.

1. Introduction

In recent years, mobile technology has emerged as a transformative force across various sectors, reshaping how services are delivered and accessed. One such sector that has embraced this shift is education, particularly in the realm of academic libraries. Traditionally, libraries were primarily physical spaces, where patrons had to visit in person to access resources, borrow books, or engage with library staff. However, with the rise of smartphones, mobile internet, and the digitalization of academic resources, academic libraries, especially in India, are gradually moving towards providing mobile-based services. This change is not only reshaping the role of libraries but also enhancing the overall user experience, making it more convenient, accessible, and efficient.

The increasing proliferation of smartphones and mobile internet in India has catalyzed the transition of library services onto mobile platforms. According to recent studies, mobile phone penetration in India has seen exponential growth, with millions of users gaining access to mobile internet. This shift in technology has created an opportunity for libraries to meet the growing demands of users for immediate and flexible access to library services. No longer bound by the traditional constraints of time and space, students, faculty, and staff can now access library resources anytime and anywhere, whether on campus or remotely.

Moreover, the growing reliance on digital resources such as e-books, journals, and online databases further necessitates the need for mobile applications in libraries. These digital resources offer a wealth of information, but their true potential can only be realized when users can access them in real-time via mobile platforms. The integration of mobile-based services has enabled Indian academic libraries to provide a seamless, efficient, and user-centric service model, which is particularly valuable in today's fast-paced educational environment.

Academic libraries have started to adopt mobile-based solutions that cater to various functions. These include tools for catalog searching, book reservations, digital resource management, real-time notifications, and enhanced user engagement. The development of mobile applications such as Koha, LibSys, DSpace, and OpenBiblio has streamlined library processes and created a more user-friendly environment. Through these applications, library patrons can easily search for resources, renew books, make reservations, and receive updates about library events or overdue items, all from the convenience of their mobile devices.

The growing importance of mobile-based services also aligns with the need for academic libraries to engage patrons in a more dynamic and interactive way. Mobile tools enable libraries to provide personalized recommendations, offer feedback channels, and foster a more connected and active community. Additionally, mobile platforms have enabled libraries to enhance accessibility for students with disabilities by providing assistive technologies and specialized services.

The increasing reliance on mobile platforms in academic libraries is not without challenges. Issues such as data security, integration across various mobile devices, and the digital divide remain obstacles to the widespread adoption of mobile services. Nevertheless, the benefits that mobile technology offers academic libraries in terms of accessibility, convenience, and user engagement make it an essential tool for modernizing library services.

This research paper aims to explore the integration of mobile-based services in Indian academic libraries, with a focus on the specific tools and applications that are being developed to enhance library operations and patron engagement. The paper will also discuss the advantages and challenges associated with the adoption of mobile technologies and how these innovations are shaping the future of library services in India. Through case studies and practical examples, this research will provide insights into how mobile-based services are transforming academic libraries and improving the overall library experience for students, faculty, and staff.

2. Importance of Mobile-Based Services in Academic Libraries

The integration of mobile technologies in academic libraries represents a transformative shift in how these institutions interact with their users. Mobile-based services are becoming increasingly essential in providing flexible, efficient, and timely access to library resources and services. With the rise in mobile device usage, academic libraries are exploring innovative ways to meet the evolving needs of students, faculty, and staff. The adoption of mobile technologies in academic libraries is not just about keeping pace with technological advances but also about improving the overall user experience by offering greater convenience, real-time updates, and personalized services.

2.1 Accessibility and Convenience

One of the primary drivers behind the adoption of mobile-based services in academic libraries is the need for enhanced accessibility. Traditionally, library services required users to physically visit the library to search for resources,

check out books, or access databases. However, with the proliferation of smartphones and mobile applications, library users can now access resources remotely, making academic libraries more accessible than ever before. Mobile apps allow patrons to search the catalog for books, e-journals, or other library materials, reserve items, and check their availability, all from their mobile devices. Whether students are on campus or off-site, the library is always just a few taps away. This convenience is particularly significant for distance learners, part-time students, or faculty members who may not always be on campus but still need access to library services.

2.2 Real-Time Updates

Another key benefit of mobile-based services is the ability to provide real-time updates to patrons. Traditional library systems relied on in-person visits or static notifications on physical bulletin boards to keep users informed. Mobile technology has revolutionized this approach, enabling libraries to send push notifications directly to users' smartphones. These notifications can include information on overdue items, upcoming library events, new book acquisitions, or changes in library hours. By providing real-time updates, libraries ensure that users stay informed and engaged, helping them manage their library activities more efficiently. This real-time communication also fosters a sense of connection between libraries and their users, encouraging greater interaction and participation in library events or programs.

2.3 Improved User Engagement

Mobile platforms offer libraries an excellent opportunity to engage with their patrons in more meaningful ways. Through mobile apps, libraries can connect with users on a personal level by sending tailored notifications, personalized book recommendations, and even conducting surveys to gather feedback. This level of engagement can increase user satisfaction and promote a sense of community among library patrons. Furthermore, mobile services make it easier for libraries to share news, promote events, or offer support services, such as virtual reference assistance or tutoring. For example, libraries can send push notifications about new books in a user's area of interest, remind users to return overdue books, or offer reading suggestions based on past checkouts. These personalized interactions help libraries build stronger relationships with their patrons, fostering loyalty and increasing the likelihood of users making regular use of library resources.

Additionally, mobile-based engagement extends beyond transactional services. Libraries can create interactive experiences, such as gamified reading challenges or mobile-based scavenger hunts, encouraging patrons to explore new resources or participate in library activities. By leveraging the

interactive and engaging potential of mobile apps, libraries can enhance the learning experience, promote literacy, and encourage more active use of library services.

2.4 Enhancing User Experience with Mobile-Based Features

The mobile-based services offered by academic libraries extend well beyond simply accessing the catalog. Many libraries now integrate mobile features such as barcode scanning for quick checkouts, digital library cards, and seamless integration with social media platforms. These added functionalities enhance the overall user experience and make interacting with the library more convenient. For example, some mobile apps allow patrons to scan a book's barcode to instantly check its availability and request a hold or loan. This ability to instantly access library services from a smartphone contributes to streamlining library processes, reducing wait times, and improving overall efficiency.

Moreover, mobile services often offer multi-platform integration, allowing users to seamlessly switch between mobile devices, computers, and library kiosks, making the entire library experience more flexible and interconnected. With the rapid pace of technological advancements, the potential for future innovations in mobile-based library services is vast, offering opportunities for even greater personalization, interactivity, and efficiency.

3. Specific Mobile Tools for Academic Libraries

The rapid evolution of mobile technologies has significantly transformed the landscape of academic libraries in India. Libraries, once limited by physical infrastructure, are now offering dynamic and accessible services through mobile applications. These tools are designed to enhance the library experience by improving accessibility, streamlining processes, and fostering stronger engagement with patrons. Several mobile tools have been developed to support these advancements. The following section highlights some of the most widely used mobile tools in Indian academic libraries: Koha, LibSys, DSpace, and OpenBiblio.

3.1. Koha Mobile

Koha, an open-source Integrated Library Management System (ILMS), is one of the most popular library management software used in Indian academic institutions. It has a dedicated mobile application that extends the functionalities of the Koha ILMS to mobile devices, offering a wide range of services to library patrons.

- **Search Library Catalogs:** The Koha mobile app allows users to search the library catalog for books, journals, and other resources by entering keywords, titles, or authors. The real-time catalog search functionality improves the convenience of accessing library resources on-the-go.
- **Renew and Reserve Books:** Koha's mobile interface enables users to renew books they have checked out and place holds on books that are currently on loan. This feature reduces the need for in-person visits, allowing patrons to manage their loans directly from their smartphones.
- **Track Loan History:** The app provides users with an overview of their loan history, helping them keep track of borrowed items, overdue books, and pending fines. This promotes transparency and keeps patrons informed about their library activities.

Koha's mobile app significantly enhances the user experience by making library transactions quick, easy, and accessible at any time.

3.2. LibSys Mobile App

LibSys, another widely used Integrated Library Management System in India, offers a mobile application designed to make library services more efficient and accessible. LibSys mobile app brings several features to patrons, making their library experience more interactive and engaging.

- **Catalogue Search:** Users can search the library's catalog by various parameters such as title, author, or subject, providing flexibility in how they search for resources.
- **Book Reservation:** The mobile app allows users to reserve books that are currently unavailable, ensuring they are notified when the resources become accessible.
- **Notifications and Alerts:** Through push notifications, the app sends timely reminders about overdue books, new arrivals, upcoming library events, and other important updates. This feature fosters better communication between the library and its users.

LibSys's mobile app offers a seamless connection between patrons and library services, helping to improve user engagement and reduce manual intervention in library processes.

3.3. DSpace Mobile App

DSpace is widely used for managing and sharing digital content in academic libraries. It is particularly beneficial for libraries that host large collections of e-books, research papers, and other digital resources. DSpace's mobile app enables users to access this digital content remotely, offering several advantages:

- **Access Digital Resources:** With the DSpace mobile app, patrons can access a wide variety of digital resources, including e-books, research papers, and journals stored in the library's digital repository. This functionality ensures that users have access to academic materials at their fingertips, regardless of location.
- **Download Content:** The app allows users to download content directly to their mobile devices, making it easier for students and researchers to study and review materials offline.
- **Stay Updated:** The app sends notifications to users whenever new publications or resources are uploaded to the digital repository. This feature helps users stay up-to-date with the latest research and academic publications.

By promoting the digital shift, DSpace's mobile app provides greater flexibility for users to access scholarly content and enhances the reach of academic libraries.

3.4. OpenBiblio Mobile Application

OpenBiblio, an open-source library management system, is used by many smaller academic libraries across India. The mobile app version of OpenBiblio offers several practical features for library patrons:

- **Search and Browse the Catalog:** The app allows users to search for books and resources in the library's catalog. It supports keyword, title, author, and subject-based search, making it easier to locate required materials.
- **Access Library Events:** OpenBiblio's mobile app serves as a platform for libraries to communicate important events, workshops, or notices related to library activities. Patrons can stay informed about upcoming seminars, book launches, or library closings through the app.
- **Manage User Accounts:** Users can manage their borrowing history, check the status of their loaned books, and renew materials directly from the app. Additionally, patrons can track fines and other notifications related to their library account.

OpenBiblio's mobile app is particularly valuable for smaller institutions, ensuring that their patrons receive the same level of convenience and service available at larger academic libraries.

4. Benefits of Mobile-Based Library Services

The integration of mobile-based services in Indian academic libraries offers numerous advantages, enhancing the overall library experience for patrons and improving library operations.

- **Enhanced Patron Experience:** Mobile apps significantly improve user experience by simplifying access to library resources. Patrons can search for books, journals, and other materials from their mobile devices, reducing the time and effort needed to physically visit the library. With user-friendly interfaces, these apps provide quick and easy access to catalogs, making it easier for patrons to find the information they need without any hassles. This ease of use encourages greater engagement with library services, especially among tech-savvy students and faculty.
- **Increased Resource Accessibility:** Mobile-based services ensure that library resources are available to users at any time and from any location. This is particularly beneficial for distance learners, who may be located far from campus, as well as for faculty and students with busy schedules. With mobile access to e-books, research papers, and journals, users can read and research on the go. This flexibility enhances the accessibility of library materials, ensuring that users are not bound by the library's physical hours or location.
- **Time-Saving:** Mobile services streamline everyday library tasks. For example, patrons can renew books, check their borrowing history, and reserve resources without having to visit the library in person. This reduces wait times and the need for manual interventions, thus making the process more efficient. Time-saving features like push notifications for overdue items or upcoming events further simplify library management and keep patrons informed in real time.
- **Cost-Effectiveness:** By automating several library functions, such as book reservations, notifications, and resource availability checks, mobile-based services help academic libraries reduce operational costs. The reliance on fewer staff for manual tasks and the decrease in the need for physical resources such as paper for notices result in a more cost-effective library management system. Additionally, mobile apps enable libraries to reach a larger user base without incurring significant infrastructure costs.

5. Challenges in Implementing Mobile-Based Services

The adoption of mobile-based services in academic libraries has revolutionized how patrons interact with library resources. However, despite the numerous advantages, several challenges hinder the full-scale implementation of mobile technologies in these libraries.

5.1 Digital Divide

One of the significant challenges in implementing mobile-based services in Indian academic libraries is the digital divide. While smartphones and mobile internet are becoming increasingly widespread, a substantial portion of students and faculty still lacks access to these technologies. Factors such as economic disparities, geographical location, and limited access to affordable internet connectivity hinder equal access to mobile library services. In rural or remote areas, where mobile infrastructure is underdeveloped, the adoption of mobile-based services faces a significant barrier. This divide limits the inclusivity of such services and may exclude a portion of the academic community from the benefits offered by these technologies.

5.2 Data Security and Privacy Concerns

Another pressing challenge is ensuring the security and privacy of user data. Mobile-based library services often require patrons to create user accounts, share personal information, and interact with digital content. Protecting this sensitive data from cyber threats such as hacking, data breaches, and unauthorized access is crucial. Libraries must implement robust security measures such as encryption, two-factor authentication, and secure data storage to safeguard patron information. Failure to address these concerns can undermine user trust and discourage the adoption of mobile services.

5.3 Technical Challenges

The implementation of mobile-based services also presents various technical challenges. Libraries need to ensure that their Integrated Library Management Systems (ILMS) and mobile applications are compatible with a wide range of devices and mobile platforms (iOS, Android, etc.). Additionally, technical issues such as poor app performance, bugs, or system crashes can lead to user frustration and reduced satisfaction. Libraries must regularly update their systems, invest in technical support, and provide training for staff to address these technical challenges effectively. Compatibility with existing library infrastructure, as well as user support for mobile technologies, remains a critical aspect of successful implementation.

These challenges highlight the complexity of introducing mobile-based services in academic libraries. Addressing these issues is essential for maximizing the effectiveness and inclusivity of mobile services in the educational sector.

6. Conclusion

Mobile-based services in Indian academic libraries are transforming the way users interact with library resources, offering greater accessibility and convenience. Tools like Koha, LibSys, DSpace, and OpenBiblio cater to the

diverse needs of library patrons, enabling functions such as resource search, book reservations, and real-time updates—all from mobile devices. These advancements not only improve the user experience by providing on-the-go access to academic materials but also promote user engagement by facilitating instant notifications and personalized services.

However, the successful implementation of mobile-based services in academic libraries faces certain challenges. The digital divide, where a significant portion of users may lack access to smartphones or reliable internet, limits the full potential of mobile services. Additionally, concerns about data security and privacy remain critical, as sensitive information may be vulnerable through mobile platforms. Addressing these issues through infrastructure development and robust security measures is crucial for the widespread adoption of mobile services.

As mobile technologies continue to advance, Indian academic libraries have an opportunity to further enhance their services, making library resources more accessible to a broader range of users. With the right approach, these tools can provide an enriched, efficient, and user-friendly experience that meets the evolving needs of the academic community.

References

1. Koha Community. (2024). *Koha: Open-source library management system*. Retrieved from https://koha-community.org
2. LibSys Software. (2024). *LibSys library management system*. Retrieved from https://www.libsys.co.in
3. DSpace. (2024). *DSpace digital repository software*. Retrieved from https://www.dspace.org
4. OpenBiblio. (2024). *OpenBiblio library management system*. Retrieved from http://openbiblio.sourceforge.net
5. Choudhury, M. M., & Soni, P. (2021). Mobile applications in Indian academic libraries: Current trends and future prospects. *Library Management*, 42(8/9), 625-637.
6. Garg, A., & Sharma, V. (2020). Role of mobile-based services in enhancing library services in Indian academic institutions. *Journal of Academic Librarianship*, 46(3), 102054.
7. Rai, A. K., & Kaur, R. (2019). Integration of mobile technologies in academic libraries in India: Challenges and opportunities. *International Journal of Information Management*, 45, 172-178.

Enhancing User Engagement: Innovative Strategies for Academic Libraries to Increase the Utilization of Library Resources

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Abstract

Introduction :This conceptual paper discusses User Engagement and Innovative Strategies for Academic Libraries to Increase the Utilization of Library Resources. Libraries are evolving into vibrant community hubs extending beyond their original role as repositories of books. Despite this transition, many libraries are experiencing a loss in patronage as the world becomes more digital. Libraries are experiencing diminishing user engagement in an increasingly digital world. Objective: The use of essential resources, such as rare and expensive books, is declining due to students' growing preference for Internet search engines over in-person library visits. We library professionals should have a positive attitude with a smile on our faces, including deep knowledge about the resources in the library, so we can adequately guide students or users. Methods**:** For this article, various print and online resources, journals, periodical articles, books, e-books, and dissertations are referred to understand the concept of user engagement, Key aspects of user engagement and strategies to enhance user engagement in academic libraries. Results**:** Evidence shows that research has been conducted, and several papers have been published on user engagement and strategies for academic libraries to increase the utilization of library resources. It also indicates that the study was conducted in my specialization and with the support utilization of academic library resources. Conclusion**:** This paper discusses the concept of user engagement, suggests some innovative strategies for academic libraries to increase the utilization of library resources, and suggests some techniques or strategies to improve the optimum utilization of the academic library.

Keywords

User Engagement, Academic Libraries, Utilization of Library Resources, User Engagement Strategies

Introduction

Libraries have always been pillars of communities, providing access to books and knowledge and serving as safe, inclusive spaces for everyone. Engaging library users has become increasingly essential and multifaceted with the evolving information and technology landscape. Recognising that libraries are more than just book repositories is critical to effectively engaging library users. This understanding will guide future library enhancements. They are dynamic community hubs that can provide extensive services and activities tailored to meet their users' diverse needs and interests. Engaging users can involve innovative programming, community partnerships, technology integration, and creating a welcoming environment that invites people to explore, learn, and connect.

Meaning of user engagement

User engagement is the interaction between a product and users, service, or content. It measures how actively and frequently users participate, showing their interest and involvement. (What Is User Engagement?, n.d.) In academic libraries, user engagement encompasses how students, faculty, and other patrons interact with the library's resources, services, and activities. User engagement aims to foster meaningful, sustained interactions that benefit both the users and the institution (in this case, the library).

1. **Key Aspects of User Engagement**
    1. **Active Participation**:

        Active participation includes attending library events and workshops, using physical and digital resources, and participating in community initiatives like book clubs or study groups.
    2. **Frequency of Use**:

        Users' engagement is often evaluated by the regular frequency of library visits, borrowing materials, using online resources or participating in library-sponsored activities. Frequent involvement suggests that consumers value the library's offerings quality and quantity of interaction are essential for engagement. Do people interact meaningfully with the library's resources? For example, a student who regularly attends library workshops on research methods or works with librarians on a research project exhibits greater engagement.
    3. **Emotional Connection**:

        Engagement promotes communication between users and the library. Users are more likely to get involved when they feel the library meets their needs, provides a sense of community, or

promotes academic success. Emotional engagement frequently leads to increased loyalty to the library.

4. **Feedback and Interaction**:
   Encourage user participation with feedback and suggestions for upgrades or new services. Engaged users are more likely to contribute comments that can help shape future library developments.
5. **Social Engagement**:
   In today's digital world, engagement can consist of communication on social media. Libraries that actively interact and share content on sites like Instagram, Twitter, or Facebook can help establish a community of users who feel informed and communicated.

User Engagement Programme: An Introduction

A user engagement program is a strategic plan that organizations, including libraries, implement to involve and interact with their users actively. The goal is to enhance user experience, satisfaction, and loyalty by creating meaningful and beneficial interactions. In the context of libraries, a user engagement program can include various activities and initiatives designed to attract, engage, and retain library users.

Review of Related Literature

Here's a brief review of the literature on enhancing user engagement in academic libraries:

1. Sharma, J. (2024) This article provides actionable insights for libraries to adjust to shifting user behaviours, establish welcoming spaces, and utilize contemporary technologies. It also examines user motivations, evaluates library practices, and suggests evidence-based solutions to improve user engagement1.

2. Appleton, L. (2020) This study of the literature includes research from a variety of academic librarianship fields. It methodically tackles topics including student voice, student engagement, student participation in learning, and student engagement strategies. Many academic librarians take the initiative to involve students, which has become an essential aspect of academic library management,

3. Cox, J. (2018). The functional, physical, strategic, and organizational changes that academic libraries have made—or may make—to position themselves within the institution better are covered in this article. It draws attention to the difficulties of repositioning libraries in the digital age and

stresses the significance of matching library strategy with institutional goals.

These references should provide a solid foundation for studies on enhancing user engagement in academic libraries.

User Engagement In Academic Libraries

User engagement in academic libraries refers to the active involvement and interaction of students, faculty, staff, and other library users with the library's resources, services, and activities. It involves how users interact with the library physically and digitally and how they gain from and contribute to the library environment. Engagement is not limited to borrowing books or accessing library spaces; it is a continuous connection in which users actively participate, find value in library offerings, and contribute to the advancement of library services.

2. IMPORTANCE OF USER ENGAGEMENT IN ACADEMIC LIBRARIES

1. **Building**: Libraries can develop a sense of acceptance by connecting people from diverse backgrounds via shared activities and interests.
2. **Resource Utilization**: Engaging users enhances the library's resources, including books, digital media, and community programming, which can be used to the fullest.
3. **Academic Success:** Utilising library resources may improve student success. For example, students who seek research assistance from librarians or attend library programs are more likely to succeed academically.
4. **Support Lifelong Learning**: Libraries can promote lifelong learning through workshops, classes, and information resources. It helps users consider the library a long-term academic and professional resource, facilitating persistent study and research.
5. **Feedback for Improvement:** Engaged users provide valuable feedback for improving library services and programs to meet their needs better.
6. **Long-term Loyalty**: Strong engagement with libraries leads to loyal users who use resources beyond their academic careers.
7. **Cultural Enrichment**: Cultural enrichment can be achieved by hosting events and exhibitions that encourage local arts and heritage.

3. STRATEGIES TO ENHANCE USER ENGAGEMENT IN ACADEMIC LIBRARIES

User engagement in academic libraries refers to students, teachers, staff, and other library users actively participating and interacting with the library's resources, services, and activities. It includes how users interact with the library physically

and digitally and how they benefit from and contribute to the library environment. Engagement is not limited to borrowing books or accessing library spaces; it is a constant relationship in which users engage with, find value in library resources, and contribute to the advancement of library services. Increasing user engagement in academic libraries is essential for ensuring that libraries continue to play an important role in education. Academic libraries require a
multidimensional approach that integrates traditional library services with cutting-edge digital resources while creating a feeling of community and engagement. In the face of growing digital tools, virtual learning, and various student needs, libraries must implement techniques that integrate technology, encourage a welcoming environment, and develop profound relationships with their users.

4. HERE ARE SEVERAL STRATEGIES TO ENHANCE USER ENGAGEMENT:

4.1 Improve Physical Space and Environment

- **Comfortable Study Areas**: Create enticing study zones with inviting furniture, sufficient natural light, and quiet regions for independent and collaborative study.
- **Interactive Spaces**: Designate interactive spaces for collaborative projects, creativity, and maker spaces with technologies such as 3D printers, digital media laboratories, and whiteboards.
- **Update Digital Interfaces**: • Optimize the library's website and catalogue for user-friendliness, responsiveness, and mobile accessibility. A well-designed digital interface lets users discover information quickly and intuitively, encouraging continued use.
- **Aesthetic Appeal**: Make the library physically appealing and modern, with comfortable furnishings and well-designed places that motivate students to stay longer.

4.2 Make use of Digital Technology and Digital Resources.

- **Online Workshops/Webinars**: Introduce online workshops/webinars on research skills, citation management, and effective library database utilisation.
- **Virtual Reference Services**: Virtual reference services, such as live chat or AI-powered help desks, provide real-time assistance to online learners who cannot visit the library in person.
- **E-Books and Digital Collections**: Make an extensive collection of e-books, audiobooks, and e-journals available for digital natives and remote learners.
- **Mobile Apps**: Develop library mobile apps for catalogue searches, easy access to service reservation systems, and notification of new resources and upcoming events.

4.3 Enhance Library Programming

- **Interdisciplinary Events**: Arrange lectures or events that bridge disciplines, involving faculty and students across various fields. For example, "STEM and Humanities Night" or interdisciplinary research showcase.
- **User-driven Programming**: Survey library users to determine what topics or programs interest them and design your offerings around their interests.
- **Workshops and Seminars**: Organise various educational programmes like citation workshops, thesis/dissertation help, or skills training on data visualization, digital humanities, or media literacy.

4.4 Create a Sense of Community

- **Community Events**: Organising social events such as Book Clubs, Movie Nights, and stress-relief activities like colouring and Pet Therapy to develop the library as a campus community hub.
- **Social Media Presence**: Use Social Media Channels like Instagram, Twitter, TikTok, and Facebook to publicise library events, resources, and services. Make necessary efforts to attract users by providing relevant content and structuring engaging posts.
- **Student Ambassadors**: It is vital to establish a program where selected students serve as student ambassadors, promoting library services, guiding their peers, and representing the library at campus
- **Networking Events**: • Networking Events include, for example, 'Meet the Teachers,' Research Seminars, and Alumni Affairs. These may be invaluable for students or early-stage academics looking to expand their professional networks. •
- **Organize Social and Cultural Events.** • Organize social and cultural events for informal events such as Library Open Houses, Reading Groups, Author Talks, Movie Screenings, and Stress-relief activities. These social and cultural activities can help to develop a community and transform the library into a social hub.

4.5 Personalize Services

Customized Suggestions: Based on each student's browsing history and behavioural data, the librarian or library staff can recommend books, journals, and other related learning resources to its users.

Research Consultations: Students should be offered one-on-one library consultations to assist in research, resource selection, or even organization of academic work.

Tailored Communication: The availability of workshops, library hours, or new resources will be communicated to the users through email or SMS.

Emails sent based on the interests or majors of the students will increase participation.

Research Consultations: One-to-one research consultations with teachers and students allow librarians to give individualized advice based on their specific needs, which may be concerning research projects, coursework, or thesis writing.

Curated Resource Lists: Develop and disseminate tailored lists of readings or research utilizing faculty suggestions or contents.

4.6 Foster Collaboration with Faculty and Departments

- **Librarians with specialized knowledge**: Assign librarians to specific departments or fields so they can establish connections with professors and students in those fields and offer tailored support.
- **Support for Student Organizations:** Collaborate with student organizations or academic clubs to provide tailored library services that address their particular need. It could be organizing activities, setting up study spaces, or assisting with research.
- **Cooperate with Other Campus Units:** Coordinate events or offer integrated resources, including resume-building workshops that incorporate library resources on research and job market trends, with student affairs, career services, and other departments.
- **Integrate Library with the Curriculum**: Collaborate with instructors to include library resources in their classes through readings, research modules, or project assignments that call for library databases.
- **Co-Teaching and Workshops:**
- To guarantee that library resources are incorporated into the academic process, offer to co-teach classes or workshops with academics, particularly on subjects like information literacy or citation management.

4.7 Improve Library Accessibility

- **Physical Accessibility:** Ensure the library space is accessible by offering ramps, elevators, and designated quiet zones.
- **Digital Accessibility**: Ensure special assistance ensuring compatibility with screen readers and providing alternative formats for materials to people with disabilities
- **Extended Hours:** consider students' schedules and provide extended hours during peak times, like exam period

4.8 Gamification and Incentive Programs

- **Reading Challenges**: Organize fun events, such as a "Summer Reading Challenge" or "Read-a-thon," with incentives for students to get into library resources and then read for prizes
- **Reward Systems**: Adopt a system that allows members to accumulate points or prizes against using library resources for participation in

workshops, book-borrowing, or both. Some rewards are gift cards or gift items, merchandise library goods, or borrowing proper privileges for more time.

- **Competitions and Contests**: Prepare contests (Photography and Photo Competitions, Creative Writing Contests, Quizzes, etc.) wherein participants engage innovatively with the library's provided resources.

4.9 Expand Research and Scholarly Support

- **Support for Open Access**: Provide instruction and resources to promote Open-Access Publishing, Research Data Management, and Academic Sharing Platforms.
- **Assistance for Graduate Students:** Offer specialized services to graduate students, such as Research Assistance, Writing Assistance, and Thesis Formatting
- **Data Management**: Help users build data management plans and organize and archive research data while ensuring they understand how to access institutional repositories.

4.10 Build Relationships with Other Campus Group

- **Collaborate with Student Services:** Organize workshops or information sessions that combine benefits from both areas by consulting with student support offices, like the Career Guidance Services or Counselling Departments.
- **Partner with Student Government:** To understand the student body's needs, cooperate with student government organisations and share events promoting library utilization.

4.11 Create a Feedback Mechanism

- **User Surveys and Polls**: Regularly survey students and faculty to get feedback on library services and programs. Use this data to refine your offerings and make improvements.
- **Suggestion Boxes**: These are either physical or digital boxes that help users quickly communicate ideas, comments, or suggestions regarding additional activities or services of the library.
- **Focus Groups**: Have a group discussion to find out more about users' preferences and needs. Collecting input from students on what would encourage them to use the library more often can help shape future engagement strategies.
- **User Testing**: Give your new Digital Interfaces, tools, and spaces to real users for a test before making a final launch. It will guarantee changes are user-centred and pertinent to the needs of academics.

4.12 Develop Alumni Engagement Programs

- **Alumni Access to Resources**: Offer alumni continued access to specific library resources or special events to build long-term engagement with the library.

- **Alumni Events**: Organize alumni-specific events, such as virtual reunions, to keep alumni connected with the library and encourage them to give back or provide mentorship opportunities for current students.

4.13 Expand Access to Diverse Resources

- **Offer More Digital Resources**: Make sure that the library's digital resources, especially Databases, Online Journals, and e-books, are extensive and easily accessible from remote locations, particularly for students enrolled in online or hybrid learning modes.
- **Open Access Initiatives**: Open Access Publishing should be increased so that academics and students can share their work with others who are interested. It might increase the library's impact and accessibility while incorporating more research cooperation.

4.14 Promote the Library as an Academic Hub

- **Faculty Engagement:** By providing Research Support, Course Material Assistance, and Faculty-focused programs (such as "Researcher Meet & Greets" and "Library for Faculty"), you can promote faculty engagement.
- **Integrate Library Services in Research Projects**: Inspire researchers and postgraduate students to utilize library services in their research activities by using archives, rare books, or special collections.
- **Alumni Engagement**: Continue strengthening links between the library and its former students by giving them special access to events and services. Alumni can provide mentorship, gifts, and support to current students.

4.15 Launch Advocacy Campaigns for Libraries

- **Library Advocacy Campaigns**: Organize events that showcase the library's contributions to student achievement, campus life, and academic research. Use campus events, social media, and signage to raise awareness.
- **Publicize Library Achievements:** Highlight the library's accomplishments. Publicize news regarding the library's influence, such as student success stories, innovative services, or new collections. It helps to show the academic community how valuable the library is.

5. CONCLUSION:

Hence, user engagement in academic libraries establishes meaningful and regular relations with the users and the library itself. It is vital for encouraging academic achievement, building the community, and ensuring its continued leadership role in the academic world. Libraries better meet the needs of their constituencies, adjusting to an evolving set of requirements to facilitate a better educational experience as they focus on increasing users' participation. It is about creating an environment that fosters academic achievement and personal growth. Thus,

effectively implementing user engagement strategies will help the librarians utilise library resources to the fullest extent. In implementing these strategies, libraries can become essential to the academic community and cultivate a culture of learning, cooperation, and innovation.

References

1. Ademilua, S. (2024). Promoting competitive intelligence strategies to advance the library. International Journal of Open and Online Library Science, 4(2), 275-296. https://doi.org/10.17509/ijomr.v4i2.75300
2. Appleton, L. (2020). Academic libraries and student engagement: a literature review. New Review of Academic Librarianship, 26(2-4), 189-212.
3. Cox, J. (2018). Positioning the academic library within the institution: a literature review. Taylor and Francis
4. Giannaros, A., Kotsopoulos, K., Tsolis, D., & Pavlidis, G. (2020). Creating a personalised experience for libraries' visitors. In Proceedings of the Conference on Digital Libraries (pp. 491-498). https:// doi.org/10.1007/978-3-030-36126-6_55
5. Farmer, L., & Stricevic, I. (2011). Using research to promote literacy and reading in libraries: Guidelines for librarians. https://www.analibraryse.com/blog/how-do-you-engage-and-attract-library-non-users
6. https://arxiv.org/abs/2411.02993
7. https://d-techinternational.com/us/blog/2022/11/01/10-easy-ways-your-library-can-attract-more-patrons/
8. https://journals.stmjournals.com/ijsu/article=2024/view=185853/
9. Meesad, P., & Mingkhwan, A. (2024). User experience and engagement in smart digital libraries. In Libraries in Transformation (pp. 273-326). SpringerLink. https://doi.org/10.1007/978-3-030-12345-6_12
10. Paul, S., Chauhan, S., & Pal, A. K. (2024). Empowering library users: Creative strategies for engagement and innovation. arXiv. https://doi.org/10.48550/arXiv.2411.02993
11. Pew Research Center. (2013, January 22). Part 4: What people want from their libraries. Retrieved from https://www.pewresearch.org/internet/2013/01/22/part-4-what-people-want-from-their-libraries/
12. Sharma, J. (2024). Strategies for increasing user engagement in academic libraries. International Journal of Sustainability, 1(2), 1-5. https://doi.org/10.1016/j.ijsu.2024.01.002
13. What is user engagement? How do we measure it? - storyly. (n.d.). Retrieved December 27, 2024, from https://www.storyly.io/glossary/user-engagement

14. University Libraries. (2024). User engagement. Retrieved from https://library.louisiana.edu/services/user-engagement
15. Zou, H., Chen, H., & Dey, S. (2015). Exploring user engagement strategies and their impacts with social media mining: The case of public libraries. Journal of Management Analytics, 2(1), 1-19. https://doi.org/10.1080/23270012.2015.1100969

A Model Curriculum for Induction Programme for Hospitality Studies Offered by Library

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Abstract
This study aims to develop a model curriculum for the induction programme for hospitality studies offered by the library. This framework will be helpful for the undergraduate first year students of hospitality studies. Students will have a comprehensive knowledge of information resources relevant to hospitality studies. They will be proficient in retrieving and evaluating information from various sources. It will help the students to be familiar with the library's physical and digital resources. It will enhance in acquiring new skills for effective information retrieval and will be helpful in doing academic research. It will enhance the ability to use information ethically and effectively in academic and professional environments. This will help students to stay updated on emerging trends and technologies in hospitality information management.

Keywords
Curriculum, Hospitality Studies, Library, Induction, Orientation, Library Tour, Undergraduate Students.

Introduction

Library plays a crucial role in student's life. The wealth of knowledge and resources available in the library should be notified to the students so that they can be aware of it and can make use of it effectively and efficiently. Proper usage of libraries leads to personal, academic and professional growth of students; it also supports research and innovation. It nurtures intellectual curiosity and encourages lifelong learning in students. Librarian can bridge the gap between students and the wealth of knowledge available in the library in physical and online platforms by proactively reaching out to students through induction programme. Librarians can conduct seminars and workshops for students to engage them in academic and research activities. These sessions will make the learning enjoyable and

accessible to students. It will inspire them to read more and lead further to their brighter future.

Need for the Study

Library plays an important role to promote students' academic growth and overall development. An induction programme helps students to familiarize themselves with the available information resources, services and facilities in the library. It helps in developing strong bonding between the library resources and users. It also builds connections with peers and faculty which leads to gaining a sense of belonging and collaboration. The induction programme promotes awareness of library resources among students which enables students to make full use of it. Students set a solid foundation for their studies by making full use of library resources and services. Induction programme connects the right users to the right library resources and services. It helps in bridging information gaps and saves the time of the users.

The main purpose of 'designing a model curriculum for the induction programme for hospitality studies offered by the library is to equip students with the knowledge and skills to effectively utilize library resources and services which will lead to enhance their academic and professional quests in hospitality studies.

Objectives of the Study

1. To introduce students to the library's resources and services and enabling them to effectively navigate and utilize available materials.
2. To develop strategies for effective information retrieval, fostering skills that support academic success in hospitality studies.

Scope of the study

Hotel management colleges (affiliated to Savitribai Phule Pune University, Pune) were considered for this study.

Methodology

Librarian can give lectures along with the PowerPoint presentations, with proper demonstrations on Online Public Access Catalogue (OPAC), online databases, citing tools, etc.

Literature Review

Sutton & Tse (1997) studied curriculum issues in the relationship between language, culture and learning, it was found that language was one cause affecting students' learning as well as culture also influenced learning. Christou (1999) recommended that to enhance the Greek hospitality education system, including curriculum reforms and increased collaboration with industry stake holders. It will lead to improving the relevance and efficacy of hospitality education which will align it with global standards and dynamic needs. Chung (2000) recommended to enhance curriculum design which will meet industry standards while addressing the evolving needs of students and employers. Lam & Xiao (2000) revealed that a key challenge is poor curriculum design, which often fails to align with industry needs in terms of both quality and quantity of trained professionals. The study discussed several educational reforms, including improvements in curriculum design. Baum (2002) reviewed skills and training for the hospitality sector in four key areas those are 'nature of work and skills in hospitality', 'De-skilling in the workplace', 'Technical vs. Generic Skills Debate' and 'Skills and the education or training process'. Chung-Herrera, Enz & Lankau (2003) highlighted the need for tailored competency frameworks in hospitality, with a focus on self-management and strategic thinking to drive leadership success. Maher (2004) examined how learning outcomes are used in higher education and evaluated the implications for curriculum design and student learning. Oberli (2019) developed a better understanding of the impact of school curriculum to identify gaps in the capacities of hospitality vocational education and training to form critical citizens and to enhance students' social responsibility. Ross (2023) emphasized designing a first-year curriculum to support transition and progression of students.

A Model Curriculum for Induction Programme for Hospitality Studies Offered by Library

Curriculum for Hospitality Studies: Information Resources, Retrieval and Use

Course Title: Library Skills for Hospitality Studies
Duration: 30 Hours
Course Level: Undergraduate
Target Audience: First-year students of Hospitality Studies
Semester: I

Programme Objective:
To introduce students to the library's resources, services and strategies for effective information retrieval, fostering skills that support academic success in hospitality studies.

Module 1: Introduction to the library (1 Hour)

- Library Tour: Tour of physical spaces and facilities.
- Library membership: Registration process, library rules and regulations.
- Circulation policies: Borrowing, renewing and returning resources.
- Research assistance and reference services.
- Digital support: Remote access to resources.

Module 2: Introduction to Information Resources (5 Hours)

- Importance of Information Resources
    - Types of information resources: Primary, secondary and tertiary.
    - Role in academic and professional development.
- Role of Libraries and Learning Resources in Academic Success
    - Structure of the Hospitality Studies Curriculum
    - Overview of Hospitality-focused library collections (Books, e-books, journals; magazines, newspapers, industry reports, Hospitality databases (e.g. ProQuest, EBSCO), Open educational resources (OERs).
    - Reference Materials: Encyclopedias, dictionaries and manuals for hospitality.
    - Introduction to Library Services.

Module 3: Information Retrieval Skills and Techniques (6 Hours)

- Effective use of library catalog OPAC and Search Tools, to locate books, articles and digital content.
- Search Strategies
    - Keywords, Boolean operators, and advanced search techniques.
    - Use of online search engines (Google Scholar etc.)
- Hospitality specific databases and tools
    - Searching databases effectively
    - Accessing Industry specific case studies and market reports
- Evaluation of Information
    - Evaluating and selecting reliable information sources.

- Hands on practice
    - Practical sessions on database searching and resource identification.

Module 4: Application of Information Resources (6 Hours)

- Academic Applications
    - Writing research papers and reports.
    - Citation Tools: Introduction to reference styles (APA, MLA etc.)
- Professional Applications
    - Market research and analysis for hospitality projects.
    - Trends and case studies in hospitality innovation.
- Presentation Skills
    - Structuring information for effective communication.

Module 5: Research Support Services (5 Hours)

- Copyright and Intellectual Property
- Plagiarism Awareness: Understanding ethical use of information.
- Literature Review Basics: Identifying key sources for assignments and projects.
- Referencing Tools: Overview of reference software (e.g. Mendeley, Zotero, EndNote)
- Research Paper Writing Support.

Module 6: Soft Skills and Career Resources (3 Hours)

- Communication and presentation skills: Library's role in skill enhancement.
- Career guidance: Resources for internships, jobs and career development in hospitality.
- Personality development tools: Self-help and soft skills resources.

Module 7: Emerging Trends and Technologies (4 Hours)

- Digital tools and platforms
    - Use of apps and software or websites in hospitality research.
    - Exploring artificial intelligence in information retrieval.
- Industry Insights
    - Trends in hospitality management and operations.
    - Sustainability and innovation in the hospitality industry.
    - Skills and Attributes Required for Hospitality Professionals such as communication skills, importance etiquette, teamwork and leadership in hospitality settings, problem-solving and critical thinking in customer service scenarios.
- Collaborative learning

- Group activities to explore and present on emerging technologies.

Assessment Methods
Reflection Essay: Students can write about their key takeaways from the induction programme.
Searching for a title in the catalogue or databases.
Assignment on finding and citing an article relevant to hospitality studies.
Presentations: Group discussion and presentations on assigned topics.

Learning Outcomes
Upon completing the course, students will:

1. Have a comprehensive understanding of information resources relevant to hospitality studies.
2. Be proficient in retrieving and evaluating information from various sources.
3. Demonstrate the ability to use information ethically and effectively in academic and professional settings.
4. Stay updated on emerging trends and technologies in hospitality information management.

References

- Hospitality related academic journals and books.
- Online databases: ProQuest, JSTOR, EBSCOhost.
- Industry reports and case studies.
- Citation guides and plagiarism detection tools.
- Online tutorials and workshops on research skills.

Feedback: At the end of the programme, participants can be provided with feedback form, students can share their learning experiences with their feedback on the programme.

Conclusion of the Study

Effort should be taken by the Librarian to conduct induction programmes every year for the first-year students at the college. This will lead to proper utilization of the library resources, services and facilities. So that students can take maximum benefit of it and can achieve academic excellence, it will be lifelong learning for them. Students will become aware of the various online courses which are available free of cost, such as those on platforms

like Swayam, Udemy, etc., and can maximize the use of the open access resources.

References

1. Baum, T. (2002). Skills and training for the hospitality sector: A review of issues. Journal of vocational Education and Training, 54(3), 343-364.
2. Christou, E. S. (1999). Hospitality management education in Greece An exploratory study. Tourism management, 20(6), 683-691.
3. Chung, K. Y. (2000). Hotel management curriculum reform based on required competencies of hotel employees and career success in the hotel industry. Tourism management, 21(5), 473-487.
4. Chung-Herrera, B. G., Enz, C. A., & Lankau, M. J. (2003). Grooming future hospitality leaders: A competencies model. The Cornell Hotel and Restaurant Administration Quarterly, 44(3), 17-25.
5. Lam, T., & Xiao, H. (2000). Challenges and constraints of hospitality and tourism education in China. International Journal of Contemporary Hospitality Management, 12(5), 291-295.
6. Maher, A. (2004). Learning outcomes in higher education: Implications for curriculum design and student learning. Journal of Hospitality, Leisure, Sport & Tourism Education (Oxford Brookes University), 3(2).
7. Oberli, C. (2019). The contribution of hospitality vocational education and training towards forming critical citizens (Doctoral dissertation, University of Glasgow).
8. Ross, O. (2023). A mixed method approach evaluating the impact of the faculty of business and hospitality's student success model within the department of business and management, in Athlone Institute of technology, over eight academic years (Doctoral dissertation, Dublin City University).
9. Sutton, J., & Tse, P. S. (1997). Curriculum issues in the relationship between language, culture and learning: The case of food and beverage management teaching. Journal of Vocational Education and Training, 49(3), 367-384.

Strategies to engage library users

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Abstract
In the time of cutting edge technology and digital revolution libraries are facing the hardship of less no. of visitor, in spite of successfully using the advance technology, digital collection and much more. A very fundamental question how to deal with such crisis which impacts not only the number game crises but the significance of traditionally the profession called "Librarianship".If we seek and deep rooted the cause, it has been found that the place where we can acquire, disseminate the knowledge (Information) as a truth in the form of natural way, place must be peaceful and with positive environment. In Indian Traditional Knowledge System there is an important statement ("एकाग्रता हर विद्या का मूल-मंत्र है") "Concentration is the main motto of everyknowledge". My research focuses on the implementation of various strategies to engage library users as a natural way and creating the Library environment as natural environment where concentration is automatically gained and reader not only enjoying the reading but acquiring the ability to connect the knowledge (truth) of the content. Very well-known concept of Liaison/Embedded/Multitasking-Librarianship/Synergy-Librarianship successfully practiced.

Keywords
Liaisoning Librarianship Embedded Librarianship, Synergy Librarianship, Multitasking Librarianship.

Introduction

There is a significant use of ICT on Libraries to fulfill the library science 4th rule "Save the time of the readers/users". Gunjal (2017) describes library professionals need to equip themselves with the latest trends to fulfill the user's requirements which is the part of Embedded librarianship and Liaisoning librarianship. Working in R&D environment and in special library category my experience agreed with Pati (2021) that in this age of digital revolution users are hardly visiting the library premises, in spite, successfully using the library collection and beyond. Traditionallyinspire with the Indian philosophy of five fundamental things of every creation and

energy.("पंच तत्व से बना शरीरा, क्षिति, जल, पावक और गगन, समीरा।"- cited quote from Shri Goswami Tulsidas).I am presenting my literature survey and results under the five points pattern and presenting the term "Synergy Librarianship". Following is the five aims of strategies to engage library users.

1. To facilitate ease of service and thus to increase the no. of users/visitors
2. Creating the environment in which concentration is automatically gained without any stress.
3. I T Department, service provider'sgateway of publishers and several consortia, engulfing the role of traditional librarian.
4. Creating the "must visit place- worth seeing" theme means besides the collection of needed information there must be something related to aesthetic, museum and something like a Selfie- Point.
5. Connecting with the great Dr. Ranganathan's library science laws 1& 2 my approach "Shelter for everyone" and all are welcome with the justification of "Synergy Librarianship" concept.

Traditional-librarian and innovative library services overview

As five point strategy following is the Service at NMRL-DRDO

1. **Collection of Printed Books & Journals with the OPAC Services through Indigenous ILMS: Suchika**

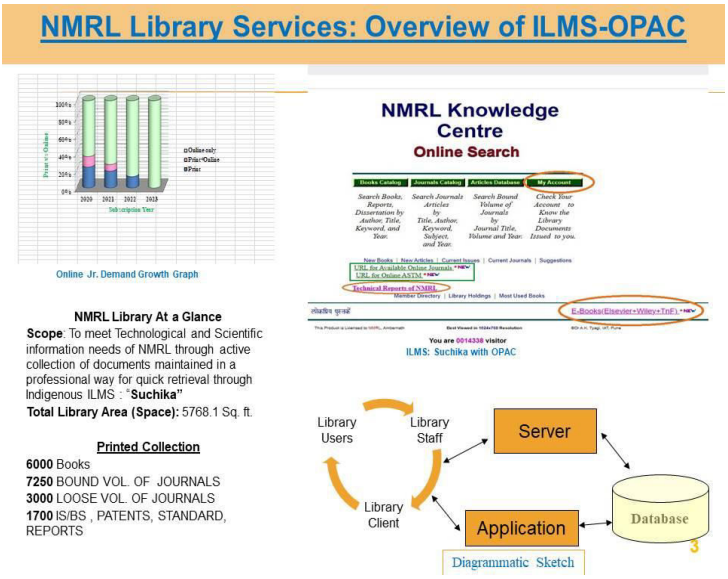


Fig.1.Overview of ILMS Suchika

2. IP Authenticated Online Journal Services

More then 2000 e-journal access has been provided through DESIDOC Consortia

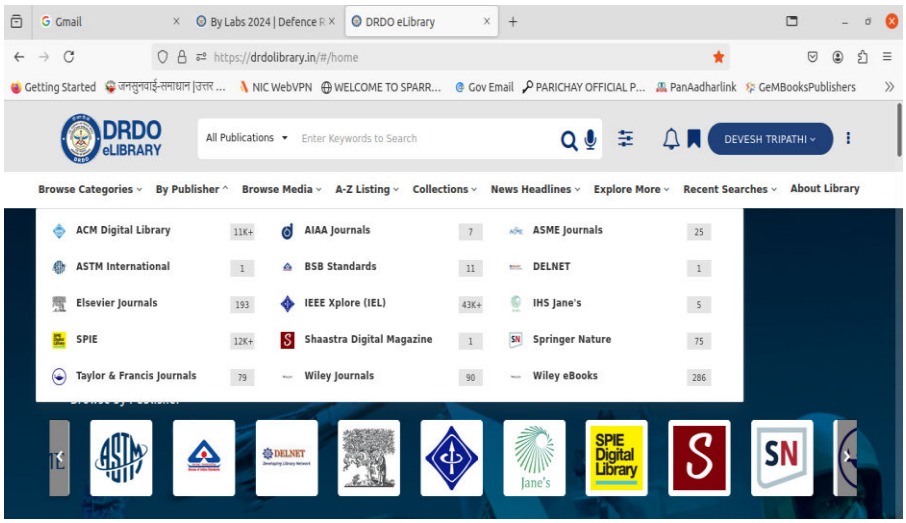
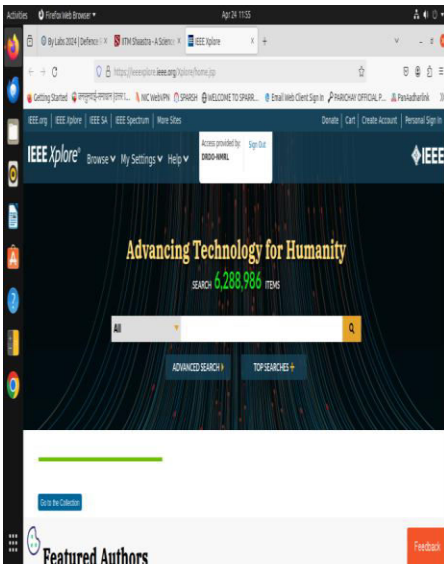


Fig.2. DRDO e-Library- Publisher under Consortia

3. Secure E-Library Services and Resource Sharing

Currently NMRL providing resource sharing with two Institution through DESIDOC i.e IEEE Xplore and IIT Madras-Shastra.



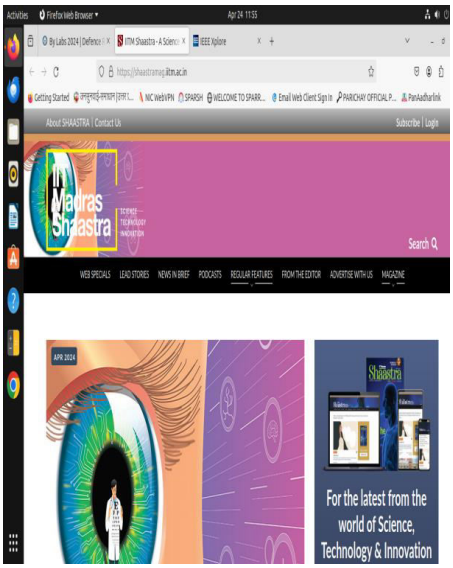


Fig. 3 & 4 Resource-Sharing with IEEE&IIT Madras: Shastra

4. **Digitization and E-books Services**:
NMRL technical reports have been digitized and available with E-books on LAN under DRDO Knowledge repository with user authentication.

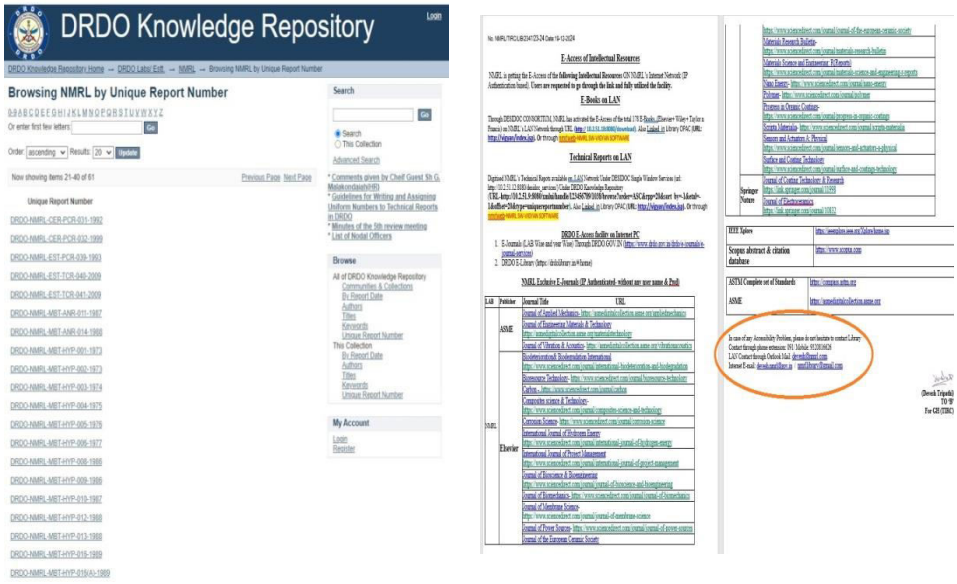


Fig. 5 & 6 Digitized Technical Report and User Awareness Circular

5. **IPR Services**
Plagiarism Checking through DESIDOC with “iThenticate” software.

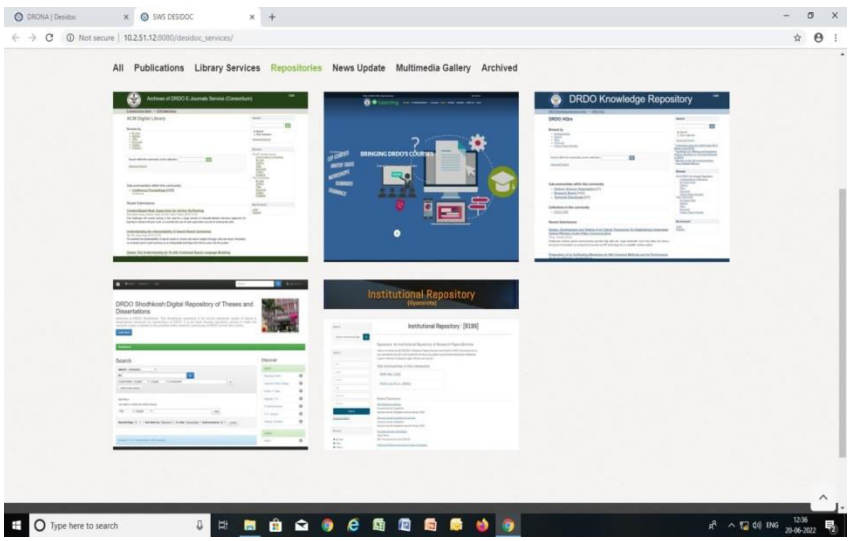


Fig.7 DRDO Repositories services

Implementation of non-traditional-librarian balancing Strategies to engage library users

Library generally is enriched with the Space in comparison to other departmentwe have implemented followingnon-traditional-librarian balancing strategies inside the library premises with the conduction of User Awareness program in between. The Impact of such programs not only increases the no. of visitors but the quality and environment of R & D activity.

1. **Meditational Activity**

   Tradition: The Great Ancient Indian Nalanda and Takshshila Pustaklay under the Gurukul Education System, their surrounding environment and activity is full of ancient Vedic parampara which supports the natural concentration and Peace.

   Implementation: Weekly Conduction of relaxation and meditation sessionfollowed by user awareness program in support to develop the natural positive environment of library

Fig. 8 & 9 Yoga & Meditation

2. **Brain Storming Group Discussion Activity**

Tradition: The Great Ancient Indian "वेद and उपनिषद" known to be as "श्रुति" realizes the importance of effective listener and increases the alertness and patience ability of person

Implementation: Weekly Conduction of lecture-cum group discussion facility over a cup of tea and of course with the maintaining of stress free and friendly environment.

Fig. 10 & 11 Lecture cum discussion Activity

3. **Event cum Exhibition Activity**

Tradition: The motto behind the event is brotherhood, respect to each other and Cultural awareness.

Implementation: Always ready to Grab the Opportunity of event conduction and be the part of Event Management Activity. Whereas possible make the space for selfie-point and exhibitory items. Following event/activity successfully conducted in the NMRL Library

- Provided Internship facility to BLIS Student as Internship Supervisor.
- Actively participated and manage to perform the stage show"JamanaBadalRahaHai". On Women's day event.
- Successfully conducted the Yog-Mahotsav event on 26-06-2023 as NMRL-Nodal Heartfulness Meditation Ambassador.
- As Event Management Team, Actively contributing in Rajbhasha, VaigyanikAvumTaknikiSanghosthi .
- Providing the Library Space for RajbhashaPakhwada event, departmental meeting and many more.
- Presented the lecture on NMRL Library Services in Hindi for RajbhashaKaryanvayanSamiti.
- Presented the lecture on "Plagiarism awareness for Researchers" under DOPT training programs.
- Conduction of Orientation programme, User awareness program, Farewell programme
- International Millets-cooking competition, Poster exhibition etc.

Fig.12 Stage/Drama Event


Fig.13 Rajbhasha Pakhwada Event

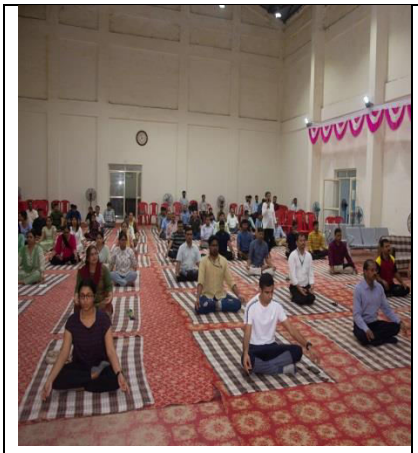


Fig. 14 International Yoga day

Fig. 15 Har Dil Dhyan Har Din Dhyan

Fig. 16 Millets Cooking Event

Fig.17 Millets Poster Exhibition

Fig.18-Prize Distribution

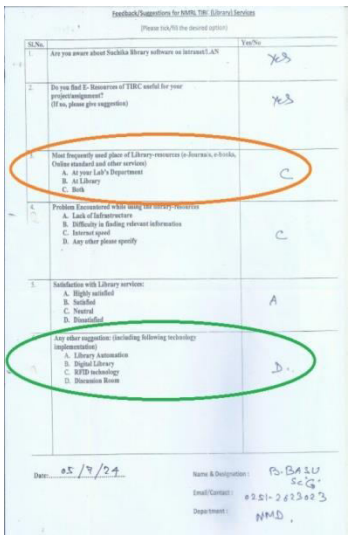
Fig.19-User Awareness Program &Holi Celebration

4. **Motivational and counseling Activity**

Tradition: As it has been said "First impression is the last impression" and knowing the experience of others itself are time saving learning ability

Implementation: Always welcome the new comers and conduction of orientation program, organize a farewell for the transferee and superannuated users to know their important experienced words in relation to use of library and work place, always welcome the Suggestion and Feedback.

Fig. 20 & 21 Welcome/Orientation and Farewell/Superannuation event



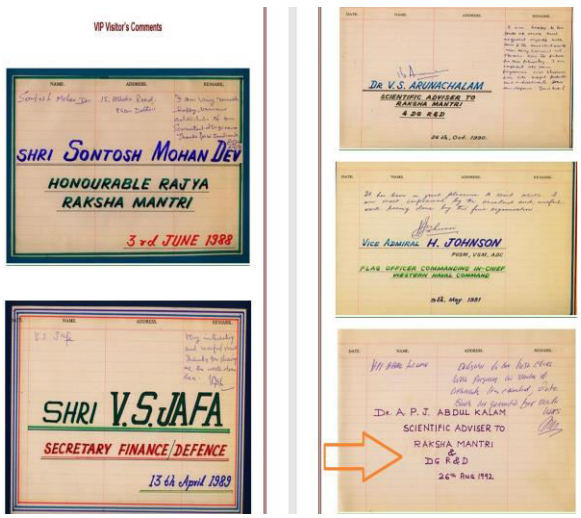
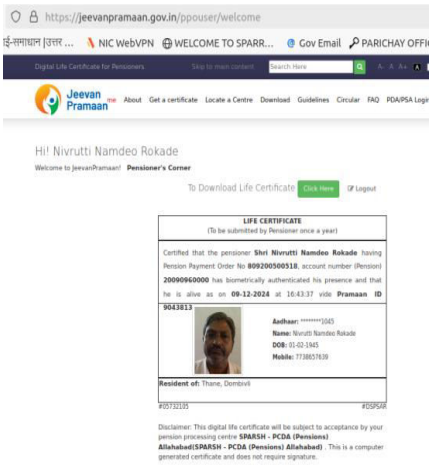


Fig.22 & 23-Feedback of LMC-Chairman and Fig.17-Heritage Visitor's Remark

5. **Ex-Employee and Retirees Corner Activity**

Tradition: One of the fundamental duty of Indian Tradition is “तर्पण” &“क्रतज्ञता”. Showing the respect, thanksgiving and gratefulness approach toward everyoneand especially Ex- employee and retired persons.

Implementation: Always ready to pay some time to the ex-employee and retired person with providing the helping hand to their pension related difficulties with the thanksgiving and gratefulness approach in respect of their valuable services to the organization.



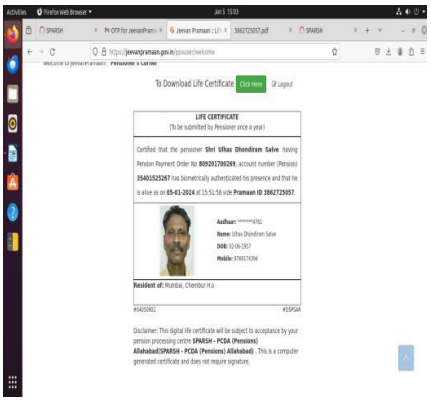


Fig.24 &25 Retirees Jeevan Praman Patra

Observation and conclusion

1. With the supportive attitude always welcome the users visiting library having different approaches of aim resulting increased no. of visitors significantly.
2. Implementing the different strategies to engage library users, without any limitation of librarian and underestimated Librarianship. With the handy support of authorities libraries shows the potential of performing “State of the Art” space& place.
3. Implementing the different eventful activity not only engages the library users but also it has been found that librarian’s

involvement in the strategic planning and service group activity increased.

4. Due to involvement in different activity and interaction among various type of users and their feedback Library and Librarian became important endeavor for the future challenges of the organization
5. With the strategies to engagement of users and even Ex-employee and retirees corner not only helps to Admin department but also justify the purpose “Shelter for everyone” (Library and Librarian always available for the support) justifying the term “Synergy Librarianship”.

References

1. Pati, B. &Majhi, (2019) Pragmatic Implication of Embedded Librarianship in Academics: a Review of Eminent Literatures, Library Hi Tech News https://doi.org/10.1108/LHTN-08-2018-0052
2. Bhojraju, Gunjal (2021), Emerging User Community Through Innovative Library Services. ISBN:978-93-87698-33-8, 263-272.
3. Pati, Bharti (2021), Exemplary Instances of Liaison Librarianship. ISBN:978-93-87698-33-8, 339-353.
4. Ansley Stuart. (2019). Embedded librarianship: the future of libraries. https://www.libraryjournal.com/?detailStory=embedded-librarianship-the-future-of-libraries
5. https://www.heartfulness.org
6. https://www.jagran.com/spiritual/religion-concentration-of-mind-opens-the-door-to-our-success-22357265.html

NAAC based best practices in library services: Special reference to BMK KRC Pune Branch

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Abstract
This paper discusses what are the best practices mentioned by NAAC for any academic library. Best practices are very useful to optimise the use of all resources available in the library. It also helps to improve quality and efficiency to library users. Best practices also depend on the users demand and type of services library want to give. Actually, best practices are not a one-time process. Library professionals have to keep updating and adopting new practices to fulfil the requirements of the reader. With help of this one can give services more efficiently and effectively. This article may help to know some different best practices to give better services.

Key Words
Best practice, Academic library, library services, library resources

Introduction
Academic libraries play key role in supporting academic activities of that institute. Academic library should establish, maintain and promote library and information services, both quantitatively and qualitatively. Quality of library services is improved by introducing best practices in library services. Academic libraries offer different types of services. It has voided range from reference services to information literacy services. The library should develop and design best practices in such a way that they should help to fill the gap between library collection & user community for maximum utilization of the resources.

This is the age of information explosion role of libraries is to support teaching learning. Importance of libraries is not less than a classroom, it is sometimes more important than even the class -room. Expectations of the users of academic libraries are changed in this age of information and communication. Ways to build a library collection and offer services to the end users vary from the past years. Overall functions of the library and information centres have to fast- accelerate educational innovations in the present-day scenario. It has

become necessary for continuous review and improvement of the knowledge resource centre.

Definitions of Best practice:

Collins Dictionary

Best practice is the way of running a business or providing a service that is recognized as correct or most effective.
(https://www.collinsdictionary.com/dictionary/english/best-practice)

Cambridge dictionary

A best practice means, a working method or set of working methods that is officially accepted as being the best to use in a particular business or industry. (https://dictionary.cambridge.org/dictionary/english/best-practice)

NAAC Based Best Practices in Library:

To promote effective and interactive access to all information resources college libraries need to have facilities that will support the users. The libraries need to provide reading space with sufficient light, clean drinking water, hygienic sanitation, and most important is welcoming staff. Spaces with adequate and appropriate seating arrangements and open maximum time of the day. It will automatically help to improve effective use of the library's resources including digital resources. For students staying on campus or in the hostel's college libraries are required to consider study space needs. The libraries need to prepare well-framed rules and guidelines with regard to hours of access, circulation policies, and other regulations to offer better services to the users. (NAAC, 2024)

The best practices suggested by the NAAC in its quality indicators in Library and Information services are as listed below.

- Computerization of Library with standard Software.
- Inclusion of Sufficient information about the library in the college prospectus.
- Compiling user statistics.
- Displaying newspaper clipping on the notice board periodically.
- Career/ Employment information services.
- Internet facilities to different user groups.
- Information Literacy programs.
- Suggestion box and timely response.
- Displaying new arrivals and circulating a list of those to academic departments.
- Conducting book exhibitions on different occasions.

- Organizing book talks.
- Instituting Annual Best User Award for students.
- Organizing competitions annually.
- Conducting user surveys periodically. (NAAC,2024).

Best Practices in BMK KRC, Pune:

1. **Library Hour**:
   Colleges allot one hour a day as a library hour. It is compulsory to come and sit in the library in that hour. Students may sit and read, may do internet search. Any activity related to the library. Sometimes faculty members may accompany the students. This practice helps to increase footfall in the library and also to inculcate reading. In Library hour students and faculty members visit the library and spend an hour in the library for reading or they discuss on reading. By keeping an hour in their time table students spend an hour in the library which brings them closer to the reading materials, indirectly it helps to increase reading habits to of students. This activity is also called as DRS (Drop Everything and Read)

2. **Information literacy programmes:**
   Information literacy programmes are previously known as library orientation or educating the users. The orientation helps & useful to the fresh students at the beginning of each academic year about the importance of the library, exposing the students to its various library services. It is very important to create an awareness about the library resources and services. This helps to users to get information they need and to locate the information quickly and effectively and thus to ensure the maximum use. This library conducts Il program at the starting of academic year. The program is different for different classes. For eleventh class it is only introduction and a tour of a library. For first year detail introduction of OPAC and other resources. For post graduate level and research scholars there is in depth training on searching of databases as well as online searching. We also teach how to write a bibliography/reference, so that they can use it while writing a research paper.

3. **Web OPAC:**
   Library OPAC is used by patrons to search for materials without a librarian's assistance. It is designed to be searched by title, author,

subject, or keyword in an interface that is more user-friendly than the previous card catalogue. It is interactive, flexible, accurate, and user-friendly. It provides secured access to digital materials. It has good collaborative capabilities. Any person can search a document from any networked library. We can check the update quickly. The cataloguer only requires minimal professional skills, to manage the records according to local variations.

4. **Table of Content:**
   In charge of periodical section scans the content page of each print periodical and sends it to a faculty member of that subject by email. It helps to the faculty to know the latest content in respective subject. This is known as TOC in library.

5. **Best Library User of the month:**
   Library gives a best reader/ reader of the month award every month. This practice helps to encourage students/ staff to make maximum use of library resources & services available in the library.

6. **Granthotsav:**
   Branch Library, Pune organizes yearly Granthotsav, a festival of books. Library has been organizing this since 1993 successfully. The basic purpose is to encourage the reading habits among the readers. In this programme well-known personalities like Dr. Jayant Naralikar, Justice B. N. Deshmukh, Shri Avinash Dharmadhikari, Dr. Mohan Agashe, Dr. Shreeram Lagoo, Shri Anil Awachat, Shri Ramchnadra Dekhne, Shri. Sumitra Bhave, Shri Deepak Shikarpur, Dr. Narendra Jadhav were invited to talk to the students. On the occasion of the Granthostsav Competitions are organized for the students include various activities like memory game based on book titles, quiz competition, dumb-charades, crossword, slogan, debate competition etc. The programme includes various competitions based on books titles, book exhibition cum sale and a lecture by a well-known personality.

7. **Annual book Exhibition.**
   Library organises book exhibition time to time. At the time of Granthotsav exhibition of new books is arranged for three days. And throughout the year library arrange book exhibition on different occasion (i.e. National Library Week, World Copyright Day,

Independence Day etc.) display rare books, newly added books or books of particular subject which are available in the library. This will lead to increased awareness among readers about knowledge wealth the library possess they can demand the books accordingly.

8. **Pick a book:**
   This is also well known as 'pick me up'. If any reader, faculty member or a student wants at donate a book to the library. But due to duplication or bad physical condition of that book library may not need such a book. We keep these books on a table at the entrance of the library. Anyone/ any reader can take home these books. They are absolutely free. Many of our student take these books.

9. **Student internship programme**
   Hands on training in the different sections of the library to post graduate students is given every year. We divide students into groups and can be allotted work assignments among the student groups for handling different sections of the library. A brief orientation of the work in different sections has to give before starting work. After the completion of their work, a report should be prepared. From this hands-on experience students get a clear understanding of the functions/activities in each section of the library. It also helps to boosts the confidence among students and it also helps the library to complete tasks like data entry or barcoding.

10. **Earn while you learn programme**
    Library provides a part-time job for the students to work under earn while learn programme. Students, who don't have any financial assistance, and who are good academic record are selected to work in various sections of the library. Through the training of library professionals, they can assist the library staff members in different types of regular non-technical works. They can earn little money through this programme for their studies. They can understand the routine works of the library through this earn while you learn programme. Library staff can give them time and work schedule that will not affect their learning.

11. **24/7 Access to e-resources**

A well-organized library provides an un-interrupted world-wide access to the library resources from anywhere, anytime, for the petrons. E-books, E-journals, electronic databases are the widely used e-resources in libraries. In BMK KRC users are oriented about how to use free-e databases and paid e-databases at the time of information literacy programme. If they occur any query library staff helps again and again to the students to maximise the use of online resources.

12. New Arrivals

We display book covers of new books and list of new books on the notice board. Also list of new arrivals is mailed to HODs of every department and principals of colleges.

It will help to faculty to know whether the books they have ordered received or not.

And the list on the notice board helps students to know of new arrivals. So that accordingly they could demand for those new books & get it.

Conclusion

In any academic library apart from providing regular services it is necessary to provide new services as well as to make changes in existing practices. It helps to serve patron better and to help for improve quality of library services. NAAC policy helps in developing the Academic Libraries and Information Centres to make modernize and to provide good standard service to users. The best practices must help to fill the gap between library collection and readers. Developing best practices, analysing and improving them at a regular interval will lead to continuous improvement in overall performance of the library and the institute.

References

1. Badiger, Mallikarjuna. et.al. (2017) Best Practices in Libraries: An Overview. International Journal of Humanities and Social Science Invention ISSN (Online): 2319 – 7722, ISSN (Print): 2319 – 7714 www.ijhssi.org ||Volume 6 Issue 7||July. 2017 || PP.65-68. Accessed on 03 December, 2024. From, https://www.ijhssi.org/papers/v6(7)/Version-2/M0607026568.pdf
2. Borade, Nirmala and Golwal, Madansing (2023) NAAC Based best practices in academic libraries and knowledge resource centres: at a glance. Library Scholar. Volume: 3 (2023) Special Issue :1 (March). ISSN

2583-2549 https://www.researchhub.org.in/library-scholar/admin/uploadedImage/reserch/8243.pdf

3. Glass, Elizabeth and Sheffield, Debi (2008) Best Practices in Multicultural Library Services: Library Settlement Program (LSP) at Toronto Public Library. World library and information congress. 10-14 August 2008, Québec, Canada http://www.ifla.org/IV/ifla74/index.htm
4. Mohanan, Neethu. (2020). Best Practices in Library Resources and Services in Academic libraries. Accessed on 03 December, 2024. From, https://www.researchgate.net/publication/339353735_Best_Practices_in_Library_Resources_and_Services_in_Academic_libraries
5. NAAC (2023). Guidelines on quality indicators in library and information services : affiliated/ constituent colleges. Accessed on 03 December, 2024. From http://naac.gov.in/docs/Guidelines/Guidelines-Colleges-Library.pdf
6. Prabhakar,SVR, Rani, S.V. Manjula (2017). Best Practices adopted in Academic
   Libraries and Information Centers: At a Glance. International Journal of Librarianship and Administration,8(1),7-15.
7. Prabhakar, S.V.R. and Manjula Rani, S.V.(2017) Best Practices adopted in Academic Libraries and Information Centers: At a Glance.International Journal of Librarianship and Administration. ISSN 2231-1300 Volume 8, Number 1 (2017), pp. 7-15 © Research India Publications http://www.ripublication.com
8. Raghu, M. (2019). Best Practices in Academic Libraries. Paper Submitted at National Conference on Scholarly Communication and Academic Libraries in the Digital Era. Accessed on 03 December, 2024. From, https://www.academia.edu/39755427/Best_Practices_in_Academic_Libraries

Leveraging Mobile-Based Services for Enhanced Library Accessibility: A Conceptual Analysis

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Abstract
The advent of mobile technologies has significantly transformed the way libraries deliver services, making them more accessible to users anytime and anywhere. This paper explores the role of mobile-based services, including mobile apps, optimized websites, and location-based tools, in enhancing library accessibility. It reviews the evolution from traditional to digital libraries and discusses the benefits, challenges, and recommendations for implementing mobile solutions. Findings highlight increased user engagement and accessibility but also identify challenges such as technological limitations and the digital divide. The paper emphasizes the importance of user-centric mobile solutions, addressing digital inequities, and ensuring privacy and security to meet the needs of modern library users.

Keywords
Mobile library services, digital libraries, mobile applications, accessibility, location-based services, user engagement, mobile technologies, digital divide, library innovation

Introduction

In the digital era, the role of libraries has evolved significantly, primarily due to advancements in technology. Introducing mobile devices has created new opportunities for libraries to reach their users outside the traditional brick-and-mortar setting. Libraries that incorporate mobile technologies into their services can offer greater convenience and improve access to information, which is essential in an age where instant access to knowledge is highly valued (Sahu, 2018). This paper explores how libraries can leverage mobile-based services to enhance accessibility for users by discussing mobile applications, mobile-optimized websites, and location-based services.

Research Objectives

- To analyze how mobile-based services enhance library accessibility.
- To explore the key mobile technologies that can be used in libraries.
- To examine the challenges and limitations associated with mobile-based library services.
- To present best practices and recommendations for implementing mobile solutions in libraries.

The Evolution of Libraries and the Role of Technology

1. Traditional Library Services

Traditional library services were once confined to physical spaces and relied on in-person interactions between staff and patrons. Patrons would visit the library to browse catalogs, check out books, and attend events. While this model still has its merits, it poses several limitations in terms of accessibility, especially for those unable to visit libraries regularly (Crawford, 2016).

2. The Rise of Digital Libraries

The shift from physical to digital collections marked a significant change in the way libraries operate. Digital libraries, which provide online access to resources such as e-books, databases, and journals, paved the way for a more accessible and user-friendly library experience. However, the full potential of digital libraries could not be realized until mobile technologies became widespread (Borgman, 2007).

3. The Advent of Mobile Technologies

Mobile technologies have disrupted many industries, including libraries. Smartphones, tablets, and mobile apps have revolutionized access to information, providing users with instant access to library resources, services, and communication channels. Mobile technologies allow libraries to reach audiences that were previously underserved, especially those who may face physical or geographical barriers (Li et al., 2020).

4. The Rise of Mobile Technologies in Libraries

Mobile Applications for Library Services

Mobile applications have become one of the most significant tools in providing library services. These apps allow users to search library catalogs, access e-books, renew books, reserve resources, and receive updates about library events and services (Edwards, 2019). For example, apps like *Libby*

and *OverDrive* enable users to borrow e-books and audiobooks directly from their mobile devices, eliminating the need to visit the library physically. Libraries such as the New York Public Library (NYPL) have also implemented apps for seamless interaction with patrons, including features like virtual tours, book recommendations, and event schedules (Mann, 2020).

Mobile-Optimized Websites

Mobile-optimized websites are essential for ensuring that users can access library services on the go. These websites are designed to be responsive, meaning they adapt to different screen sizes, whether accessed via a smartphone or tablet. Libraries with mobile-optimized websites offer users access to the same services available on desktop platforms, such as searching for resources, browsing digital collections, and accessing academic databases. The University of Illinois Library's mobile website, for instance, offers a comprehensive suite of services that allow users to search the catalog, check their account, and interact with library staff through live chat services (Kong, 2017).

Location-Based Services

Location-based services are another mobile tool that enhances library accessibility. By leveraging GPS technology, libraries can provide location-aware services such as finding the nearest branch, providing directions to library facilities, and delivering notifications about local events or resources. These services help libraries cater to users who may not be familiar with the library's physical layout or those who may benefit from location-specific resources, such as maps, schedules, and program alerts (Goh & Tan, 2019).

Benefits of Mobile-Based Library Services

1. **Enhanced Accessibility**

Mobile-based services break down the traditional barriers of time and space. Users no longer need to visit libraries during business hours to access resources, renew items, or participate in activities. This 24/7 access to library services has become particularly valuable for individuals with busy schedules or those who cannot visit the library in person due to mobility challenges or distance constraints (Zhang & Chan, 2022).).

2. **Increased User Engagement**

The integration of mobile-based services has also increased user engagement by providing more personalized and interactive experiences.

Through push notifications, libraries can inform users about upcoming events, new arrivals, or changes in library policies. Libraries also have the ability to personalize content based on user preferences and past interactions, creating a more user-centric service model (Al-Ani & Al-Khalifa, 2021).

3. Broader Reach

Mobile services help libraries extend their reach beyond local communities. Users from different geographical locations can access digital content and resources, making libraries more inclusive and accessible. Furthermore, mobile technologies enable libraries to serve a wide range of demographics, including young people who are often more accustomed to mobile platforms than traditional library services (Edwards, 2019).

Challenges in Leveraging Mobile-Based Services

1. Technological Limitations

One of the significant barriers to implementing mobile-based services in libraries is the technological limitation faced by some institutions. Libraries with limited budgets may struggle to develop and maintain mobile applications or mobile-optimized websites. Additionally, the continual evolution of mobile technology means that libraries must invest regularly to keep up with updates and ensure compatibility across various mobile platforms (Williams, & McGuffie, 2020).

2. The Digital Divide

Despite the widespread adoption of Smartphone's and mobile devices, there remains a significant digital divide, particularly in underserved or rural areas. Users without access to mobile devices or reliable internet connections may not be able to benefit from mobile-based services. Libraries must consider this divide when implementing mobile solutions and ensure that alternative access methods are available for those who are excluded (Thompson & Sweeney, 2021).

3. Privacy and Security Concerns

As libraries collect data on users through mobile apps and websites, issues related to privacy and security become paramount. Libraries must ensure that user data is stored securely and that users are informed about how their information is used. This is especially important when libraries offer personalized services or handle sensitive data such as library history or payment information (Sahu, 2018).

Recommendations for Future Implementation

1. Developing User-Centric Mobile Solutions

Libraries should focus on developing mobile applications and websites that meet the specific needs of their user communities. By conducting user surveys or focus groups, libraries can better understand the features that would be most valuable to their patrons. Tailoring mobile services to the unique needs of users will improve engagement and ensure higher adoption rates (Edwards, 2019).

2. Addressing the Digital Divide

To ensure equity in access, libraries should focus on providing support for users who may not have access to the latest mobile devices or high-speed internet. This can include offering loan programs for mobile devices or creating partnerships with local organizations to provide free internet access (Zhang, & Chan, 2022). Additionally, libraries can provide digital literacy training to help users take full advantage of mobile services.

3. Ensuring Privacy and Security

Libraries must prioritize data security and privacy when implementing mobile-based services. Clear privacy policies and transparent data usage guidelines should be communicated to users. Libraries should also consider using encryption technologies and secure user authentication methods to protect sensitive information (Cox & Duranti, 2019).

Conclusion

Mobile-based services have become essential tools for enhancing library accessibility, offering users the flexibility to access resources and services anytime and anywhere. By integrating mobile technologies, libraries can reach underserved communities, increase user engagement, and create a more inclusive environment. However, challenges such as technological limitations, the digital divide, and privacy concerns must be addressed to ensure equitable access and secure service delivery. Libraries should prioritize user-centric mobile solutions and consider partnerships to bridge digital gaps. The future of library services lies in harnessing mobile technologies, with the potential to redefine user experiences and increase global access to information.

References

1. Edwards, P. (2019). *The Future of Library Mobile Apps: Challenges and Opportunities*. Journal of Library Innovation, 12(2), 45-56.
2. Goh, M., & Tan, J. (2019). *Enhancing Library Accessibility through Mobile Technologies: A Case Study*. Library Management, 40(5), 306-318.
3. Kong, C. (2017). *Mobile Websites in Libraries: Accessibility and User Experience*. Library and Information Science Research, 29(1), 14-23.
4. Mann, J. (2020). *Mobile Apps in Public Libraries: Adoption and Impact*. Public Library Quarterly, 39(4), 310-322.
5. Sahu, R. (2018). *Exploring the Role of Mobile Technology in Improving Library Services*. International Journal of Library Science, 27(3), 191-201.
6. Crawford, W. (2016). The traditional library model: Challenges and opportunities in the digital age. Library Technology Reports, 52(6), 5-13.
7. Borgman, C. L. (2007). Digital libraries and the future of information access. Journal of the American Society for Information Science and Technology, 58(5), 811-818.
8. Li, X., Zhang, X., & Yu, S. (2020). Mobile technologies in libraries: Enhancing accessibility and user engagement. Information Technology and Libraries, 39(3), 56-70.
9. Biermann, L. (2020). Building access to library services with mobile technologies: A review of practices. *Journal of Library & Information Services in Distance Learning, 14*(4), 221-232.
10. He, Y., & Li, Z. (2019). Mobile libraries: Revolutionizing the user experience and information access. *Journal of Academic Librarianship, 45*(6), 453-463.
11. Zhang, J., & Chan, W. (2022). Evaluating mobile library services for accessibility: User-centric approaches and technological challenges. *Library Technology Reports, 58*(3), 10-20.
12. Thompson, S., & Sweeney, E. (2021). Mobile libraries in the digital age: Ensuring equitable access. *Library Management, 42*(2), 131-143.
13. Liu, J., & Gao, H. (2019). Library services and mobile applications: A global perspective. *International Journal of Library Science, 27*(4), 229-241.
14. Williams, M. D., & McGuffie, S. (2020). The impact of mobile technology on library service delivery: Case studies and innovations. *Library Quarterly, 90*(1), 53-68.

15. Watson, L., & Lister, A. (2018). User experience and mobile library applications: Addressing the gaps. *Journal of Library Innovation, 9*(1), 38-45.
16. Al-Ani, H., & Al-Khalifa, H. (2021). Enhancing library access through mobile technologies in developing countries: A case study of Iraq. *Global Knowledge, Memory & Communication, 70*(3), 205-221.
17. Ramloll, R., & Lee, S. (2019). Mobile library applications: A comparative study of public and academic libraries. *International Journal of Mobile Computing and Multimedia Communications, 11*(3), 33-45.
18. Cox, A. M., & Duranti, L. (2019). Libraries and mobile technology: Creating opportunities for inclusivity and access. *Journal of Information Science, 45*(5), 623-634.

The Internet of Things' (IoT) Contribution to Academic Libraries: Improving Services and Streamlining Operations.

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Abstract
Libraries are among the many industries where the Internet of Things (IoT) is a game-changing technology. IoT has the potential to improve operations, resource management, and user services in academic libraries. An organized paper outlining the advantages, difficulties, and potential applications of IoT in academic libraries can be found below. Using smart technology and networked devices, the internet of things (IoT) in libraries is a revolutionary way to improve operations and services. The term "Internet of Things" (IoT) describes a network of physical objects that are connected to one another and exchange information via the internet. IoT technologies have the potential to improve user experience, expedite operations, and offer new approaches to resource management in academic libraries. This study examines how IoT can be integrated into academic libraries, emphasizing its uses, advantages, difficulties, and prospects for the library industry going forward. Additionally, it talks about how IoT improves user engagement, library security, and resource management.

Keywords
Internet of Things (IoT), academic libraries, library management, smart libraries, resource tracking, RFID, Cloud Computing.

Introduction
Academic libraries are essential resources for education, research, and information exchange. The Internet of Things offers a promising chance to improve library administration and user experience as institutions continue to adjust to new technology. The term "Internet of Things" describes a network of gadgets that are equipped with sensors and software that enables data collection, sharing, and analysis. By connecting digital and physical resources, IoT can help libraries manage more intelligently and provide better services. The Internet of Things (IoT) is a new Internet revolution that is gaining speed in wireless communications, networking, cloud computing, sensor networks, and mobile devices. The use of IoT in libraries enhances workflow and services, adds additional users to existing resources and

services, and saves patrons time by giving them a digital view of physical goods to locate them. By integrating sensors, RFID tags, smart shelving, and automated systems, libraries can efficiently manage inventory, monitor environmental conditions, and optimize space usage.

What is Internet of Things (IoT)?

The innovative technology idea known as the Internet of Things (IoT) entails connecting commonplace objects to the internet so they may exchange data. Creating a seamless ecosystem where data is continuously gathered, examined, and used to improve decision-making across multiple domains is the basic objective of the Internet of Things. Micro-electromechanical systems (MEMS), the Internet, and wireless technologies have come together to form the Internet of Things. To put it simply, the Internet of Things allows any object, whether natural or man-made, to connect with one another and exchange data using a unique IP address, whether or not such creations were created by humans.

IoT Applications in Academic Libraries:

As knowledge bases and gathering places, libraries stand to gain a great deal from the implementation of IoT technologies. This demonstrates how IoT can be used in a variety of library operations and service areas.

Inventory Control:

1. **RFID Tags:**

Labelling books and other materials with RFID (Radio Frequency Identification) tags is one of the most significant IoT applications in libraries. The automated check-in and check-out procedures made possible by these tags facilitate the management of loaned goods for both employees and customers.

RFID tags also make it possible to track books in real time within the library, which improves inventory management overall and cuts down on time spent looking for lost goods.

RFID tags also make it possible to track books in real time within the library, which improves inventory management overall and cuts down on time spent looking for lost goods. The University of California, Los Angeles (UCLA) has implemented an RFID-based system that automates inventory management and enhances user experience by reducing waiting times.

2. Automated Shelving Systems.:

Sensor-equipped smart shelving systems can identify the presence of books and other items, assisting library employees in keeping their collection well-organized. To guarantee that supplies are always in the right place, these systems can notify employees when an item is missing or needs to be reshelved.

3.Library Security:

IoT has the potential to greatly enhance academic library security. Library property can be monitored around-the-clock with the use of smart surveillance systems that are connected with cameras, motion sensors, and Internet of Things-enabled access control systems. IoT devices can also stop library material theft or loss by sending out real-time notifications when items are taken out without being properly checked out.

4.Environmental Monitoring:

IoT devices can be used in libraries to monitor and regulate environmental elements including air quality, temperature, and lighting. HVAC (heating, ventilation, and air conditioning) systems and smart lighting can maximize energy use while maintaining a comfortable atmosphere for users. IoT-enabled sensors, for instance, can automatically change the lighting according to the time of day and occupancy.

IoT technology is being used by the University of Amsterdam to control temperature and lighting, increasing sustainability and lowering energy expenses.\

5. Personized Services:

With the help of IoT, libraries may provide their users with individualized notifications. For example, library members can use mobile apps linked to the library's IoT system to get real-time alerts about forthcoming events, due dates, and book availability. By delivering timely and pertinent information, this improves customer pleasure and engagement. The University of Michigan’s library uses location-based services to guide users to specific resources and study spaces, enhancing the overall library experience.

6. Interactive Spaces:

IoT may be used to create interactive learning experiences in library settings. Educational experiences that are engaging and collaborative can be created with the help of smart boards, digital displays, and linked gadgets. These areas facilitate a range of activities, including group study sessions, workshops, and lectures.

Intelligent security setups and Automated Access

Keeping the library safe and secure is essential, IoT-enabled security cameras and access control systems can keep an eye on the building in real time, spot questionable activity, and notify security staff.Additionally, automated access control systems can limit access to specific locations, guaranteeing that only authorized personnel can enter restricted or sensitive library areas.

Benefits of IoT in Academic Libraries

Improved Efficiency

Libraries can enhance their efficiency by minimizing manual tasks and focusing on delivering excellent services through the automation of labor-intensive processes such as inventory management, check-in/check-out, and space optimization.

Cost Savings

By implementing automation for systems such as lighting, HVAC, and resource management, academic libraries can lower their operational expenses. Energy-efficient IoT technologies lead to ongoing savings while promoting a sustainable library atmosphere.

Enhanced User Experience

The Internet of Things allows academic libraries to provide services that are more user-focused and adaptable. Tailored alerts, services based on location, and seamless access to resources enhance user satisfaction and involvement. Both students and faculty gain a more straightforward and effective library experience.

Real-Time Data and Insights

The Internet of Things allows academic libraries to provide services that are more user-focused and adaptable. Tailored alerts, services based on location, and seamless access to resources enhance user satisfaction and involvement. Both students and faculty gain a more straightforward and effective library experience.

Major issue regarding privacy

A. Comprehensive data collection.
B. Surveillance Concerns.
C. Absence of Clarity.
D. Utilization and Dissemination of Data.
E. Behavioral Analysis.

Challenges and Barriers

The Internet of Things (IoT) offers a significant opportunity for libraries to elevate their service offerings, optimize operational effectiveness, and deliver tailored experiences to their patrons.Here are some common challenges libraries face when implementing IoT.

Data Privacy and Security.
Cost of Implementation
Technological and Staff Adaptation
Interoperability Issues

Future Directions

As IoT systems gather and share data , protecting user privacy and sensitive information is essenial . Libraries needs to adopt strong security measures to safe guard user data and their system.Moreover, libraries may expand their IoT applications to include smart study rooms, automated book retrieval systems, and digital signage for real-time updates on library services and events.

Conclusion:

The Internet of Things is poised to revolutionize the operations and services of academic libraries. From enhancing resource management and improving security to offering personalized user services and optimizing energy use, IoT has the potential to redefine the library experience. However, academic libraries must address challenges related to data privacy, costs, and system integration. By carefully planning and embracing these technologies, libraries can ensure that they remain at the forefront of innovation, offering efficient and user-friendly services in an increasingly digital world.

References

1. Alshamrani, A., & Alamri, A. (2020). *The Role of IoT in Smart Library Management*. Journal of Information Technology and Libraries, 39(2), 59-70.
2. Butters, A.(2008). RFID in Australian academic libraries:exploring the barriers to implementation.Australian Academic &Research Libraries, 39(#),198-206.
3. Chang, A.(2016). Building an Internet of things environment in the library, the VALA 2016 18th Biennial Conference and Exhibition, Melbourne Convenyion and Exhibition Centre, Melbourne, Australia from 9-11 feb 2016.

4. Kaladhar, K. & Somasekhara Rao,(2017). Internet of Things: A route to smart Libraries, Journal of Advancements in Library Sciences, Vol 4,Issue 1, ISSN:2349-4352.
5. Kumar, M., & Patel, R. (2021). *Smart Libraries and IoT: A Comprehensive Overview*. International Journal of Library Science, 18(4), 215-230.
6. Smith, A., & Brown, T. (2019). *Enhancing User Experience with IoT Technologies in Libraries*. Library Management Review, 45(3), 123-137.
7. Srinivasan, S., Vanithamani, R.(2013).An Internet of Things Approach to Library Management and Monitoring. International Journal of Research in Engineering & Advanced Technology (IJREAT), 2320-8791,1(2)
8. DOI:https://doi.org/10.15517/eci.v8il.30010.
9. https://www.ripublication.com/ijitls16/ijitlsv5nl.01.pdf.
10. Techopedia.Internet of Things.Available at:https://www.techopedia.com/definition/28247/internet-of-things-iot-iot.

Library Automation Service at Engineering Colleges of Pune city: Satisfaction of Students and Faculty Members

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Abstract
The advancement in information technology has brought transformation in library services. Engineering college students and faculty members always in need of efficient and accessible information resources. Purpose: This research paper aims to investigate user satisfaction with library automation service provided in engineering college libraries of Pune city highlighting key factors viz. accessibility for Web OPAC and resource discovery system, implementation of barcode system and self-check in check out system. Methodology: This study is based on survey with simple random sampling method to collect comprehensive data from users. Findings: It was found as ME M.Tech student respondents are moderately satisfied with two aspects of Library automation service Viz. Accessibility for Web OPAC and Resource Discovery System and implementation of barcode system. And all designation respondents are not satisfied with implementation of Self Check in /Check out system in their college libraries. Further study: Further similar studies are suggested for other type of technical oriented courses like management, pharmacy, architecture etc. based on different demographic structure. Suggestion: It is essential to implement the self-check in and check out system for students and faculty members to enhance their satisfaction level and library service. Value of the Paer: This study will be helpful to Pune city engineering college librarians to identify the aspects of library automation service with which respondents are moderately satisfied and not satisfied and take efforts to improve these services and increase their user's satisfaction.

Keywords
Library automation, library service, engineering college, user satisfaction, Pune city,students,faculty

Introduction

Due to rapid technological advancements, the automation become imperative for every institution in order to streamline the different functions to provide effective and quick services to their students and faculty members. Pune is the city there are a number of engineering colleges which imparts education in under graduation, post-graduation and research level. Engineering colleges provides technical education which is very significant for growth and development of the country. Library is the one of significant division in every engineering institute. Therefore, libraries of engineering colleges should have good collection of information resources, and services, facilities, infrastructure and qualified manpower to serve the users in effective manner and achieve greatest user satisfaction. Apart from this it is essential to conduct user survey study to discover how they are satisfied with existing resources and services. Library automation is one of the important services of each engineering institute which revolutionized the traditional library functions by optimizing resource management and enhanced the overall user experience. In this regard this article focused on user satisfaction with library automation in engineering colleges of Pune city area. The study aims to explore the satisfaction with different aspects of library automation service on various user groups including UG students, PG students and faculty members. The exploration spans a spectrum of factors, ranging from system accessibility and resource availability on user interface functionality. By analyzing the perceptions of students and faculty members this study aims to identify the areas for improvement as per user concrete needs in the context of library automation. Through combination of quantitative and qualitative analysis this study offers insights which can guide for future enhancements as per user needs.

Objectives

1. To find out the usage pattern of libraries by the Pune city engineering college library users.
2. To measure and compare the user satisfaction with library automation service aspects in the engineering colleges in Pune City.
3. To identify the needs of Pune city engineering college library users with regard to library automation service.
4. To determine the designation factors responsible for variations in the satisfaction level regarding library automation services in engineering college library users in Pune City.

5. To suggest ways of enhancing library automation services offered.

Scope and limitations

This study is limited to engineering colleges located in Pune city only. Respondents consists of Under Graduate and Post Graduate engineering students and regular faculty members of engineering colleges of Pune City area. Questionnaires distributed to 660 respondents and 509 received back in person with 77.12% of response rate

Literature review

Gomathi and Dhanavandan, (2012) evaluate user's satisfaction with information services in government engineering library, Salem. Along with user's satisfaction the author examined usage of library, user's expectations with provided library services The author opined as state government require to release fund to surveyed library to increase the relevant information resources and to provide ICT facilities to users. The necessity of library automation felt by author to enhance the library services provided. Sarkar P (2015) highlights the information needs and demand of library users of the colleges of Barak Valley (South Assam). found from the study that, there is low awareness among users about existence of variety of information resources. The author felt about the need of automation of libraries under study to enable them to provide online access to bibliographic records of available resources. Thanuskodi (2012) in Indian university libraries found that students and faculty members were generally satisfied with the automation services, citing improved access to resources and efficient management of library operations as key benefits. However, the study also noted that technical issues and insufficient training could hinder satisfaction levels. Anwar and Al-Ansari (2016) in public libraries in the Gulf Cooperation Council (GCC) countries revealed high satisfaction levels among users, particularly regarding the ease of accessing digital resources and the efficiency of self-service kiosks. However, the study pointed out the need for continuous system improvements and user training to maintain satisfaction. Mathew and Baby (2015), school librarians reported that automation had significantly improved the management of library resources and user services. The study emphasized the importance of integrating user feedback into system enhancements to ensure that the automation services meet the evolving needs of students and teachers.M. Nashipudi and Muthuraj (2022) discussed the current scenario of automation activities of Government First Grade College (GFGC) Libraries of

Karnataka. The findings of this research study include the different issues of colleges and its libraries, principally including automation software, IT infrastructure, barriers of library automation, need for automation training, and others. The author opined as to provide the effective, efficient and timely services to the library users libraries and librarians need to implement the latest and standard ILMS. Regular training is required for the library staff for delivering best services and to meet the increasing demands of the clientele. Singh and Pinki (2009), users appreciate the convenience of online catalogs and self-service options, which reduce wait times and improve overall satisfaction. Kumar and Kumar (2010) found that the availability of digital resources and remote access to library services significantly boosts user satisfaction, particularly among tech-savvy users. Madhusudhan and Nagabhushanam (2012) emphasized the importance of an intuitive and user-friendly interface in ensuring a positive user experience. Their findings indicate that a well-designed interface can enhance navigation and reduce the learning curve for new users. Veeramani and Amudhavalli (2013) corroborates this, highlighting that systems with complex interfaces can frustrate users and diminish satisfaction. Zhang and Li (2014) observed that users are more satisfied with library automation when the system offers comprehensive and up-to-date resources. Sahu & Mahapatra, (2017) The integration of digital libraries and databases within the automation system ensures that users have access to a wide range of academic materials, which enhances their research and learning experiences. Ameen and Haider (2013), users often face challenges in adapting to new technologies, making ongoing support and training critical. Their research suggests that libraries that invest in user education and provide accessible technical support tend to report higher levels of user satisfaction.Kaur and Singh (2011) highlighted that frequent system downtimes and slow response times can significantly impact user experiences. Their study recommends regular maintenance and updates to ensure the system's reliability and optimal performance. Sharma & Kaur, (2014) Furthermore, redundant systems and backup plans are crucial to prevent data loss and ensure continuity of services.

Hypothesis of the study

Null Hypothesis (Ho)

“There is no significant difference in satisfaction level between three designated groups of users with library automation service in engineering colleges of Pune city”

Alternative Hypothesis (H1)
"There is a significant difference in satisfaction level between three designated groups with Library automation service in Engineering colleges of Pune city"
This study rejects the null hypothesis in favor of alternative hypothesis. The findings of Chi square test show evidence of existence of a significant difference in satisfaction level between three designated groups with Library Automation Service in Engineering colleges of Pune city"

Research Methodology
The present study is based on a survey being carried out consisting of engineering colleges of Pune city. Questionnaire was to know the pattern of use of libraries by students and faculty members and approaching users directly in person. Questionnaires were distributing to 660 number of respondents and 509 received were relevant for the study

Data Analysis
All the responses were grouped among BE/B.Tech students, ME/MTech students and Faculty members. Percentage analysis made to know the satisfaction of students and faculty members about different aspects of library automation service. Mean scores were calculated to know the point of satisfaction level. Chi square calculations were made to observe the significant differences among three designation group respondents about usage of libraries.
(1) Library Usage Pattern of Respondents: Library usage pattern by students and faculty members was analyzed by knowing frequency of library visit, time spent in library, and preferable period to use library by students and faculty members.

Table (1) Library Usage Pattern of respondents:

Frequency of library visit	**Number and percentage**	**Average time spent in**	**Number and percentage**	**Preferable period to use library**	**Number and percentage**
Daily	141 (29.5%)	One Hour	300 (63.3%)	Morning Hours	144 (30.4%)
Weekly	237(49.6%)	Three Hours	125 (26.4%)	Afternoon Hours	214 (45.1%)
Monthly	99 (20.7%)	Five hours	21 (4.4%)	Evening Hours	97 (20.5%)
Never	1 (0.2%)	More than five	28 (5.9%)	Night Hours	19 (4.0%)
Total	478 (100%)		474 (100%)		474 (100%)

Table 5.1.1 reveals that, more and nearly half (49.6%) of respondents visit library weekly and only 1 (0.2%) of respondents never visited their library. And with regard to time spent in library by respondents highest and nearly two third 300 (63.3%) of respondents spent one hour and lowest 21 (4.4%) of the respondents spent five hours daily in their college libraries. As for as time preferred to visit library by respondents more 214 (45.1%) of respondents preferred after noon hours to use library and less 19 (4.0%) of them preferred night hours to use their college libraries.

(2) Satisfaction with Library Automation Service: Table 5.1.2 reveals the data about satisfaction of respondents with different aspects of library automation service provided by their college library. Analysis has been made on the basis of number of respondents responded to particular question.

Table 5.1.2: Chi Square summary for library automation service

Satisfaction Level	BE/B Tech Students	ME/MTech Students	Faculty Members	Total	χ^2 Value
Accessibility for Web OPAC and Resource Discovery System					
Extremely	82	10	8	100	**61.408**
Satisfied	122	18	22	162	
Moderately	46	42	10	98	
Not satisfied	18	18	6	42	
Not at all satisfied	8	2	0	10	
Total	**276**	**90**	**46**	**412**	
Implementation of Barcode System					
Extremely	89	13	8	11o	**49.317**
Satisfied	108	27	23	1582	
Moderately	38	42	8	88	
Not satisfied	30	8	6	44	
Not at all satisfied	6	4	0	10	
Total	**271**	**94**	**45**	**410**	
Implementation of Self Check in /Check out System					
Extremely	22	8	6	36	**35.170**
Satisfied	6	4	0	10	
Moderately	52	38	12	102	
Not satisfied	94	10	8	112	
Not at all satisfied	96	28	20	144	
Total	**270**	**88**	**46**	**404**	

Degree of freedom: 8 **Critical Value: 15.507**

It is inferred from the obtained Chi Square values, it is significant with respondents satisfaction with all the aspects of library automation service *viz* Accessibility for Web OPAC and Resource Discovery System, implementation of barcode system and Self -Check in /Check out system

(**χ^2 >**15.507).Therefore it is concluded that there is ***association*** between designation group and respondents satisfaction with all the aspects of library automation service

Table (3) presents the mean scores calculated and mentioned in last column for individual aspects of library automation service to measure and compare the satisfaction of respondents with library automation service has been summarized in Table (3)

Table (3): Designation-wise comparison of satisfaction with library automation service

Library Automation Service Aspects	BE/B.Tech Students	ME/M.Tech Students	Faculty Members
Accessibility for Web OPAC and Resource Discovery System	3.91	3.18	3.69
Implementation of Barcode	3.90	3.39	3.73
Implementation of Self Check in /Check out system	2.13	2.48	2.22
Overall Mean Score	3.91	3.01	3.21

5=Extremely Satisfied,4=Satisfied, 3=Moderately Satisfied, 2=Not Satisfied, 1=Not at all Satisfied

Based on the mean scores of individual aspects of library automation service it is concluded that, BE/B.Tech students and faculty members are satisfied with two aspects of library automation service i.e., Accessibility for Web OPAC and Resource Discovery System (M=3.91 and 3.69 for BE/B.Tech and Faculty respectively), implementation of barcode system (M=3.90 and 3.73 for BE/B.Tech and Faculty respectively), But those from ME/M.Tech student respondents are moderately satisfied with these two aspects of library automation service (M=3.18, 3.39 for Accessibility for Web OPAC and Resource Discovery System and implementation of barcode system respectively). It was also found as all designation respondents are not satisfied with implementation of Self Check in /Check out system in their college libraries (M=2.13, 2.48, 2.22 for BE/B. Tech, ME/M. Tech and Faculty members respectively).

Findings

It was found as ME/M. Tech students and faculty members are moderately satisfied with library automation service aspects. And all designation respondents are not satisfied with Self -Check in /Check out system. **Suggestions:** It is essential to take feedback from ME/M. Tech students to understand their needs with library automation services and take efforts to provide these services as per their requirements. And engineering college libraries require to implement self-check in and check out system as this is the aspect with which the respondents are not satisfied.

Conclusion

In the present paper satisfaction level of students and faculty members of engineering college of Pune city with library automation service was analyzed. It was found that, overall substantial students and faculty members shown their satisfaction level with Web OPAC and Resource Discovery System, implementation of barcode system and were not satisfied with self- check in and check out system. And it is also concluded as Librarians can think of RFID and need to take efforts to enable the students and faculty members for self- check and check out facility. It is also essential to take feedback from users at regular intervals about the library automation provided and can take efforts to increase the satisfaction level by improving these services as per user's needs.

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References

1. Ameen, K., & Haider, S. J. (2013). Perception and level of satisfaction with automation in university libraries of Pakistan. *Library Hi Tech News*, 30(5), 10-15.
2. Anwar, M. A., & Al-Ansari, H. (2016). User satisfaction with public libraries in the Gulf Cooperation Council countries: A study. *Library Review*, 65(3), 148-164.
3. Biswas, A., & Chakrabarti, B. (2014). Place of doctoral research in Library and Information Science: looking back through the

recommendations of commissions and committees in India. *Indian Journal of Library and Information Science*, 8(3), 253- 263.

4. Gomathi. P. (2012).User satisfaction of the information services in Government Engineering College Library, Salem:A Study. *Journal of Advances in Library and information Science , 1* (3), 109-112.
5. Kaur, A., & Singh, A. (2011). Evaluation of user satisfaction in academic libraries: A case study of Guru Nanak Dev University Library. *Library Philosophy and Practice*, 2011, 1-15.
6. Kumar, P.S.G., & Kumar, P. A. (2010). Library Automation. New Delhi: B.R. Publishing Corporation.
7. M. Nashipudi and Muthuraj (2022) . Status of Library Automation in Government College Libraries of Karnataka, India. *World Digital Libraries An International Journal,* 15(1), June 2022, 7-18
8. Madhusudhan, M., & Nagabhushanam, V. (2012). Use of web-based library services in select university libraries in India: A study. *International Journal of Library and Information Studies,* 2(1), 1-20.
9. Mathew, S. K., & Baby, M. D. (2015). Automation in school libraries: A study on the perception of school librarians in Kerala. *SRELS Journal of Information Management*, 52(1), 19-25.
10. Sahu, A. K., & Mahapatra, R. K. (2017). Impact of library automation on library services and user satisfaction: A study. *DESIDOC Journal of Library & Information Technology*, 37(2), 111-116.
11. Sarkar, P.(2015). Ascertaining information needs and library use in colleges with special reference to barak valley (South Assam). *Journal of Engineering Computers*
12. Sharma, P., & Kaur, A. (2014). Reliability of automated library systems: A case study of Punjab Agricultural University Library. *Library Progress (International)*, 34(1), 1-10.
13. Singh, J., & Pinki. (2009). User satisfaction in academic libraries: A case study of Guru Nanak Dev University Library. *Library Management*, 30(8/9), 645-660.
14. Thanuskodi, S. (2012). User satisfaction of library resources and services in a university library: A case study. *International Journal of Library and Information Studies,* 2(3), 55-61.
15. Veeramani, S., & Amudhavalli, A. (2013). Usability of library automation software packages in engineering college libraries: A study. *Annals of Library and Information Studies*, 60(4), 321-330.

Status of Automation in University Libraries

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Abstract
This research investigates the current status of automation in university libraries, focusing on state universities in Maharashtra. With the increasing adoption of technology, the shift towards automated systems has become vital for boosting operational efficiency, enhancing resource accessibility, and addressing the changing needs of users. This study assesses the implementation of automation across various library functions, including cataloging, circulation, acquisitions, and the management of digital resources. It also explores the challenges encountered during the automation process, such as financial limitations, the need for staff training, and infrastructure inadequacies. By conducting a comparative analysis of different university libraries, the research identifies effective practices for automation adoption and highlights key areas that require further development. The results emphasize the significant role of automation in modern academic libraries and offer recommendations to streamline technology integration, enhancing overall library performance and user experience.

Keywords
Library Automation, Library Computerization, Computer Applications, ICT Applications, University Libraries; Computer Hardware and Software, Manpower, Library Software Packages

1. Introduction

University libraries are pivotal in supporting academic endeavors by offering access to a vast array of information resources. With the continuous evolution of information and communication technologies (ICT), the need for automating library operations has become increasingly apparent. Automation simplifies critical library functions such as cataloging, circulation, acquisitions, and the management of digital resources, thereby improving efficiency and accessibility. In higher education, where the

demand for fast and efficient access to information is ever-increasing, automation has become essential rather than optional.In the context of state universities, particularly in Maharashtra, the shift towards automation is shaped by several factors, including the availability of technological infrastructure, financial resources, and the readiness of library staff to adopt new technologies. While some libraries have made significant progress in automating their services, others continue to face hurdles in the implementation process. This study seeks to evaluate the current state of automation in university libraries across Maharashtra by examining both the successes achieved and the challenges encountered. By assessing the level of automation and identifying obstacles, this research aims to offer valuable insights on how libraries can harness technology more effectively to improve services and meet the evolving needs of their academic communities.

2. Review of Literature

Kamble, A. (2015), in his study "Status of Library Automation in the Institutions of Higher Studies in Punjab," provides an overview of key aspects of library automation. The study examines the use of computers in six major areas of library operations, highlighting the purpose of automation in each area. It also describes the main approaches currently used, with examples of popular tools and services.

Bansode and Periera (2008) conducted a survey on library automation in college libraries in Goa. The study revealed that all the colleges had implemented automation, with most of them using NewGenLib software. The authors emphasized the need for library professionals to enhance their skills to meet the increasing demands of library users.

Haneefa (2007) studied the use of ICT in special libraries in Kerala and found that, while these libraries had some hardware, software, and communication facilities, ICT-based resources and services were not being fully utilized by users. The most commonly used ICT resource was email. The study highlighted challenges such as insufficient funding, inadequate infrastructure, and a lack of skilled professionals, which hindered the complete automation of library management and the broader application of ICT.

Mulla (2010) surveyed engineering college libraries in Karnataka using a questionnaire. The study found that most colleges had implemented automation using proprietary software such as Libsoft and EasyLib, effectively utilizing all modules to provide better services. However, some libraries that were not yet automated faced challenges like insufficient funding and a lack of computer facilities.
Raval (2013) focused on the challenges faced during the pre- and post-automation phases in libraries. The three main issues identified were technological, economic, and attitudinal. Technological challenges involved hardware and software issues, economic challenges related to the cost of setup and maintenance, and attitudinal challenges stemmed from librarians' lack of awareness about the benefits and impact of automation.

Veeranjaneyulu (2017) examined the status of automation and digitization in agricultural university libraries in India. The study focused on areas like automation, digitization, KrishiKosh membership, AgriCat Union Catalogue membership, and RFID technology use. It found that 80% of these libraries had implemented automation.

Kalbande D.T. & Chavan S. (2018)This paper examines the status and challenges of library automation in agricultural college libraries under MPKV, Rahuri. It reveals that 65% of libraries are automated, with key challenges including inadequate staff, poor infrastructure, limited funds, and lack of staff training. The study also highlights the software and automation modules used, noting that self-financed colleges are in the early stages of automation, primarily using modules like acquisition, circulation, and cataloguing.

3. Objectives of the study:

This paper presents a study on the status and challenges of library automation in university libraries in Maharashtra.
The primary objectives of this study are:

1. Determine how many libraries have automated systems.
2. Identify the functions and services that are automated.
3. Assess the level of automation in university libraries.
4. Investigate staff challenges in the automation process.
5. Identify software solutions used for automation.

4. Hypothesis of Study:

1. Most libraries have implemented automation systems.

2. The majority of university libraries are completely automated.

5. Data Analysis

Table No. 5.1Library Automation Status

Sr.No	Library Automated	No of Libraries	Percentage
1	Yes	9	100
2	No	0	0
	Total	**9**	**100**

The analysis of the data presented in Table 4.4.5 indicates that all 9 university libraries, accounting for 100% of the total, are automated.

Table No. 5.2 Present Status of Library Automation

Sr.No	Present Status	No of Libraries	Percentage
1	Completely Automated	5	55.6
2	Partially Automated	4	44.4
3	Initial Stages	0	0.0
	Total	**9**	**100**

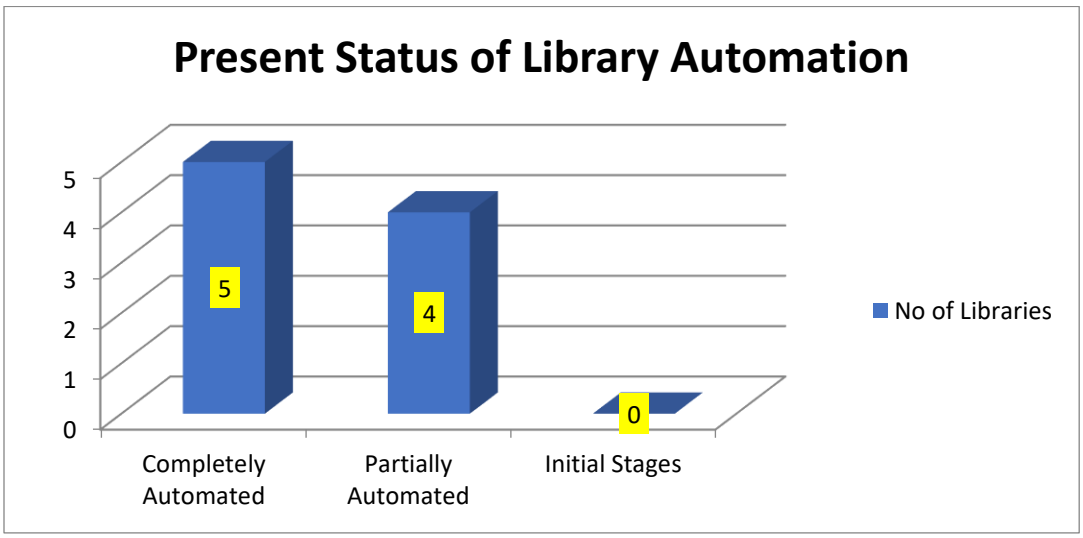

Fig. No.1 Present Status of Library Automation

Among the surveyed libraries, it is observed that out of the total number of libraries, 5 (55.6%) libraries are fully automated, while 4 (44.4%) libraries are partially automated. Additionally, no libraries, representing 0% of the sample, are in the initial stage of library automation.

Table No. 5.3 Library Software

Sr.No	Library Software	No of Libraries	Percentage
1	SOUL 3.0	5	55.6
2	KOHA	1	11.1
3	SLIM 21	1	11.1
4	LIBSYS	2	22.2
11	**Total**	**9**	**100**

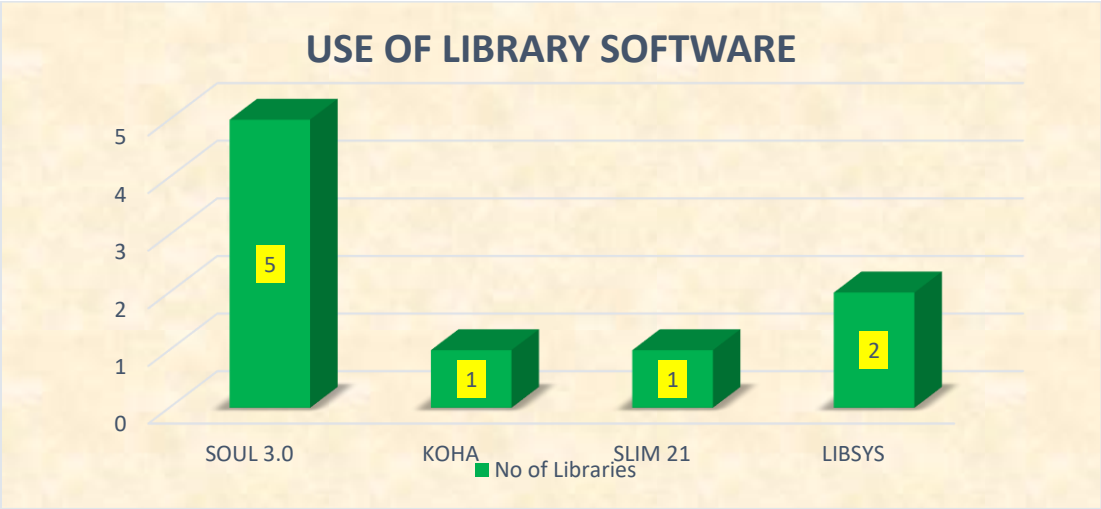

Fig. No. 2 Use of Library Software

According to the data, it is observed that among the surveyed university libraries, 5 (55.6%) libraries employ the SOUL 2.0 library management software. Additionally, 2 (22.2%) libraries utilize the Libsys software, while 1 (11.1%) library each uses the KOHA and SLIM 21 software for library automation and housekeeping operations.

Table No.5.4 Areas of Automation

Sr.No	Areas of Automation	Initial	Completed	Total
1	Acquisition	4 (44.4)	5 (55.6)	9 (100)
2	Cataloguing	1 (11.1)	8 (88.9)	9 (100)
3	Circulation	1 (11.1)	8 (88.9)	9 (100)
4	Serial Control	7 (77.8)	2 (22.2)	9 (100)
5	Information Retrieval Service	4 (44.4)	4 (44.4)	9 (100)
6	SDI/CAS	4 (44.4)	5 (55.6)	9 (100)

7	OPAC	1 (11.1)	8 (88.9)	9 (100)
8	Administration	3 (33.3)	6 (66.7)	9 (100)
9	Budgeting	5 (55.6)	4 (44.4)	9 (100)

The analysis presented in Table 4.4.8 the areas of library automation. The data reveals interesting observations regarding the stages of automation in various library functions.

It is observed that a significant number of libraries, specifically 7 (77.8%), are in the initial stage of automation for Serial Control. Furthermore, 5 (55.6%) libraries are also in the initial stage of automation for Budgeting. In addition, 4 (44.4%) libraries are in the initial stage of automation for functions such as Acquisition, Information Retrieval Service, SDI/CAS, and SDI/CAS.

Table No. 5.5 Back-end Database of Automation Software

Sr.No	Database	No of Libraries	Percentage
1	MySQL	7	77.8
2	Oracle	1	11.1
3	MS Access	0	0.0
4	No any	1	11.1
	Total	**9**	**100**

The analysis presented in Table 4.4.9 provides insights into the back-end databases used in library management software. Among the total of 9 university libraries surveyed, it is observed that a significant majority, 7 (77.8%) libraries, employ the MySQL back-end database in their library management software. On the other hand, 1 (11.1%) university library utilizes the Oracle back-end database for their library management software. These findings highlight the prevalent choices of back-end databases among the surveyed university libraries

Table No. 5.6 Total Records in Database

Sr.No	No of Records	No of Libraries	Percentage
1	1-100000	1	11.1
2	100001-200000	2	22.2
3	200001-300000	2	22.2
4	300001-400000	4	44.4
	Total	**9**	**100**

The data presented in Table 4.4.10 provide information about the number of records available in the database of library management software. Among the total of 9 university libraries surveyed, it is revealed that 4 (44.4%) libraries have a range of 300,001 to 400,000 records in their library management software. Moreover, 2 (20%) libraries fall into each range, with 100,000 to 200,000 records and 200,000 to 300,000 records respectively. Additionally, one university library has up to 100,000 records in their library software database. These findings highlight the variations in the number of records stored in the surveyed university libraries' database, providing insights into the scale of their information management.

Table No. 5.7 Frequency of Updating Database

Sr.No	Frequency of Updating	No of Libraries	Percentage
1	Always	7	77.8
2	Sometime	1	11.1
3	Rarely	1	11.1
4	Never	0	0.0
	Total	**9**	**100**

The data presented in Table 4.4.11 the frequency of updating the database in library management software. Among the total of 9 university libraries surveyed, it is observed that a significant majority, 7 (77.8%) libraries, perform regular updates in their library database. Additionally, 1 (11.1%) university library updates their database occasionally, while another library performs updates infrequently. These findings provide insights into the practices of database updating among the surveyed university libraries, emphasizing the importance of regular maintenance and keeping the library databases up-to-date.

Table No. 5.8 Separate Library Server

Sr.No	Separate Library Server	No of Libraries	Percentage
1	Yes	9	100
2	No	0	0
	Total	**9**	**100**

Table 4.4.12 indicates the availability of a separate library server. Among the total of 9 university libraries surveyed, it is observed that all 9 libraries,

representing 100% of the sample, have a separate library server. This finding highlights the prevalent practice of having dedicated server infrastructure for library operations among the surveyed university libraries

Table No. 5.9 LAN Connectivity

Sr.No	LAN Connectivity	No of Libraries	Percentage
1	Yes	9	100
2	No	0	0
	Total	**9**	**100**

The analysis presented in Table 4.4.13 focuses on the availability of Local Area Network (LAN) in university libraries. It is observed that all 9 university libraries included in the study have LAN connectivity. This finding indicates that LAN infrastructure is widely implemented and accessible within the surveyed university libraries, facilitating efficient communication, data sharing, and networked services.

Table No. 5.10 Availability Internet Facility

Sr.No	Internet Facility	No of Libraries	Percentage
1	Yes	9	100
2	No	0	0
	Total	**9**	**100**

The analysis presented in Table 4.4.15 focuses on the availability of internet facility to users in university libraries. It is observed that all 9 university libraries included in the study provide internet facility to both users and staff members. This finding highlights the widespread provision of internet access within the surveyed university libraries, enabling users to utilize online resources, conduct research, and access a wealth of information through the internet.

Table No. 5.11 Types of Internet Connectivity

Sr.No	Internet Connectivity	No of Libraries	Percentage
1	Broadband	3	33.3
2	Dial-up	1	11.1
3	Leased Line	4	44.4
4	Other	1	11.1
	Total	**9**	**100**

The data presented in Table 4.4.16 illustrates the types of internet connectivity used in university libraries. Among the total of 9 university libraries surveyed, it is observed that 4 (44.4%) libraries utilize leased line connectivity, indicating a dedicated and reliable internet connection. Furthermore, 3 (33.3%) university libraries rely on broadband connections, which offer high-speed internet access. It is worth noting that only 1 (11.1%) university library still uses dial-up connection, which is relatively slower compared to leased line and broadband connections. This data highlights the varying approaches to internet connectivity adopted by university libraries, with the majority opting for leased lines or broadband connections to ensure efficient and fast internet access for their users.

6. **Conclusion**

Library automation has greatly improved library operations, making services more effective and efficient. However, Many libraries use only a few modules, such as acquisition, circulation, and cataloguing, while the full benefits of automation remain untapped. To maximize efficiency and provide better services, libraries should adopt all modules of automation, including OPAC, serial control, stock verification, and budgeting. This comprehensive approach will help librarians manage tasks more effectively and better meet the needs of users in academic and research settings.

References

1. Kamble A. (2015). Status of Library Automation in the Institutions of Higher Studies in Punjab, In Library and Information Scinece Compendium,1- 11.
2. Bansode, S. Y., &Periera, S. (2008). A survey of library automation in college libraries in Goa state, India. Library Philosophy and Practice, 1-7.
3. Mohamed Haneefa, (2007),"Application of information and communication technologies in special libraries in Kerala (India)", Library Review, Vol. 56 Iss 7 pp. 603 – 620.
4. Mulla, K.R. and Chandrashekara,M. (2010), Use of Integrated Library Software: A Survey of Engineering College Libraries in Karnataka, International Journal of Information Science and Management, 8 (2), 99-111.

5. Raval,Ajaykumar,M.(2013).Problems of Library Automation. International Journal of Multidisciplinary research ,2(2),1-6.
6. Veeranjaneyulu, K., Kumar, Amrendra&Rathinasabapathy, G. (2017). Status of Library automation in Agricultural universities in india: A study. In National Conference on Digital Libraries, Library Automation and Open Courseware: Issues and Best Practices: Mysore
7. Kalbande D.T. & Chavan S. (2018)Status of Automation in Agricultural College Libraries. “Knowledge Librarian” An International Peer Reviewed Bilingual E-Journal of Library and Information Science Special Issue, January 2018, 364-371.

Security Measures to Protect Your Library Data: An Overview

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Abstract
Cybersecurity is essential in the information technology industry. In the digital age, when cybercrime is on the rise, cybersecurity has become the most urgent issue in recent years. The primary objective of cybersecurity is to prevent cybercrime. We must understand all the safety measures required to prevent cybercrime since cybersecurity is crucial. These studies require libraries to adhere to various technology, standards, and guidelines in order to safeguard user information and guarantee privacy when accessing electronic resources and other data. The significance of cyber security in the context of digital libraries is also covered. There are various obstacles related to protecting private data in library electronic resources. It looks at a number of topics, including user confidentiality, data encryption, access management, and privacy law compliance. This paper is discussed what is data security, need for cyber laws, types of cyber laws, security measurement systems in libraries, how to prevent of data security threats and future trends of security and privacy in digital libraries.

Keywords
Data Privacy, Library e-Resources, Cyber security, Confidentiality, Access Control, Compliance, Ethical Considerations, Best Practices, Cyber threats, Digital collections, Digital Rights Management (DRM), The American Library Association's (ALA).

Introduction

Cybersecurity is the process of defending against hostile assaults on computers, servers, mobile devices, electronic systems, networks, and data. Other names for it include electronic information security and information technology security.

The last ten or so years have seen a boom in the amount of information available in digital libraries worldwide. In addition to housing scholarly databases and various collections of digital resources, libraries act as guardians for vast information stores. These resources are making knowledge more easily accessible. Ensuring the protection of sensitive user data and intellectual property rights is difficult.

Data Security and privacy are major issues in today's digital world, particularly when it comes to library e-resources. The confidentiality, integrity, and availability of library resources are crucial in the modern era as most information is accessed and stored online.

Library History of Data Privacy:

As technology has advanced and cultural expectations surrounding the protection of personal information have changed, so too has the idea of data privacy in libraries.
Here is a brief review of the main developments.

- **The library's pre-digital environment:**
  Libraries used to mainly handle physical collections of books and manuscripts before the digital age. The primary focus was on maintaining the secrecy of patron information and borrowing histories, rather than the concept of data privacy. The privacy of those who utilized library services was the primary concern of librarians.
- **Automated System Introduction:**
  As automated library systems became available in the 1970s and 1980s, libraries began to move from manual record keeping to computerized databases, which sparked worries about the privacy and security of patron data held on computers.
- **The American Library Association's (ALA) Policy:**
  A major factor in the importance of privacy in library services was the American Library Association. The American Library Association adopted a "code of ethics" in 1975 that elaborates on library records. In terms of user privacy, the code established the foundation for ethical considerations.
- **Development of online resources and the Internet:**
  New opportunities and difficulties were presented in the 20th century with the development of the internet and the digitalization of library

collections. As libraries begin to offer online resources and services, security and the possibility of unwanted access become issues.

- **Access control and Digital Rights Management (DRM):**
  Digital rights management technologies were employed by libraries to safeguard copyrighted content and regulate e-resource access. Intellectual property concerns were addressed by DRM. It also presented issues with data collection and resource usage.

Objectives

The main objective is data security measurement systems in libraries, how to prevent of data security threats and future trends of security and privacy in digital libraries.

1. To study the data security and history of data privacy in library
2. To know about types of cyber laws and, need for cyber laws
3. To know about data security measurement systems in libraries
4. To know about how to prevent of data security threats and future trends of security and privacy in digital libraries.

The definition and meaning of cybercrime

However, no statute or law has yet to define the Information Technology Act of 2000. Cybercrime is not specifically defined under the IT Act of 2000. However, the term "cybercrimes" refers specifically to those types of crimes where a computer is either the subject of the crime or an object of the crime, or maybe both. Cybercrime is therefore defined as any conduct that employs a computer as a tool, goal, or means to commit more crimes.

Any unlawful activity in which a computer is used as a tool or the target of the crime, that is, any crime whose means or intent is to change how a computer operates.

Attributes of Cybercrime

- Low-risk, high-reward endeavors
- A lack of knowledge among the victims
- These kinds of crimes do not require physical presence.
- Lack of technological expertise among the investigative authorities.
- There is no violence.
- No limits of territory.
- Transparency and anonymity.

The necessity of cyber law

Cyber law is significant because it affects practically every facet of transactions and activities pertaining to the Internet, the World Wide Web,

and cyberspace. Cyber laws may appear to be a very technical area at first glance, with little relevance to the majority of online activity. Cyber law is significant because it affects practically every facet of online transactions and activities, including those involving the World Wide Web and cyberspace.

Every online action and response have certain legal and cyberlegal implications.
Cyber law is the area of the broader legal system that addresses cyberspace, the Internet, and the legal challenges that surround them. The field of cyber law is fairly broad and includes a number of subtopics, including as online privacy, Internet access and usage, and freedom of expression.

Types of cyber laws
According to academics, cybercrimes fall into the following categories:

1. **Software related crimes:**
    a) **Unauthorized Access:** Unauthorized access to computer networks or systems refers to any individual who gains or tries to get access to a system that is protected.
    b) **Salami Attack**: The purpose of this attack is to commit financial crimes. The idea here is to make the change so minor that it would be entirely overlooked in one instance.
    c) **Logic Bomb:** This program is event-dependent. This suggests that the software was designed to only execute when a specific event—referred to as a trigger event—occurs. Since some viruses, like the Chernobyl virus, remain dormant throughout the year and only become active on a specific date, they can be referred to as logic bombs.
    d) **VirusAVorm Attack:** A virus is a program that infects a computer or file and spreads to other files and computers connected to a network. They typically alter computer data by erasing or warning about it. Worms do not require their host to connect to them, in contrast to viruses.
    e) Trojan Attack: The program, appropriately named a Trojan, is an illicit program that operates by masquerading as an authorized application to hide its true purpose.
    f) Intellectual Property Crime: This covers things like trademark infringement, copyright violations, software piracy, and more**.**

g) **Trap Door:** Malicious security manipulations go around the logic that system makers apply to save additional keystrokes and access particular programs.

h) Time Bombs

i) Super Zapping

j) Wire-Trapping

k) Software Piracy

2. Data related crimes:

a) **Data Diddling**: This type of attack entails warning the raw data just prior to computer processing and then altering it once processing is finished.

b) Data Leakage: using the information on any magnetic or other medium in a fraudulent, unlawful, or extortion-related manner.

c) Data Spying: Modems and telecom connections can be used to gain access to large network installations using valid passwords or by cracking the password and selling it to a rival or hostile nation in exchange for money.

d) **Scavenging:** a technique for recovering and reusing data that is left in or near a computer system following processing. The process includes both technical searches for residual data and a manual inspection of 26 dustbins for any computer listing copies that have been discarded.

3. Physical crimes:

a) Theft

b) Breakage

c) Destroying Data, Output or Media

d) Inter-Processing Manipulations

4. **Internet and other computer related crimes**:

a) **E-mail Bombing:** Email bombing is when a high volume of emails is sent to the victim, causing the mail server (for a business or email service provider) or email account (for an individual) to crash.

b) Internet Time Theft

c) Cyber Pornography

d) **E-mail Spoofing:** The term "spoof" refers to an email that looks to have come from one source but was actually sent from another.
e) **Cyber Stalking**
f) **Password Attacks**
g) **Brute-Force Attack**
h) **Main-in-the-middle**
i) **Hacking**
j) **Blackmailing**
k) **Frauds**

❖ **Data Security Measures in Libraries:**

Libraries should adhere to the same rules as other companies, particularly because the frequently handle a lot of personally identifiable information about their users. Here are some tips for preventing downtime and protecting your library.

I. Essential factors to consider:

1. **Access Control:** Make sure that only authorized personnel can access particular information by limiting access to sensitive data according to user roles and permissions.
2. **Encryption:** Encrypt private information, such as customer details, to guard against illegal access even in the event that the data is hacked.
3. **Strong Passwords:** Encourage frequent password changes and enforce strong password regulations that use a combination of capital and lowercase characters, digits, and symbols.
4. **Backup System:** Make regular backups of library data to an offsite location to guard against possible data loss from cyberattacks or hardware failure.
5. **Network Security:** To stop unwanted access and filter incoming and outgoing network traffic, put in place a strong firewall system.
6. **Antivirus Software:** To guard against viruses and malware, install and keep up-to-date antivirus software on every computer in the library.
7. **Software Updates:** Update operating systems and software programs on a regular basis to fix security flaws.
8. **Staff Training:** Inform library employees about data protection procedures, phishing awareness, and password hygiene as well as other cybersecurity best practices.

9. **Data Classification:** Determine the proper security measures for various sorts of information by classifying data according to sensitivity.
10. **Monitoring and Auditing:** Continuously monitor network activity for suspicious behavior and conduct regular security audits to identify potential risks.

II. **Particular factors to consider for libraries:**

1. **Patron Privacy:** Protecting customer data, such as personal information and borrowing history, should receive special attention.
2. **Digital Collections:** Digital library resources and internet databases can be accessed securely with the right authentication methods.
3. **Physical Security:** Using security measures like locking cabinets and CCTV systems, you can prevent theft or damage to physical library assets like computers and servers.
4. **Collaboration with IT:** Implement and maintain security measures in close collaboration with the library's IT department.

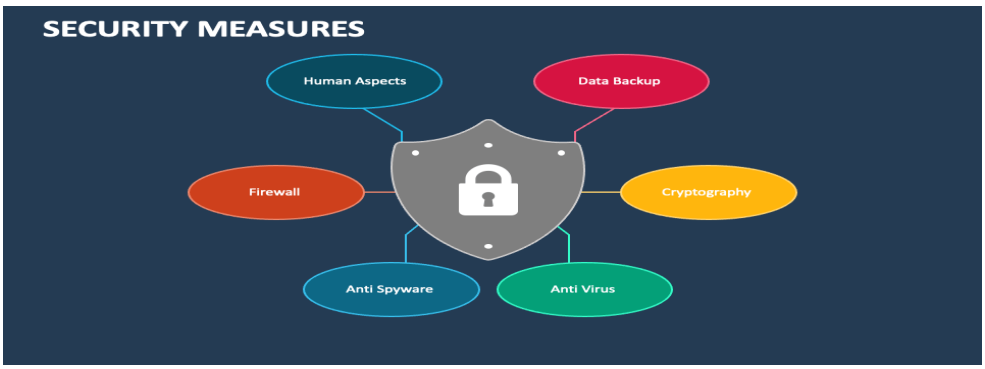

Fig1: Security Measures

Future Trends of Security and Privacy in Digital Libraries:

For digital libraries, predicting future security and privacy trends requires foreseeing emerging risks, shifts in user behaviour, and technological improvements. Here are a few possible future developments.

- **Artificial Intelligence-Driven Security Solutions:** Machine learning algorithms and artificial intelligence (AI) will be essential for identifying and thwarting security risks in digital libraries. Security systems driven by AI are able to scan vast datasets in order to spot

irregular behaviour, anticipate possible threats, and automate incident response.

- **Privacy-Preserving Technologies:** Digital libraries may incorporate privacy-preserving technologies like federated learning and differential privacy in response to growing concerns about data privacy. These technologies allow for data analysis and sharing while protecting users' personal information.
- **Biometric Authentication:** Digital libraries are expected to expand their usage of biometric authentication techniques, such as fingerprint, facial recognition, and iris scanning, to improve security and user authentication procedures while decreasing reliance on conventional password-based verification.
- **Zero-Trust Security Model:** A zero-trust security model is one that digital libraries may choose to use, in which users' access to resources is restricted and constantly watched whether they are inside or outside the network circuit. Within the library's infrastructure, this strategy aids in preventing threats from moving laterally and gaining illegal access.
- **GDPR and Data Privacy Compliance:** Digital libraries will continue to prioritize compliance with data privacy laws like the General Data Protection Regulation (GDPR). Organizations will need to invest in strong data governance structures, clear data practices, and means for getting user consent to ensure compliance with growing privacy rules.
- **Enhanced User Awareness and Education:** To protect digital libraries from phishing attempts, social engineering attacks, and other online dangers, it will be more crucial than ever to educate users about cybersecurity best practices. To assist patrons in identifying and addressing possible security threats, libraries may provide workshops, training courses, and other materials.
- **Continuous Security Monitoring and Incident Response:** Digital libraries will use automated incident response systems and real-time monitoring technologies to quickly identify and address security incidents. Potential security flaws can be found and minimized before attackers can take advantage of them with the aid of proactive threat hunting, vulnerability scanning, and frequent security audits.
- **Emergence of New Threat Point:** New threats could emerge as technology develops, including as assaults on cloud infrastructure, Internet of Things (IoT) devices, and augmented reality/virtual reality

(AR/VR) systems. To properly handle these changing risks, digital libraries will need to modify their security plans.

❖ **Future Directions and the challenges:**

It might be difficult for libraries in developing nations to implement cybersecurity best practices for digital collections. The following are some of the difficulties and restrictions they might encounter

- **Limited resources:** The financial and technical resources available to developing nations for cybersecurity initiatives are frequently constrained. This can make it challenging for libraries to spend money on the equipment, knowledge, and infrastructure required to put strong cybersecurity procedures in place.
- **Lack of expertise:** The lack of cybersecurity experts with the abilities and know-how to establish and uphold efficient cybersecurity procedures may be a problem for developing nations. It may be difficult for libraries to create and implement thorough cybersecurity plans due to this lack of experience.
- **Outdated technology:** Numerous libraries in developing nations could still be dependent on antiquated software and hardware, such as legacy systems. Such antiquated systems can have known flaws that hackers could take advantage of, making it challenging to guarantee the safety of digital data.
- **Limited awareness and training**: Cybersecurity awareness and training initiatives may be insufficient or non-existent in developing nations. Employees at libraries might not have received enough training or be knowledgeable about the most recent cybersecurity risks, defences, and best practices. Security breaches may become more likely as a result of this ignorance and lack of training.
- **Legal and regulatory obstacles:** The legal and regulatory frameworks pertaining to cybersecurity may be less developed or unclear in developing nations. This may lead to ambiguity about roles, data security, and library compliance needs. Additionally, it may make it more difficult for them to adopt cybersecurity best practices.
- **Limitations in infrastructure and connectivity:** Limited internet connectivity and unstable infrastructure may be

issues in developing nations. Implementing and overseeing cybersecurity procedures, such as patch management, timely software updates, and threat intelligence resource access, may become difficult as a result.

Conclusion

In the context of digital libraries, data security and privacy are essential for maintaining information integrity, confidentiality, and trust. Addressing privacy and security issues becomes essential as digital libraries grow into repositories of enormous volumes of sensitive material, such as research data, proprietary content, and personal information.

Protecting data security and privacy in the context of digital libraries necessitates a multifaceted strategy that includes cooperation, education, policy, and technology. The confidentiality and integrity of information in the digital age can be maintained by digital libraries by emphasizing privacy protection, putting strong security measures in place, and encouraging a culture of awareness and alertness.

Data security is essential for protecting users' knowledge of aid and the money they spend on it. Every librarian has a responsibility to implement excellent security measures and devices. The importance of security to the repository's objective must be widely understood for a security program to be successful. To prevent loss and damage to library collections and assets, as well as to the safety of employees and users, appropriate safety measures should be implemented.

This paper main discussed on Security measures to protect your library data, need for cyber laws, types of cyber laws, security measurement systems in libraries, how to prevent of data security threats and future trends of security and privacy in digital libraries and Future directions and the challenges in libraries

References

1. P Lavanya (2017), Security Systems in Libraries: An overview, International Journal of Library and Information Studies, ISSN: 2231-4911, Vol.7(1), Jan-Mar, 2017.
2. Sandeep Bhavsar and Sonia Bhavsar (2017), Cyber Crime and Measures to Prevent in Libraries, An International Peer Reviewed Bilingual E-Journal of Library and Information Science, E-ISSN No. 2394-2479, Volume: 03, Issue: 05, Sept. – Oct. 2017, Pg. Nos. 38-47.

3. Ayooluwa Aregbesola and Ekene Lawrence Nwaolise (2023), Securing Digital Collections: Cyber Security Best Practices for Academic Libraries in Developing Countries, Library Philosophy and Practice, DOI: https://digitalcommons.unl.edu/libphilprac/7822.
4. Rudrani Saha (2024), Data Privacy and Cyber Security in Digital Library Perspective: Safe Guarding User Information, ISSN: 2582-3930, International Journal of Scientific Research in Engineering and Management (IJSREM), Volume: 08, Issue: 04, April – 2024, DOI: 10.55041/IJSREM30761.
5. https://scholar.google.com/
6. https://blog.techsoup.org/
7. https://www.google.co.in/

Mobile-Based Library Services and Apps

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Abstract

Mobile technologies are increasingly crucial in today's phone-adolescent world, connecting libraries to the globally . Advancements in networking have made mobile devices and applications useful in education and library services. These technologies provide easy access to information, are effective and efficient and enhance learning by providing a lot of information and mobile app. This article mainly focus the meaning of mobile technology, its use in library services,and library app ,research related app and its mobile technology advantages and disadvantages.

Keywords

Academic Libraries, Mobile Technology, Smart Phones, Library Apps, Mobile Websites.

Introduction

Mobile technology is becoming an integral part of everyday life, providing timingsaving ,accessibility, easy to use ,prortabiliy and to communication and information. It has significantly impacted banking, tourism, and health services,online shopping,o Libraries are social institutions that connect people with information. To stay relevant in the mobile society, librarians must adapt to technological changes and integrate into the mobile realm. Mobile devices offer flexibility for users to access e-books and multimedia content. For beginners, mobile-based websites can be designed in-house and require minimal web design knowledge. Library policies and services should be flexible and open to meet new information needs and organizational needs.

Literature Review

According to Hansaben Shashikantbhai Bhoj (2013), libraries are among the institutions and establishments that cannot overlook the use of mobile phone technology in all facets of our daily lives. As a result, libraries in wealthy nations have welcomed the mobile phone revolution and are using it to provide services that are both effective and efficient. On the other hand, university libraries in India do not generally offer mobile-based services. Academic and research libraries have not yet adopted them. The results of a survey on mobile-based library services in many Indian libraries are presented in this study.

Kosturski, Kate, and Frank Skorria (2011) In order for users to effectively explore new technologies, the author explains library regulations and services that are accessible to everyone.

In study by Marcin Kozak, Brady D. Lund, and Hamid Reza Saeidnia (2023) the design, development, implementation, and evolution of a mobile application for academic library services at Tarbiat Madras University are the primary topics of this article.

In their study, Marcin Kozak, Brady D. Lund, and Hamid Reza Saeidnia (2023) discuss the design, development, implementation, and evolution of a mobile application for academic library services at Tarbiat Madras University, involving a four-step process.

Jennifer Koenig Johnson (2015) The study explores the impact of mobile phone usage in libraries on browsing and television viewing, highlighting the benefits of 4G or 5G connections for users. It covers services like SMS alerts, remote learning, and e-resources. This paper focuses on identifying and evaluating apps that can assist library personnel in reference and information services. After evaluating 101 apps, 25 were chosen for their suitability in library settings. The article highlights the need for more research and training to better utilize these apps in reference services. While all apps are ideal for all settings, they can be useful in certain situations.

Md. Shiful Islam, (2020) This research paper examines students' perceptions of mobile phone usage in Dhaka University Library (DUL) and its potential advantages and drawbacks. A survey method with a structured questionnaire was used, involving both undergraduate and graduate students. The results show satisfactory mobile phone usage, with students agreeing on its use in

service delivery. The study provides evidence on students' attitudes towards implementing a mobile- based library system.

Soni, (2019) In the age of information technology, mobile technology plays a crucial role in managing and providing quick access to information. Libraries are exploring emerging technologies like Libraries In Hand, which allows users to access library resources and stay updated through their mobile devices.

Nidhi Khare (2009) This text provides an overview of mobile tools and applications for libraries, including Internet Mobile, Mobile Multimedia, and SMS/texting. It examines mobile search providers, their usage, and future strategies for tailored services.

Puttaraj A. Choukimath & Mallikarjun Angadi (2010) Mobile apps are revolutionizing information delivery in libraries, providing user-centric, personalized services. With more smartphone users than other computing devices, these apps are the future of m-libraries, offering convenient and reliable information services to patrons.

Catharine, Bomhold (2014) This paper examines the availability of discovery functions on mobile devices at academic research libraries, focusing on whether they are providing the necessary services for students' academic success. A survey of 53 mobile apps and websites at Carnegie-rated RU/VH universities revealed a discrepancy between full and minimal levels of research functions. The study provides valuable insights for other libraries and is the first to evaluate and quantify the level of services provided by Carnegie Foundation RU/VH institutions.

Mohan Lal Vishwakarma, Shyam Lal Maurya, Shivani Govil (2013) Information Communication Technology (ICT) is transforming the way people communicate and organize information. As technology evolves, communication protocols also change. Traditional library services are transitioning to mobile library information services, requiring different infrastructure and pros and cons. The Indian educational industry is shifting from distance learning to e-learning and now m- learning, integrating ICT into daily learning. Indian libraries must incorporate mobile devices into their strategic ideas to remain vital to users.

Library Services through Mobile Technology

a) **SMS Notification Services:**More libraries use sms notification services .this service useful user daily update information .library services ,library event ,library reservation facility ,books overdue ,new books alert ,overdue ,outstanding fines library holiday , library closure notification library orientation programme .for example Tata institute social science library ,university of Pune ,

b) **Formal Education, Distance Learning**: Mobile phones and applications offer versatility for students, allowing academic libraries to implement library services for distance learning, formal education, this learning flexibility,Accessibility ,cost -effectveness ,personalization research in synchronous learning ,Asynchronous learning , blending with teaching and research practices.example for distance learning ,swayam ,e-pgpathasala (mooc) ,massive open online courses ,learning management systems ,online degree programme ,ignou cources etc.

c) **Database Browsing: L**ibraries offer mobile-friendly database browsing through OPAC, integrated search, and original document search. The WorldCat, Mobile application enables users to find books and materials in local libraries via a web-based application.

d) **My Library**: It is a personal library space where users can access information, resources, track interlibrary loans, request items, receive email notifications, and set catalog searching preferences.

e) **E-resources with Mobile Interface:** Some publishers are offering mobile-accessible e- books and digital resources like e-books, e-journals, and audiobooks. These can be downloaded from library websites or borrowed on mobile devices. Libraries also offer free and subscription-based audiobooks and multimedia messaging services for sharing. Most publishers provide 24x7 access to library subscriptions on various devices, including iPads, Android devices, and Kindles.

f) **Library Guides:** Library guides offer users comprehensive information, including use guides, question answering services, and library statistics, ensuring efficient use and quick responses to queries via mobile devices.

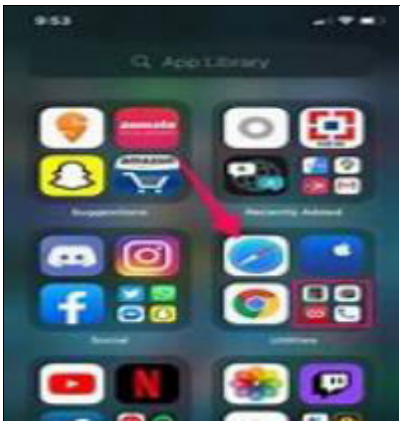
g) **Mobile Document Supply:** Mobile technology offers new opportunities for document supply, monitoring collections, and automation of administrative operations, supporting electronic funds transfer, supply chain management, e-marketing, and inventory management.

h) **OPAC-Text Messaging Alert Service:** Many library use OPAC text messaging servies use issue retued status if books reminder, request for books, pay of fine, search OPAC.

i) **Mobile Catalogue**: M-OPAC stands for Mobile-online public access catalog help for books access theire account .new and request items.

j) **Current Awareness Service**: CAS this services provied up to date information current information newspaper cliping services,journlas article indexing , this services usefull for research scholar ,letes books journals articles send the text message, news etc.

Library Apps There are several mobile Apps for the reading, reference and other purposes such as Reeder, Feedly, Flipboard, Good Reader, Press Reader, Paper, Kindle, Instapaper, Google Reader, Flipboard, etc.



Library Apps

Some of the most popular Apps are mentioned below:

- **Libby by OverDrive**: A popular app for borrowing e-books and audiobooks from your local library.
- **Hoopla**: Offers a wide variety of media, including movies, TV shows, music, audiobooks, and e-books.
- **LibraryThing**: A cataloging app for books with community features like reviews and recommendations.
- **BorrowBox**: Another app for borrowing e-books and audiobooks, typically used by public libraries in specific regions.

- **Social networking App**: Email, Facebook, Twiteer, Youtube, Wahtssap, Viper, Skype, Line, Tango, Google Mobile, Wikipedia Mobile, Instagram, Google Map, Flickr, We chat, etc.
- **For learning app:** Classics, Dropbox, Evernote, Library Congress, Meebo, Mobile, ISSRN, EVERNO, etc.

Reserch related mobile app:-

citation app (References tools) :- mobile app for citation use for references more sophisticated tool link zotero ,Qiqqa ,mendeley ,Endnote .very useful manage references .because librarian are very engaged in library work ,teaching ,students about issues of authority .this app knowlegeable about proper citation practices .

Advantages of Mobile Technologies

a) Right information right user
b) Save the time
c) Indulizaed library service
d) Location Awareness
e) Ability to access information
f) User assistance

Disadvantages of Mobile Technologies

a) Hight cost
b) Less computer power
c) Internet services
d) Inconvenient input of data and output interface

Future Trends

AI Integration: Depending on user behavior, apps may employ AI to offer more individualized book recommendations and insights. Virtual Library Services: More libraries might provide book clubs or virtual reading rooms that patrons can join virtually via an app. Users may be able to browse library resources or obtain interactive guidance within a library with the help of augmented reality (AR) capabilities. The qualities listed above will help you make a decision if you're interested in creating a library mobile app or searching for one for a certain library. Do you want more specific details on any of these features or particular apps?

References

1. Choukimath, Puttaraj A. & Angadi, Mallikarjun (2018). Library Mobile App: A Revolutionary Trends in Managing Information Resources and Services

2. Hamid Keshavarz, Bakthavachalam Elango, Afshin Babajani, and Ali Ghorb. Design Development Implementation and eveluation of a mobile Application for academic library services: A study in a developing country. 2023
3. Kate K, and Frank S. (2011). Handheld Libraries using Mobile Technologies in the Academic Library. Feature, 31(6).
4. Libraries on Move: Library Mobile Applications.
Nidhi Khare. (2009). International CALIBER-2009, Pondicherry University, Pondicherry, February 25-27.
5. Sonu (2019). Libraries in Hand: An Impact of Mobile Technology on Llibrary Services.
6. Washburn, Bruce. (2011). Library Mobile Applications: What Counts as Success? Information Outlook, 15 (1), January/February. Available Online
7. Hoy,M.B(2011) An introduction to QR codes: linking libraries and mobile patrons .medical references services Quarterly ,30(3) 295-300

Exploring Data Privacy Laws and Their Impact on Cyber Security Practices for National and International Court's Libraries

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Abstract

The quick development of data privacy regulations has had a big impact on how court libraries handle, preserve, and safeguard private legal data. These regulations, like the California Consumer Privacy Act (CCPA) and the General Data Protection Regulation (GDPR) of the European Union, have changed cyber security procedures to guarantee compliance while preserving access to legal resources. This study examines how cyber security strategies in national and international court libraries are affected by data privacy laws, emphasizing important issues like managing cross-border data flows, balancing data security and accessibility, and complying with multiple jurisdictions. International data flow, resource limitations, and striking a balance between security and accessibility present difficulties that call for careful planning. The study highlights the necessity of strong security measures, international standardization, and flexible approaches to guarantee the protection of sensitive legal data in an increasingly digital and linked world by analyzinghow these legal frameworks interact with cyber security protocols.

Keywords:
Data privacy laws, Cyber security, Court libraries, General data protection regulation (GDPR), International courts, National courts, Legal data protection, Legal information management, Information security,

Introduction

Legal professionals depend on court libraries to give them access to essential information, such as case law and legal research materials. The legal industry is rapidly going digital, and court libraries are depending more and more on technology to handle, store, and distribute enormous volumes of private information. Legal data protection has become a top priority due to the rise in digital information volume and the sophistication of cyber threats. Institutions handling sensitive information, including court libraries, now operate under the fundamental framework of data privacy laws, which regulate the collection, processing, and protection of personal data. Data protection standards have been established in recent years by laws such as the California Consumer Privacy Act (CCPA) and the General Data Protection Regulation (GDPR) of the European Union, which present court libraries with both opportunities and challenges. These rules make it more difficult for international courts that deal with cross-border data flows to manage legal data in addition to defining how it must be handled within national borders.

The goal of cyber security procedures is to prevent data breaches, illegal access, and other security threats; they are closely related to data privacy laws. To guarantee that legal professionals and other authorized users can obtain vital resources promptly, court libraries must strike a balance between the requirements for secure data transmission and storage. As privacy regulations continue to change, court libraries need to modify their cyber security procedures to stay in compliance and promote an atmosphere where legal information is freely accessible. The way that national and international court libraries handle and safeguard legal data is influenced by data privacy laws, which are examined in this paper along with their intersection with cyber security practices. Additionally, it addresses the difficulties court libraries encounter in complying with these regulations and the global ramifications for data privacy, particularly in countries with disparate legal styles. In analyzing these problems, this paper aims to demonstrate how crucial strong cyber security safeguards are to

preserving the availability, confidentiality, and integrity of legal data in a world growing more interconnected by the day.

Objectives of the Study

The specific objectives of the study are:

1. To examine the impact of data privacy laws on court libraries.
2. To recognize cyber security practices in court libraries.
3. To identify challenges in complying with data privacy and cyber security standards.
4. To examine the implications of cross-border data transfers.
5. To inspect recommendations for strengthening data privacy and cyber security practices.
6. Key data privacy laws relevant to national and international court libraries.
7. The intersection of data privacy laws and cybersecurity practices.
8. The challenges faced by court libraries in adhering to these laws while maintaining access to legal information.
9. The international implications of data privacy laws and cross-border cybersecurity practices.

Research Methodology

This is collected through various publications, books, the Internet, and articles. This study will employ a mixed-methods approach, combining qualitative and quantitative research techniques to collect and analyze pertinent information on cyber security practices and data privacy laws in national and international court libraries. The Study is based on secondary data.

Scope of the study

The main goal of this study is to investigate how cyber security procedures and data privacy laws interact in national and international court libraries. The following crucial elements define the study's scope. The goal of this study is to give a thorough grasp of how cyber security practices in national and international court libraries are impacted by data privacy laws. The study intends to illustrate the changing relationship between legal data protection, accessibility, and security by concentrating on important regulations, technologies, and stakeholder challenges. Legal professionals, legislators, and information security specialists employed in the judicial sector will find value in the findings.

Significance of the Study

Many stakeholders in the legal, information management and cyber security domains will find great value in this study. Court libraries, tasked with managing enormous volumes of sensitive legal data, face both significant opportunities and challenges as a result of the growing significance of data privacy and the changing cyber security landscape. This study is important because it has the potential to enhance court libraries' handling and security of private legal data. This research will help support informed decision-making, facilitate compliance with global data protection standards, and contribute to the continuous evolution of the legal information management landscape in both national and international jurisdictions by addressing the changing intersection of cyber security practices and data privacy laws.

Review of Literature

The study's literature review looks at the corpus of research on cyber security procedures, data privacy laws, and how these topics intersect with court libraries on a national and worldwide scale. The evolution of data privacy laws, the difficulties court libraries encounter in adhering to them, and the function of cyber security in safeguarding legal data will all be covered in the review. The impact of regulatory frameworks like the California Consumer Privacy Act (CCPA) and the General Data Protection Regulation (GDPR), the changing cyber security tactics used by legal institutions, and the global difficulties brought on by cross-border data flows are some of the major themes in the literature.

1. Data Privacy Laws and Regulations

In the digital age, the idea of data privacy has undergone substantial change. Global guidelines for how businesses must handle personal data have been established by laws such as the CCPA (2020) and the GDPR (2018). By emphasizing individual privacy rights and requiring strong security measures for data processing, GDPR has established a precedent for data protection. The law affects how court libraries and other organizations handle and store sensitive legal data by requiring them to adopt stringent consent management procedures and data handling protocols (Voigt and Von demBussche, 2017). Data privacy compliance varies by jurisdiction, according to research. Although GDPR has established itself as a global standard for data protection, nations like the U.S. S.

possess a variety of state-specific laws, such as the CCPA and HIPAA, which complicate matters for businesses handling global data transfers (Zeng, 2020). These differing laws make it difficult for court libraries to strike a balance between domestic adherence to international norms, particularly in situations where legal data is shared across borders.

2. Cyber security in Legal Institutions

For court libraries that handle sensitive data, cyber security has emerged as a major concern. A foundational model for comprehending risk management, data protection, and cyber security practices in legal institutions, the National Institute of Standards and Technology's (NIST) Cyber security Framework has been frequently referenced in scholarly works (NIST, 2018). Court libraries looking to protect legal data from cyber threats must follow NIST's guidelines on data encryption, access control, and risk assessments. Role-based access control (RBAC) is essential in court libraries to guarantee that only authorized personnel have access to sensitive legal documents, according to a study by Cheng and Wang (2020). Cyber security procedures that protect against both internal and external threats must include the use of data encryption, secure storage options, and on-going IT system monitoring.

3. Intersection of Data Privacy Laws and Cybersecurity

Research on the relationship between cyber security procedures and data privacy laws is becoming more and more popular. Effective cyber security protocols are crucial to preventing breaches and guaranteeing compliance, according to scholars, even though data privacy laws impose requirements on data handling and protection (Lobel, 2021). Ghernaouti-Hélie (2020) asserts that to maintain compliance and stop unwanted access, cyber security measures like firewalls, data encryption, and multi-factor authentication (MFA) must be in line with privacy regulations like the GDPR. The idea of privacy by design, in which cyber security tactics are incorporated into the creation and execution of data privacy policies from the beginning, is examined as a critical approach in the literature. According to Ding and Lee (2019), court libraries must embrace a comprehensive security strategy that incorporates privacy protections and cyber security measures to maintain compliance and ensure efficient data protection.

4. Challenges Faced by Court Libraries

The difficulties court libraries encounter when putting data privacy and cyber security procedures into practice are covered in a large amount of literature. Many court libraries, especially those in smaller jurisdictions, struggle to implement strong cybersecurity measures due to resource constraints, as noted by Geller and Frigo (2020). This difficulty in adhering to strict data protection regulations is especially noticeable in courts with limited funding or IT know-how. The topic of cross-border data flows is another important challenge that was covered. International courts are governed by various data privacy laws in each nation since they hear cases involving data from several jurisdictions. For instance, negotiating the intricate web of international agreements and data transfer laws presents difficulties for the European Court of Human Rights and the International Criminal Court. According to researchers like Johnston & Parker (2021), to guarantee the smooth transfer of legal data across borders while upholding privacy standards, international cooperation and harmonization of data protection laws are crucial.

5. Cross-Border Data Transfer and Compliance

Cross-border data transfer is one of the most important topics covered in the literature. Court libraries that handle international legal data will be significantly impacted by the GDPR's prohibitions on sending personal data outside of the EU to nations with insufficient privacy protections. The EU-U is discussed by Kuner (2020). S. An agreement called Privacy Shield was created to make data transfers easier while guaranteeing adherence to EU data protection regulations. However, questions concerning the future of cross-border data exchanges were raised in 2020 when the European Court of Justice declared the Privacy Shield invalid (Bamberger, 2020). According to Edwards and Veale (2020), the literature also emphasizes the function of data protection impact assessments (DPIAs), which are mandated by regulations like the GDPR to guarantee that cross-border data transfers adhere to privacy standards and reduce data risks. Court libraries that handle cases from around the world need to have procedures in place that assess the risks involved in data transfers and guarantee the application of safe practices like binding corporate rules (BCRs) and standard contractual clauses (SCCs).

6. International Cooperation and Standardization

Many academics stress the value of global collaboration in cyber security and data privacy. Patterson (2018) emphasizes that cross-border

cooperation is crucial to bringing cyber security standards and data privacy laws into line as legal institutions, including court libraries, operate internationally. To promote international agreement on data protection and security measures, international legal frameworks such as the UNConvention on Cybercrime and the OECD guidelines on the protection of privacy and trans-border flows of personal data (1980) are essential.

Although data privacy laws like the CCPA and GDPR are crucial for safeguarding personal information in court libraries, the literature review shows that they pose serious obstacles to the deployment of cyber security measures. Particularly when it comes to compliance, cross-border data flows, and striking a balance between security and access, the relationship between these regulations and cyber security practices is complicated. To emphasize the necessity of integrated strategies that address privacy and cyber security concerns in the context of national and international court libraries, the study draws on a variety of scholarly research, legal frameworks, and technical standards.

Exploring Data Privacy Laws and Their Impact on Cyber Security Practices for National and International Courts Libraries Theoretical Background

Over the past few decades, data privacy laws have rapidly changed, and they have had a significant impact on how information is handled, stored, and transmitted especially in specialized fields like court libraries. For national and international court libraries, the nexus of data privacy laws and cyber security practices becomes crucial due to sensitive data on court proceedings, litigants' personal information, and private legal research. This study investigates how these laws influence cybersecurity procedures and consider the ramifications for both domestic and foreign courts. To guarantee that legal professionals have access to the tools and information they require, court libraries are essential. Ensuring the security of digital information and adherence to data privacy regulations becomes crucial as its volume increases. The way that court libraries handle, store, and distribute sensitive data is influenced by data privacy laws, such as the California Consumer Privacy Act (CCPA) in the US and the General Data Protection Regulation (GDPR) in the EU. These laws have an effect that goes beyond the national level, especially for international courts that handle cross-border data flows (Deen, 2024)

1. Data Privacy Laws Relevant to Court Libraries

Data privacy laws play a critical role in shaping the operations of court libraries, particularly in how they manage, store, and share sensitive legal data. These laws are designed to protect individuals' personal information and regulate how organizations, including court libraries, handle such data. For court libraries, the importance of adhering to these laws is compounded by their responsibility for preserving confidential legal information, including case records, client data, and judicial communications. Below are some of the most relevant data privacy laws and regulations that impact court libraries at both national and international levels.

The General Data Protection Regulation (GDPR) is one of the most extensive and significant data protection laws in the world. It was put into effect in May 2018 and is governed by the European Union (EU) and the European Economic Area (EEA). It governs the gathering, storing, and processing of personal information about individuals in the EU and EEA as well as any organization that handles information about EU citizens, wherever they may be. Relevance to court libraries when handling personal data associated with legal cases, such as client information and personal identifiers in case files, court libraries in the EU are required to adhere to GDPR. GDPR mandates that data controllers the organizations that decide how to process personal data make sure that data is processed legally, openly, and for the intended purposes. This entails putting strong data access control, encryption, and security measures in place for court libraries. For court libraries to guarantee that people's privacy is maintained during case documentation and public access to legal resources, data subject rights such as the right to access, amend, and remove personal data are also essential. Because the GDPR restricts the transfer of personal data outside the EU to nations with inadequate data protection standards, cross-border data transfers are another crucial consideration for court libraries involved in international legal matters.
(Greenleaf, Chung & Mowbray, 2015)

2. California Consumer Privacy Act (CCPA)

Jurisdiction California, United States OverviewThe CCPA is a historic privacy law in the United States that gives Californians more privacy rights over their personal information. It went into effect in January 2020. Despite being state-specific, it has broad ramifications for organizations and government agencies that deal with data belonging to Californians.

Relevance to Court Libraries When processing personal data, Californian court libraries and those that serve Californians must abide by the CCPA. This entails providing opt-out clauses for the sale of personal data, guaranteeing transparency regarding data collection, and enabling people to request access to or deletion of their data. Similar to the GDPR, the CCPA enforces strict data security regulations to stop illegal access to personal data. This implies that to stop data breaches, court libraries need to keep their cybersecurity measures up to date. The CCPA's clauses about data subjects' access rights (e.g. G. Court libraries' management and dissemination of personal data in case files is directly impacted by the right to know what personal data is being collected and the right to have it deleted. (Goldman, 2020)

3. Health Insurance Portability and Accountability Act (HIPAA)

Overview HIPAA governs the security and privacy of medical records in the United States. S. especially when it comes to medical and health-related documents. Despite HIPAA's primary focus on health information, court libraries that handle legal cases involving patient data or healthcare providers may find it pertinent. Court libraries must make sure that protected health information (PHI) is appropriately managed and stored following HIPAA regulations when they are involved in cases involving healthcare or medical malpractice. This can entail making certain that patient information, medical records, and associated paperwork are managed safely. Court libraries handling cases involving sensitive health information must adhere to HIPAA's requirements for data encryption, secure data transmission, and access controls. (Nosowsky& Giordano, 2006)

4. Personal Data Protection Act (PDPA)

Jurisdiction singapore overviewsingapore's data protection law, the PDPA, has been in effect since 2014 and regulates how businesses gather, use, and disclose personal information. It seeks to safeguard people's right to privacy and control the way public and private organizations handle personal data. Relevance to court libraries the pdpa's rules regarding data collection, data retention, and security requirements must be followed by Singaporean court libraries and those handling cases involving singaporean citizens. This involves making certain that private information in court documents is managed and kept safe. Additionally, the PDPA requires businesses to give people the option to view and update their personal information. Court

libraries must make sure that these rights are upheld by their data management procedures. (Ghani, Shabri, Rasli, Razali&Shuffri, 2020)

5. General Data Protection Law (LGPD)

Jurisdiction Brazil Overview Brazil's GDPR equivalent, the LGPD, went into effect in 2020 and governs how personal data is processed there. It regulates the handling of personal data by both public and private institutions, including court libraries. Relevance to court libraries to collect, process, and lawfully store personal data, Brazilian court libraries must abide by the LGPD's regulations. This covers the consent of data subjects, openness regarding data processing operations, and particular rights for people to view and remove their data. With possible fines for non-compliance, LGPD requires that institutions, including court libraries, put in place suitable security measures to safeguard personal information and prevent data breaches. (Canedo, Cerqueira, Gravina, Ribeiro, Camões, Reis & Sousa, 2021)

6. International Privacy Frameworks

EU-U. S. Standard Contractual Clauses (SCCs) and Privacy Shield For court libraries engaged in international legal proceedings, cross-border personal data transfers frequently necessitate compliance with international frameworks like the EU-U. According to EU data protection standards, these frameworks guarantee that transferred personal data is adequately protected. Cross-border data transfers since many court libraries deal with cases from other countries, they have to manage the challenges of cross-border data transfers while making sure that local data protection regulations are followed. To prevent possible breaches or infractions of privacy laws, it is essential to implement efficient procedures for managing and protecting cross-border legal data.

Court libraries work in a complex environment where their operations are directly impacted by national and international data privacy laws. Court libraries can protect sensitive legal data, stay out of trouble with the law, and protect the privacy of those involved in legal proceedings by adhering to laws like the GDPR, CCPA, LGPD, and HIPAA. To ensure the safe administration of legal information, appropriate access controls, and responsible data sharing following changing legal standards, court libraries must comprehend and abide by these laws in both national and international contexts. (Babikian, 2023)

Introduction to Data Privacy Laws

Data privacy laws are rules created to safeguard people's private information and control how businesses handle, store, and use it. These regulations are essential for protecting privacy and stopping the improper use of personal data. These laws are especially important in the context of national and international courts because they strike a balance between the protection of sensitive personal data and the requirements for openness and access to legal information. The General Data Protection Regulation (GDPR), a European Union law that places strict guidelines on data collection, processing, and storage, especially about personal data is one of the most important data privacy laws. The California Consumer Privacy Act (CCPA) is a law that was passed in California, USA, and it gives residents more privacy rights, especially when it comes to the sale and access of personal data. Despite being primarily concerned with health data, HIPAA (Health Insurance Portability and Accountability Act) has an impact on data privacy practices in fields such as legal proceedings, especially when it comes to cases involving health-related information. By GDPR guidelines, the Data Protection Act (UK) regulates how personal data is used in the country. (Oyewole, Oguejiofor, Eneh, Akpuokwe, &Bakare, 2024)

Impact of Data Privacy Laws on Cybersecurity Practices

Cyber security is the term used to describe the procedures and tools used to shield data from breaches, attacks, and unauthorized access. Cyber security procedures in national and international court libraries, which frequently handle private and sensitive data, are greatly impacted by data privacy laws. Among these effects aredata encryption and access control according to privacy laws, courts must use encryption and access controls to safeguard data. For instance, courts must make sure that personal information, including defendants' or victims' identities, is encrypted both during transmission and storage by the GDPR. By doing this, breaches are avoided because only authorized personnel can access the data. Safe Data Storage and Retention The amount of time that personal data can be kept is governed by privacy laws. Systems for safely keeping case files, transcripts, and other legal documents that might include personal information must be put in place by national and international courts. These retention requirements must be met by cyber security procedures, such as on-

premise security systems and safe cloud storage options. Breach Detection and Response Organizations are required by data privacy laws to promptly report data breaches. A breach could jeopardize private court cases or the participants' personal information. Real-time monitoring, intrusion detection systems (IDS), and incident response protocols that enable prompt detection and response are essential components of cyber security systems.
(Sumartono, Harliyanto, Situmeang, Siagian, &Septaria, 2024)

Challenges for National and International Courts Libraries

Dealing with cyber security and data privacy regulations presents special difficulties for national and international court librariescross-border data transfer it can be challenging to ensure compliance with different national privacy laws when court libraries handle international cases or exchange data between jurisdictions. It might be necessary to move data between nations where its protection is governed by various laws (like the US CLOUD Act and the GDPR). Courts need to make sure they have safe ways to transfer data (e.g. G. encryption, data anonymization, etc.) that adhere to these rules. Access Control in contrast to... Public Access to Legal Data Courts strikes a balance between protecting personal data and ensuring transparency and public access to legal information. Legal data, including precedents and case laws, is frequently made available to the general public. Court libraries must, however, limit access to private data. To guarantee that sensitive personal data is protected while still offering the required legal data for public use, cyber security procedures must be carefully planned.

Resource Restrictions It can take a lot of resources to implement and maintain the required cyber security procedures. It could be difficult for smaller national or international courts to make investments in cutting-edge cybersecurity infrastructure. In these situations, courts have to make tough choices about how to divide up scarce resources between data protection and preserving efficient legal operations. Changing legal frameworks privacy laws are always changing. For instance, newer technologies like biometric data and artificial intelligence are being covered by laws like the GDPR. To maintain compliance, national and international courts must keep abreast of regulatory changes and modify their cyber security procedures as necessary. This necessitates integrating modern

security technologies and providing staff with continual training. (Mwangi, 2015)

Strategies for Ensuring Compliance and Enhancing Cybersecurity

The following tactics can be used by national and international courts to address these issues adopting detailed data privacy policies court libraries are required to develop detailed data privacy policies that specify the handling, storing, and protection of personal information. Data access, user authentication, data retention, and breach response are a few topics that should be covered by these policies. Investing in technology investing in state-of-the-art technologies such as blockchain for document verification, multi-factor authentication, and sophisticated encryption protocols can improve data security and compliance. Courts can better meet the strict requirements set by data privacy laws thanks to these technologies.

Frequent Cybersecurity Training Regular training programs ought to be required to keep employees informed about the most recent security procedures and data privacy regulations. This will guarantee that workers who handle sensitive data are knowledgeable about the latest legal requirements and are capable of putting data protection strategies into practice. Collaboration and knowledge sharing to exchange best practices and insights on protecting sensitive data, national and international courts can work with cyber security specialists, legal counsel, and privacy regulators. By working together, courts can improve their cyber security frameworks and maintain compliance with changing legal requirements.
(Itani, Eltweri, Faccia, &Wanganoo, 2024**)**

Cyber security Practices in Court Libraries

Court libraries need to implement strong cybersecurity procedures because of the sensitive nature of the information they handle. These procedures must comply with data privacy regulations and guarantee that data is safe from breaches and unauthorized access, while also being available to authorized users.Court libraries manage confidential legal information, such as transcripts, case files, court records, and private data about litigants, witnesses, and other justice-related parties. The confidentiality, availability, and integrity of this data must be guaranteed. Court libraries must implement strong cybersecurity procedures to guard against illegal access, data breaches, and other online dangers. The integrity of the legal system and the protection of private legal information depend heavily on the

cybersecurity procedures used by court libraries. Through the implementation of strong security measures like encryption, access control, frequent training, and adherence to data privacy laws, court libraries can reduce risks, safeguard important legal data, and guarantee that they continue to be a safe resource for both the general public and legal professionals. Court libraries will be able to stay ahead of changing cyber threats and carry on operating efficiently in an increasingly digital world by incorporating these practices into their everyday operations. (Stanfield, 1997)

Challenges Faced by Court Libraries in Adhering to Data Privacy Laws

Court libraries, which oversee private and sensitive data about court cases, encounter various obstacles in complying with data privacy regulations. Although the purpose of these laws is to protect the data of individuals, the nature of court operations frequently entails complicated data processing, cross-border information sharing, and preserving public access to court documents, all of which can make compliance challenging. The complexity of legal data, the requirement for public access to court records, and the constantly changing privacy regulations present major obstacles for court libraries in their efforts to comply with data privacy laws. Among the most important issues that court libraries need to handle are managing cross-border data flows, guaranteeing data security, managing data subject rights, and striking a balance between privacy and transparency. Strong data protection policies, ongoing technological investment, and employee training are necessary to overcome these obstacles and preserve public confidence. (Stanfield, 1997)

National and International Implications of Data Privacy and Cybersecurity Practices

Data privacy and cyber security have become crucial issues in today's connected world, affecting not just individuals but also businesses and governments. For organizations like courts, libraries, and other government agencies that deal with private, legal, and governmental data, this is especially crucial. Global business operations, legal frameworks, and public trust are all impacted by the national and international ramifications of cyber security and data privacy practices, which also shape how data is shared, processed, and protected internationally. Cyber security and data privacy policies have important domestic and global ramifications. To safeguard the data of their citizens and guarantee adherence to both

national and international standards, nations must create strong legal frameworks at the national level. International organizations and institutions face difficulties due to problems like extraterritorial jurisdiction, disparate cyber security standards, and cross-border data transfers. To balance the need for data protection with the public's access to legal resources, court libraries, and other public sector organizations must comply with both national and international regulations. In the end, protecting data and preserving public confidence in both domestic and international legal systems depend on strong cyber security and privacy policies as well as international collaboration.

National and international court libraries have serious concerns about the relationship between cyber security procedures and data privacy laws. Given the volume of sensitive personal data handled by courts, it is imperative to put strong cyber security measures in place that adhere to data privacy regulations. Courts can protect their data and protect the rights of those involved in legal proceedings by implementing best practices and keeping up with technological and legal developments, despite the significant obstacles. (Cohen, Hall, & Wood, 2017)

Findings

Several important conclusions are drawn from the investigation of the national and worldwide ramifications of cyber security and data privacy practices in court libraries. The results show that data privacy and cyber security are becoming more and more important for court libraries, which handle sensitive data in both domestic and foreign settings. These findings also highlight the risks, difficulties, and tactics that court libraries must implement to safeguard sensitive data while maintaining compliance with changing legal frameworks. Court libraries need to focus on some important areas, such as vendor management, data security, staff training, legal compliance, and international collaboration, to guarantee compliance and reduce risks. Court libraries can preserve sensitive data, guarantee adherence to legal frameworks, and uphold public confidence in the legal system by implementing strong cyber security measures, keeping abreast of changing regulations, and incorporating privacy by design into their systems.

Recommendations for Future Research

The growing intricacy of cybersecurity and data privacy regulations, particularly as they relate to court libraries, presents a number of important research topics.Understanding the changing issues and assisting court libraries, legal organizations, and legislators in putting into practice efficient data protection measures require this research. Future studies on cybersecurity and data privacy procedures in court libraries are essential to comprehending how legal data protection is changing. Court libraries can adopt more efficient methods for protecting sensitive legal data by addressing the issues raised by emerging technologies, cross-border data flows, ethical concerns, and the human element in cybersecurity. By investigating these topics, scholars can aid in the creation of all-encompassing solutions that preserve public confidence in legal systems around the world, guarantee compliance, and protect privacy.

Conclusion

In the current digital era, data privacy and cyber security are essential pillars, particularly for institutions like court libraries that handle sensitive data. To guarantee the protection of legal and personal data while preserving openness and public access to crucial legal resources, these organizations must negotiate a complicated web of national and international regulations. To protect public trust and protect citizens' information, court libraries nationwide must adhere to cyber security standards and local data privacy laws. There may be serious legal, monetary, and reputational repercussions if these laws are broken. Additionally, national governments are spending more money on cyber security to reduce the possibility of data breaches that could jeopardize both national security and individual privacy. Since different nations have different privacy laws and data frequently moves across borders, the problem becomes more complicated on a global scale. Even if court libraries and other institutions are not physically located in those countries, they must adhere to foreign regulations due to the extraterritorial reach of laws like the GDPR. Given that cyber threats are becoming more cross-border and can impact multiple jurisdictions at once, international collaboration in cyber security is crucial.

The confluence of data protection, public access to court records, and legal transparency presents a special set of difficulties for court libraries. It is essential to strike a balance between upholding stringent privacy and cyber security regulations and preserving public access to legal information. These

organizations need to stay flexible and keep updating their procedures, technology, and policies to conform to both domestic and international frameworks as data privacy laws and cyber threats change. In conclusion, maintaining the integrity, confidentiality, and accessibility of legal data depends on strong cyber security and data privacy procedures. To reduce the risks associated with cyber threats, court libraries must take the initiative to invest in secure technologies, educate themselves on the national and international ramifications of these regulations, and promote cooperation. This strategy preserves the legitimacy and efficiency of legal systems around the world in addition to safeguarding people's privacy.

References

1. Bamberger, A. (2020). Accumulating cosmopolitan and ethnic identity capital through international student mobility. *Studies in Higher Education*, *45*(7), 1367-1379.
2. Babikian, J. (2023). Securing Rights: Legal Frameworks for Privacy and Data Protection in the Digital Era. *Law Research Journal*, *1*(2), 91-101.
3. California Department of Justice. (2020). California Consumer Privacy Act (CCPA).
4. Cohen, B., Hall, B., & Wood, C. (2017). Data Localization Laws and Their Impact on Privacy, Data Security and the Global Economy. *Antitrust*, *32*, 107.
5. Canedo, E. D., Cerqueira, A. J., Gravina, R. M., Ribeiro, V. C., Camões, R., dos Reis, V. E., & de Sousa Jr, R. T. (2021). Proposal of an Implementation Process for the Brazilian General Data Protection Law (LGPD). In *ICEIS (1)* (pp. 19-30).
6. Deen, N. (2024). *Information privacy and data protection in e-government services in The Gambia: A human rights perspective* (Master's thesis, UiTNorgesarktiskeuniversitet).
7. Edwards, L., Veale, M., Lynskey, O., Coldicutt, R., Loideain, N. N., Kaltheuner, F., ...&Bietti, E. (2020). The Coronavirus (Safeguards) Bill 2020: Proposed protections for digital interventions and in relation to immunity certificates.

8. European Commission. (2020). General Data Protection Regulation (GDPR).
9. Fishman, W. L. (1980). Introduction to transborder data flows. *Stan. J. Int'l L.*, *16*, 1.
10. Frigo, C. A., Wyss, C., & Brunner, R. (2020). The effects of the rectus femoris muscle on knee and foot kinematics during the swing phase of normal walking. *Applied Sciences*, *10*(21), 7881.
11. Greenleaf, G., Chung, P., & Mowbray, A. (2015). Supporting and influencing data privacy practice: The free access International Privacy Law Library. *Computer Law & Security Review*, *31*(2), 221-233.
12. Goldman, E. (2020). An introduction to the California Consumer Privacy Act (CCPA). *Santa Clara Univ. Legal Studies Research Paper*.
13. Ghani, F. A., Shabri, S. M., Rasli, M. A. M., Razali, N. A., &Shuffri, E. H. A. (2020). An Overview of the Personal Data Protection Act 2010 (PDPA): Problems and Solutions. *Global Business and Management Research: An International Journal*, *12*(4), 559-566.
14. Ghernaouti-Hélie, S., Benzekri, A., Laborde, R., Aitsaadi, N., & Garcia-alfaro, J. (2020, November). 2020 4th Cyber Security in Networking Conference (CSNet). In *4th Cyber Security in Networking Conference: Cyber Security in Networking (CSNet 2020)*. IEEE: Institute of Electrical and Electronics Engineers.
15. International Organization for Standardization. (2020). ISO/IEC 27001: Information security management systems.
16. International Court of Justice. (2021). Data Privacy and Security Protocols for International Courts.
17. Itani, D., Itani, R., Eltweri, A. A., Faccia, A., &Wanganoo, L. (2024, February). Enhancing CybersecurityThrough Compliance and Auditing: A Strategic Approach to Resilience. In *2024 2nd International Conference on Cyber Resilience (ICCR)* (pp. 1-10). IEEE.

18. Johnston, S., & Parker, D. (2022). Causes and Consequences of Policy Uncertainty: Evidence from McGirt vs. Oklahoma. *Law & Economics Center at George Mason University Scalia Law School Research Paper Series*, (22-046).
19. Krumay, B., Bernroider, E. W., &Walser, R. (2018). Evaluation of cybersecurity management controls and metrics of critical infrastructures: A literature review considering the NIST cybersecurity framework. In *Secure IT Systems: 23rd Nordic Conference, NordSec 2018, Oslo, Norway, November 28-30, 2018, Proceedings 23* (pp. 369-384). Springer International Publishing.
20. Kuner, C. (2020). The GDPR and international organizations.
21. Nosowsky, R., & Giordano, T. J. (2006). The Health Insurance Portability and Accountability Act of 1996 (HIPAA) privacy rule: implications for clinical research. *Annu. Rev. Med.*, *57*(1), 575-590.
22. Lobel, I. (2021). Revenue management and the rise of the algorithmic economy. *Management Science*, *67*(9), 5389-5398.
23. Mwangi, E. (2015). *Information literacy in special libraries: a case study of the high court library Milimani law courts in Nairobi, Kenya* (Doctoral dissertation, University of Nairobi).
24. Oyewole, A. T., Oguejiofor, B. B., Eneh, N. E., Akpuokwe, C. U., &Bakare, S. S. (2024). Data privacy laws and their impact on financial technology companies: a review. *Computer Science & IT Research Journal*, *5*(3), 628-650.
25. Stanfield, A. (1997). Cyber courts: using the Internet to assist court processes. *JL & Inf. Sci.*, *8*, 240.
26. Sumartono, E., Harliyanto, R., Situmeang, S. M. T., Siagian, D. S., &Septaria, E. (2024). The Legal Implications of Data Privacy Laws, Cybersecurity Regulations, and AI Ethics in a Digital Society. *The Journal of Academic Science*, *1*(2), 103-110.

27. Voigt, P., von demBussche, A., Voigt, P., & von demBussche, A. (2017). Practical implementation of the requirements under the GDPR. *The EU General Data Protection Regulation (GDPR) A Practical Guide*, 245-249.
28. Wang, D., Hu, B., Hu, C., Zhu, F., Liu, X., Zhang, J., ...&Peng, Z. (2020). Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus–infected pneumonia in Wuhan, China. *jama*, *323*(11), 1061-1069.
29. Zhang, D., Tang, Z., Huang, H., Zhou, G., Cui, C., Weng, Y., ...& Zhao, Y. (2019). Metabolic regulation of gene expression by histone acetylation. *Nature*, *574*(7779), 575-580.
30. Zeng, F., Huang, Y., Guo, Y., Yin, M., Chen, X., Xiao, L., & Deng, G. (2020). Association of inflammatory markers with the severity of COVID-19: A meta-analysis. *International Journal of Infectious Diseases*, *96*, 467-474.

Awareness of web 2.0 tools among college librarians: a study

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Abstract
Web 2.0 technologies offer tremendous opportunities for libraries to provide user centered service. The information sharing tools of web 2.0 have made libraries to understand and embrace these new technologies to offer better user services.Web 2.0 technologies have great potential to enhance the delivery of library services and to contribute to the professional development of library staff. New emerging technologies like web 2.0, paves support for great opportunities for libraries, librarians and users to connect each other even if they are geographically distributed.The present deals with Awareness of Web 2.0 Tools among College Librarians Affiliated to KBCNMU, Jalgaon (MS). This paper includes concept of web 2.0, awareness of web 2.0 among college librarians, its use for personal and library work, way of participating in web 2.0 and various constraints faced by librarians while web 2.0 tools implementing in library etc.

Keywords
Web 2.0, College Library, Librarian, KBCNMU, Jalgaon

Introduction
The Internet and web technology has changed the way people interact, communicate, share and acquire knowledge. However, when the web was created it did not have features andfacilities for users to interact. With the evolution of Internet and communication Technology,Web 2.0 has evolved into a dynamic, interactive and collaborative platform that facilitiesexchange of knowledge and information amongst its users (Thanuskodi, 2012).Web 2.0 is attaining the status of most powerful trend on the Web, which is growing day by day. Web2.0 is commonly used for identifying the trend of new kind of tools and activities happening, as a second phase of Web developments. It represents the change in people's activities on the Web, from a mere place to access information towards a place to create, write, share, collaborate, network with their intellectual

involvement (Vijayakumar, 2012).Web 2.0 technologies offer tremendous opportunities for libraries to provide user centered service. The information sharing tools of web 2.0 have made libraries to understand and embrace these new technologies to offer better user services (Ramana, 2009).Web 2.0 technologies have great potential to enhance the delivery of library services and to contribute to the professional development of library staff. New emerging technologies like web 2.0, paves support for great opportunities for libraries, librarians and users to connect each other even if they aregeographically distributed. The advent of web 2.0 has created a new break for librarians to deliver information services to users at their expected range. Many mainstream libraries in India have started to equip their library websites with web 2.0 technologies (Sudhakaran&Sivankutty, 2011).

Definitions of Web 2.0

The term Web 2.0 was coined by 0' Reilly in 2003 and became popular after the first web 2.0 conference in 2004. Web 2.0 is the use of new web technology to enhance creativity, information sharing, interactivity, participation, collaboration and functionality of the web. Web 2.0 refers to the improved versions of the web for the development of web-based communities and hosted services such as social-networking sites, video sharing sites, wikis, blogs, podcasts, RSS feeds and folksonomies**.** Web 2.0 technologies tend to foster innovation in the assembly of systems and sites composed by publishing together features from distributed independent developers. It is a participative platform where users generate and distribute content often with freedom to share and re-use.

Tim O'Reily (2005) defined Web 2.0 as: 'Web 2.0 is the network as platform, spanning all connected devices; Web 2.0 applications are those that make the most of the intrinsic advantages of that platform: delivering software as a continually-updated service that gets better the more people use it, consuming and remixing data from multiple sources, including individual users, while providing their own data and services in a form that allows remixing by others, creating network effects through an "architecture of participation," and going beyond the page metaphor of Web 1.0 to deliver rich user experiences' (Ramana, 2009).

The important Web technologies like blogs, wikis, podcasts, RSS feeds, mashups, share point and social networking responsible for the evolution of web 2.0 are given below:

- **Blogs -** Online diaries hosted on a web site
- **Wikis –** Open web pages
- **Social networking –**linking of user generated content from users to other users eg. Facebook**,** My space, LinkedIn.
- **RSS (Really Simple Syndication)** – Allows people to subscribe to online distribution of news, blogs, podcasts etc.
- **Folksonomics**- Collaborative tagging, classification and indexing
- **Streaming audio and video media**
- **Instant messaging –** Allows real time communication between users and librarians.
- **Mashups –** Merging content from different sources to create a new service.
- **Photo –** sharing through sites such as Ficker, Picasa etc.
- **Podcasts –** Audio and Video recordings (Ramana, 2009).
- **Medium**- Medium is an American online publishing platform developed by Evan Williams and launched in August 2012. It is owned by A Medium Corporation.
- **Weebly**- Weebly, a subsidiary of Block, Inc., is an American web hosting and web development company based in San Francisco, California. Founded in 2006 by David Rusenko, Chris Fanini, and Dan Veltri, the company has grown to provide user-friendly website creation tools and services
- **Tumblr**- Tumblr is a micro blogging and social networking website founded by David Karp in 2007 and currently owned by American company Automattic. The service allows users to post multimedia and other content to a short-form blog.

Purpose of the study

The aim of this web survey is to have a clear picture about the extent of awareness of Web 2.0 technologies in college librarians in KBCNMU, Jalgaon. It also tries to implementation of web 2.0 applications in college library.

Objectives of the study

The present study has been carried out with following objectives:

- To find out the awareness of Web 2.0 among college librarians affiliated to KBCNMU
- To know the purpose of using Web 2.0 tools

- To identify the choice of web 2.0 technology usedby the college librarians for personal and Library work
- To find out the ways of college librarians accepting to participate in web 2.0 tools

Scope & limitations of study

The scope of the present study is limited to 49 College Librarians in Jalgaon District which are affiliated to KBCNMU, Jalgaon; and the study is limited only to Arts, Commerce and Science Colleges.

Statement of the research problem

The Problem under Investigation is "Awareness of Web 2.0 Tools among Academic Librarians Affiliated to KBCNMU, Jalgaon (MS)". The study evaluates the Awareness of web 2.0 tools among the College librarians which are affiliated to KBCNMU, Jalgaon.

Methodology

Survey method used for the study. The online questionnaire was distributed to the librarians through e-mail. The collected data and information analysed by applying statistical method and certain techniques of research methodology.

Data analysis

The data were collected using questionnaires were consolidated for analysis. Percentage method is used to derive findings. The following Tables and figures show the responses of the faculties relating to the problem under study.

Awareness of Web 2.0

Respondents were asked about Awareness of Web 2.0. The responses received are presented in Table 1.

Table 1:- Awareness of Web 2.0

Awareness	**Number**	**Percentage**
Aware	35	100%
Not Aware	00	00
Total	**35**	**100**

It is observed from Table no. 1 that 100% of the respondent Librarians are aware about web 2.0.

Knowledge possessed abut web 2.0

Respondents were asked Knowledge possessed abut web 2.0. The responses received are tabulated in Table No. 2.

Table No. 2: Knowledge possessed abut web 2.0

Response	Number	Percentage
Only theoretical	07	20.00%
Only practical	05	14.28%
Both theoretical and practical knowledge	23	65.71%
Total	**35**	**100**

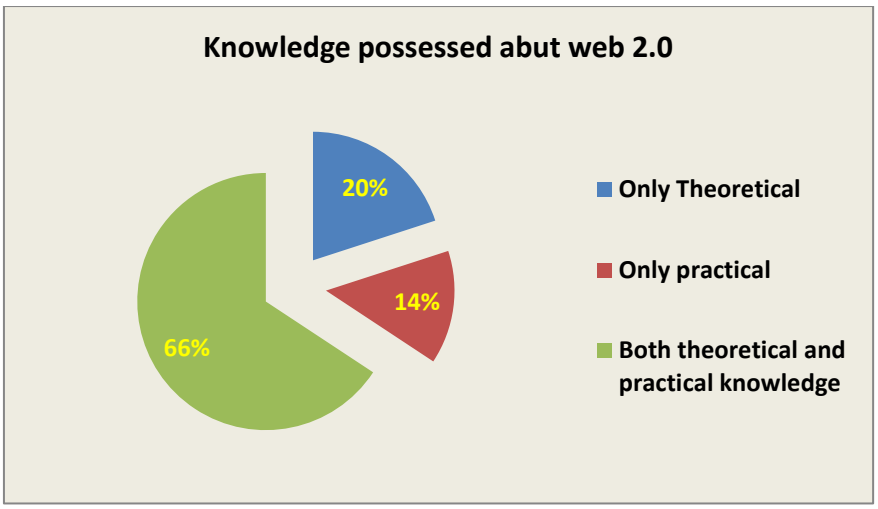

Figure No. 1: Knowledge possessed about web 2.0

It was reveals that the Table No. 2 and figure no. 1 indicates that out of 35 respondents who were aware of Web 2.0, 07 (20%) had only theoretical knowledge. Further, 05 respondents (14.28%) had only practical knowledge and 23(65.71%) had both theoretical and practical knowledge.

Purpose of using Web 2.0 services

Respondents were asked about Purpose of using Web 2.0 services. The responses received are presented in Table No.3.

Table No.3: Purpose of using Web 2.0 services

Purpose	Number	Percentage
To participate in a book discussion platform	05	14.28%
For getting book reviews	04	11.42%
Sharing what your know/have with others	28	71.42%
Getting guidance about new thing	12	34.28%
Using it as a research tool	08	22.85%
For getting library related news and views	09	25.71%
Getting general information and views about a topic	07	20.00%
For professional communication	30	85.71%
As a part of library services	14	40.00%

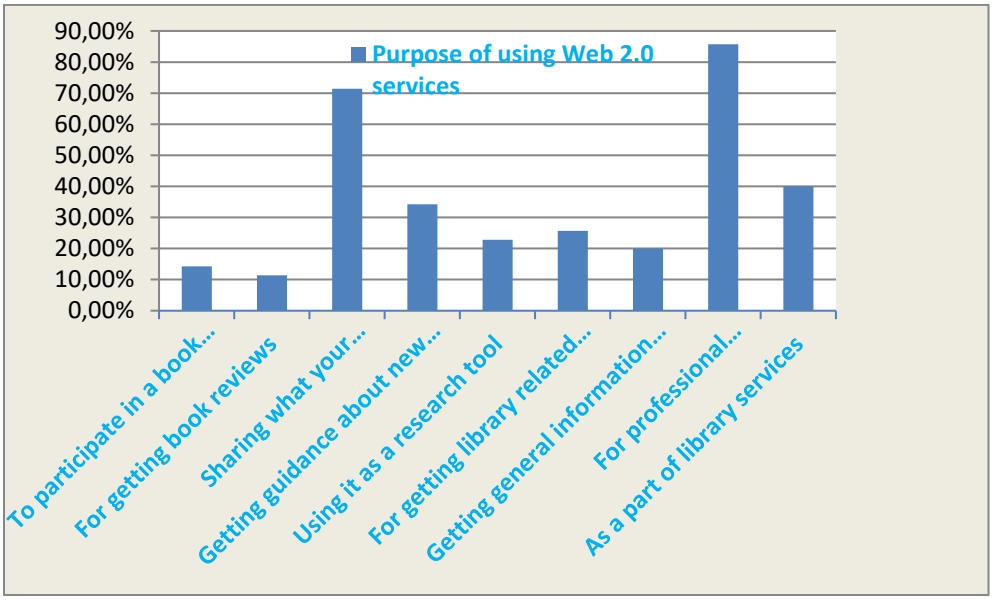

Figure No. 2: Purpose of using Web 2.0 services

It is observed from the table no. 3 and Figure no. 2 that the 85% of responders responded that web 2.0 is forprofessional communication. It is followed by sharing what you know/ have with others (71.42%), as part of library service (40%), getting guidance about new thing (34.28%), to participate in a book discussion platform (14.28%), for getting book reviews

(11.42%), using it as a research tool (22.85%), For getting library related news and views (25.71%), Getting general information and views about a topic (20%).

Application of web 2.0 tools in personal work

Respondents were asked Application of web 2.0 tools in personal work. The responses received are presented in Table No. 4.

Table No. 4:Application of web 2.0 tools in personal work

Application of web 2.0 tools in personal work	**Number**	**Percentage**
Blogs	07	20.00%
Wikis	05	14.28%
RSS Feeds	01	02.85%
Social Networking Sites	22	62.85%
Social Bookmarking	-	-
Podcasting	-	-
Total	**35**	**100**

The Table no. 4 indicates that 62.85% respondents used Social networking sites in their personal work. Whereas 20% respondents used Blogs, 14.28% used wikis and only 2.85% respondents used RSS feeds their personal work.

Application of web 2.0 tools in Library work/Services

Respondents were asked Application of web 2.0 tools in Library work/Services. The responses received are presented in Table No.5.

Table no.5: Use of web 2.0 tools in Library work/Services

Application of web 2.0 tools in Library work/Services	**Number**	**Percentage**
Blogs	10	28.57%
Wikis	08	22.85%
RSS Feeds	-	-
Social Networking Sites	17	48.57%
Social Bookmarking	-	-
Podcasting	-	-
Total	**35**	**100**

The Table no. 5 indicates that 48.57% respondents used Social networking sites for library services. Whereas 28.57% respondents used Blogs, 22.85%

used wikis. Nobody used RSS feeds, Social Bookmarking, Podcasting for library work/services.

Participation in Web 2.0 Activities

Respondents were asked about how they participated in Web 2.0 technology. The responses received are tabulated in Table No.6.

Table No.6: Participation in Web 2.0 Activities

Participation in Web 2.0 Activities	**Number**	**Percentage**
By reading	03	8.57%
By posting	04	11.42%
Training Programme	-	-
Online Tutorials	-	-
Friends/Colleagues	28	80.00%
Total	**35**	**99.99=100**

It observed from the table no.6 that 80% respondents join web 2.0 through friends and colleagues, whereas 11.42% participated by posting, 8.57% participated by reading. Nobody joint web 2.0 activities by training programme and online tutorials.

Constraints in implementing web 2.0 technologies in Library

Respondents were asked about Constraints in implementing web 2.0 technologies in Library. The responses received are tabulated in Table No.7

Table No.7: Constraints in implementing web 2.0 technologies in Library

Constraints	**Number**	**Percentage**
Tight working Schedule	04	11.42%
Lack of Infrastructure	11	31.42%
Lack of co-operation from the authority	17	48.57%
Poor provision for training	03	08.57%
Total	**35**	**100**

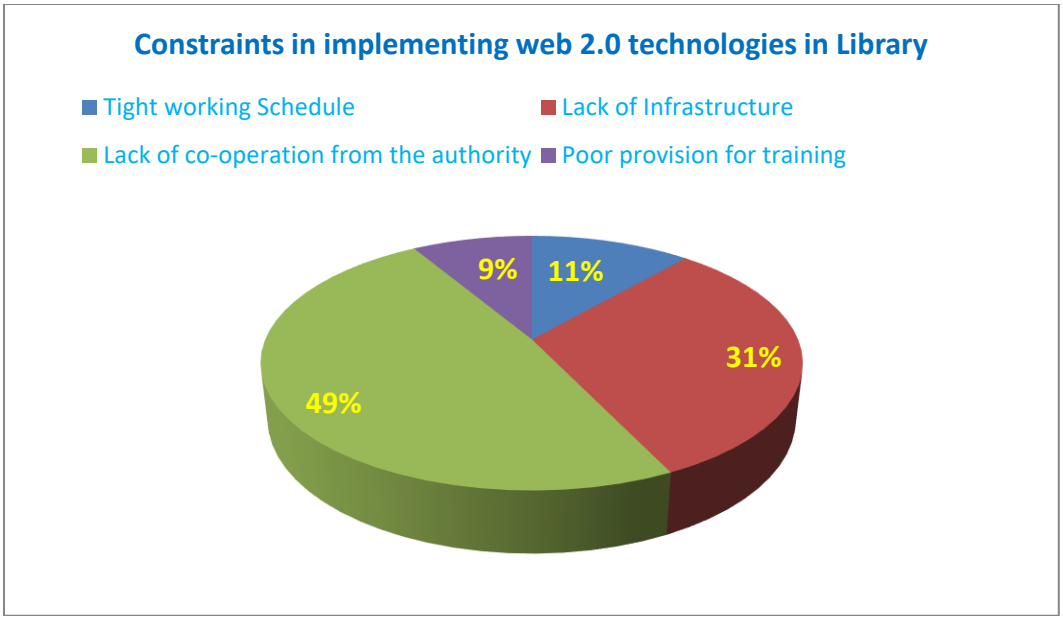

Figure No.3: Constraints in implementing web 2.0 technologies in Library

The Table No. 7 and figure no. 3 indicates that 48.57% respondents felt that lack of co-operation from the authority is the major constraint in implementing web 2.0 technologies in library, whereas 31.42% respondents are facing the problems of lack of infrastructure, 11.42 respondents don't have time to implement web 2.0 technology in library, 8.57% respondents felt that there is no provision for training.

Conclusions

Hundred percent Respondents/Librarians are aware about web 2.0; 07 (20%) res had only theoretical knowledge. Further, 05 respondents (14.28%) had only practical knowledge and 23(65.71%) had both theoretical and practical knowledge; 85% of responders responded that web 2.0 is for professional communication; 62.85% respondents used Social networking sites in their personal work; 48.57% respondents used Social networking sites for library services; 80% respondents join web 2.0 through friends and colleagues; 48.57% respondents felt that lack of co-operation from the authority is the major constraint in implementing web 2.0 technologies in library, whereas 31.42% respondents are facing the problems of lack of infrastructure, 11.42 respondents don't have time to implement web 2.0 technology in library, 8.57% respondents felt that there is no provision for training.

References

1. Ahmad, P., Hussain, A. & Aqil, M. (2013). Use of web 2.0 in Saudi Arabia Universities. *International Journal of Information Dissemination and Technology*, 3(3), 158-166.
2. Jadon, N.S., Jadon, Gopal Singh, Singh, Amrita & Rajput, Brajendra Singh (2009). Web 2.0 Technologies: Library 2.0 and its Implication for Libraries, *Pearl,* 3(1), 11-16.
3. Majumdar, Sandip (2012). Web 2.0 Tools in Library Web Pages: Survey of Universities andInstitutes of National Importance of West Bengal. *DESIDOC Journal of Library & Information Technology*, 32 (2), 167-170.
4. Ramana, P. Venkata (2009). Library 2.0: Web 2.0 Applications in Libraries. *Pearl,* 3(2), 52-56.
5. Satpathy, Sunil Kumar & Maharana, Rabindra K. (2014). Awareness of Web 2.0 among LIS Professionals of Engineering Colleges of Odisha, India. *PEARL - A Journal of Library and Information Science*, 8(1), 1-8.
6. Seena, S.T. & Sudhier, K.G. Pillai (2014). Impact of Web 2.0 Technology Applications in Kerala University Library: Library Professionals' Perspective. *DESIDOC Journal of Library & Information Technology*, 34(5), 419-425.
7. Sudhakaran, Jinu & Sivankutty V. S. (2011). Skills of New Genre Librarians: An Exploratory Survey of the Web 2.0 Skills of Library and Information Science Professionals in India. *International Journal of Information Dissemination and Technology*, 1(4), 253-257.
8. Thanuskodi, S. (2012). Awareness of Web 2.0 among Participants of the 3rd LIS Refresher Course in Bharathidasan University. *SRELS Journal of Information Management*, 49(6), 655-661.
9. Tyagi, Sunil (2012). Use of Web 2.0 Technology by Library Professionals: Study of Selected Engineering Colleges in Western Uttar Pradesh. *DESIDOC Journal of Library & Information Technology*, 32(5), 439-445.
10. Vijayakumar, J. K. (2012). Use of Web 2.0 Applications in Medical Education and E-Learning. *Information Studies*, 18(1), 73-78.

NextGenLib
A New Cloud-Based Integrated Library Management Software

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Abstract
At present in this world a variety of software are available in almost all fields of human activity. Due to change in users' needs and availability of new technologies, it becomes necessary to update software from time to time or develop new software afresh. The Library and Information Science field is no exception to this and therefore a new software namely NextGenLib has been developed. This paper describes the various features available in this software and other details related to this software.

Keywords
NextGenLib, Library & Information Science, Library Automation Software, Digitization of Libraries, Institutional Digital Repositories

Introduction
The current trend of digitized libraries, change in users' needs and expectations and availability of new technologies have compelled software experts to develop new library software. Therefore, we at Madhavi Information Services with support from our software team, have designed and developed NextGenLib – A new Cloud-based integrated library management software. It is hosted in the fastest cloud and made available as "Software as a Service" (SaaS). The quality of any library software is judged by factors such as its suitability for different types of libraries, number of modules and options (features) in the software, adherence to international library standards, use of latest technologies, periodical updating, user friendliness and last but not least its price.

NextGenLib
Beyond Traditional Library Automation. NextGenLib software has been developed using latest web technology (Postgres SQL open source software for database management at the back end and front end .Net technology using programming languages such as VB.Net, C# (C Sharp), Javascript, HTML5 and Android based mobile app). The software follows international

library standards like AACR2, MARC21, Web 3.0, NCIP/SIP 2 Protocol, Z39.50 and Google Books. Further this software covers a number of modules and features as detailed below.

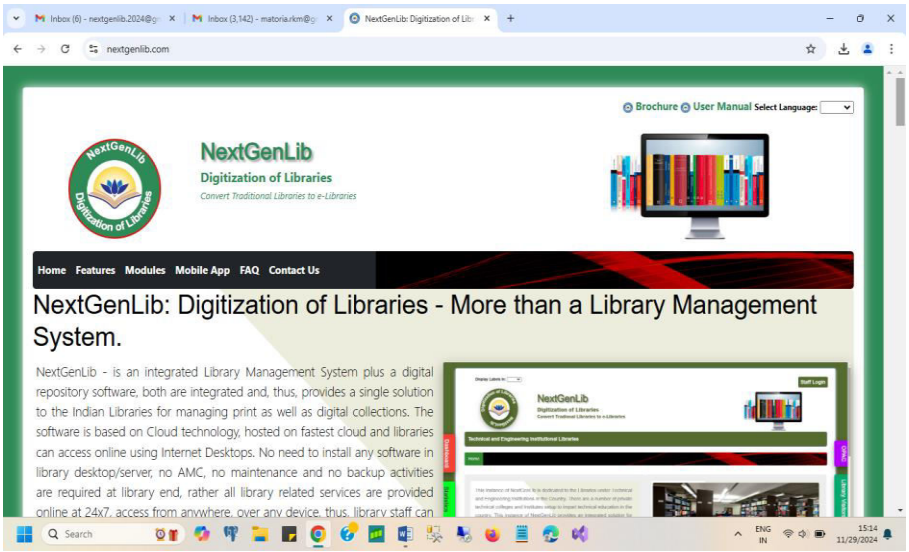

Fig.1: NextGenLib Home Page

Features

it's price is reasonable, competitive and it is available on an annual subscription basis. The software is user friendly and suitable for all types of libraries – personal, departmental, academic (school, college, university), public, special, corporate etc.. The software is well integrated and compliant with email, SMS, Google Books, RFID, barcode, QR code, webcam for member photos and book cover photos and RESTful OpenAPI. Use of smart card is being integrated in the software. Being a cloud-based software there is no necessity of having server(s) in the library, no installation required by library, no backup, no updating and no maintenance at the library end. This makes library staff free to focus on library services. User manual is also available in all Indian regional languages. Registered members can access library services using web OPAC and mobile app (Android). Mobile app is available on Google Play Store under name NextGenLib.

Advanced Features

This software, so to say, is a three-in-one software – first for automating in house functions in a library; second for automating information services to

users; and third for building up an institutional digital repository of copyrighted documents (books, chapters in books, journal articles, discussion papers, technical reports, project reports, syllabus, e-lectures, audio-lectures delivered during pandemic, photos of important events, etc.) adding further therein e-books, animated e-books, rare e-books, audio books, newspaper items, etc. of members' interest. You may not use a separate digital library software such as dSpace or e-Print or Bridgestone Digital Library. Further you can track users' visit (footfall) to your library. Besides sending reminders after due date, you can alert your users by sending them reminders one or two days before due date for returning publications borrowed by them. This feature helps students to reduce payment of fine to a minimum.

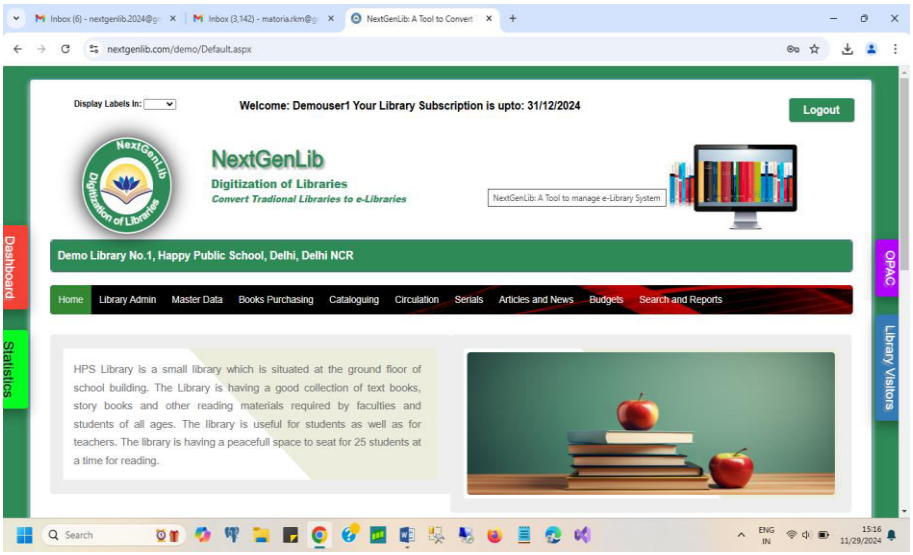

Fig.2: Staff Interface

Modules - A list of modules available in the software and salient features (except those mentioned earlier) are listed below.:

- ✓ Database Admin
- ✓ Group Admin
- ✓ Library Admin
- ✓ Master Data
- ✓ Books Purchasing Module
- ✓ Cataloguing Module
- ✓ Circulation Module
- ✓ Serials Subscription Module
- ✓ Articles/News Items Indexing

- ✓ Library Budget Module
- ✓ Search and Reports Module
- ✓ Web OPAC

Features At A Glance

- ✓ Online Data entry and member services
- ✓ Covers all In-house Activities including, Book Purchasing , Cataloguing, Billing etc.
- ✓ Member Categories and sub-categories wise entitlements and due days including variable Fine System
- ✓ Books Issue/Return/Renewal/Reservation
- ✓ Sharing of Resources with other Libraries
- ✓ Member Cards generation with various designs
- ✓ Articles and Chapter Indexing
- ✓ News Clipping Managers
- ✓ External Resources indexing with uploading of free e-Books
- ✓ Subscription to Digital Library Package
- ✓ Multi-copy accessioning
- ✓ Uploading of e-Books Copy (pdf files) along with Books details
- ✓ Members may download and read e-Books so uploaded.
- ✓ E- Book access control with options to give access to your members, other libraries' members or to public.
- ✓ Search with various fields options using Boolean operators
- ✓ Member profile updating, photo uploading, fine and receipt generation and download options
- ✓ Password management by Members
- ✓ Online Reservation and book supply request on email
- ✓ Inter Library Loan request among libraries
- ✓ Export/Import of books and members data
- ✓ Data Migration Free to NextGenLib users
- ✓ Online Training / Online Support
- ✓ Current Awareness Service/S.D.I.
- ✓ Download catalogue record using ISBN (copy cataloguing)

✓ Link to Google Books and WorldCat

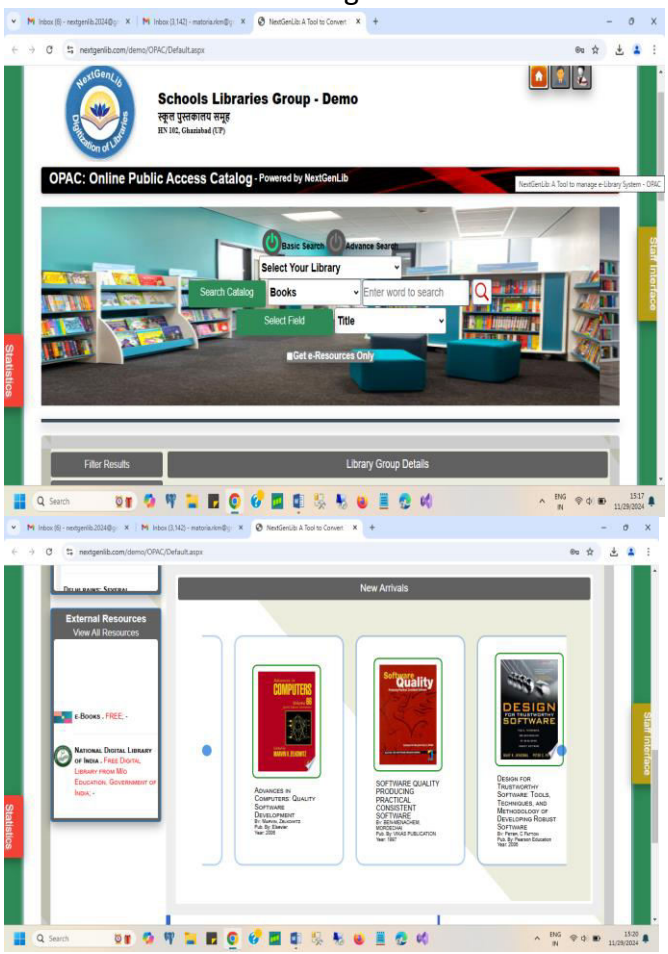

Fig.3: Membrer Interface (OPAC)

Search and Reports

Using Accession Register option one can search information about books by selecting one from the Acquisition Mode(Purchased/Free/Donated); Section(General/Textbooks/Reference); Copy Status(Lost/Withdrawn/Damaged, etc.); Location; Classification Number and download or print (PDF/DOC/HTML) and export records in (Excel/MARC21/ISO2709) format. Using Catalogue Search option, one can perform search by specifying Author, Editor, Title, Keyword or Word(s) in title, ISBN, Accession Number, Year, Classification Number, Publisher, Broad Subject, etc. Further a number of reports can be generated. Among others mention may be made of the following reports:

a) Recent Arrivals List (Books)
b) Soft Copy of Content Pages of Recently Arrived Journal Issues
c) Current Awareness Service/S.D.I.
d) Footfall of Visitors to a Library
e) List of Top Users
f) Most Used Books
g) Reminder to Users One or Two Days Before Due Date
h) Title-Copies Report
i) Subject-wise Title-Copies Report

Conclusion

We do not wish to compare this software with other library software presently available and we leave it to library professionals to find for themselves the strengths and shortcomings (if any) of this software. To sum up this software is suitable and useful for converting existing traditional libraries into e-libraries. It is hoped that libraries not having any library software or those having some library software but have not gone digital so far would consider NextGenLib for implementation at their libraries.

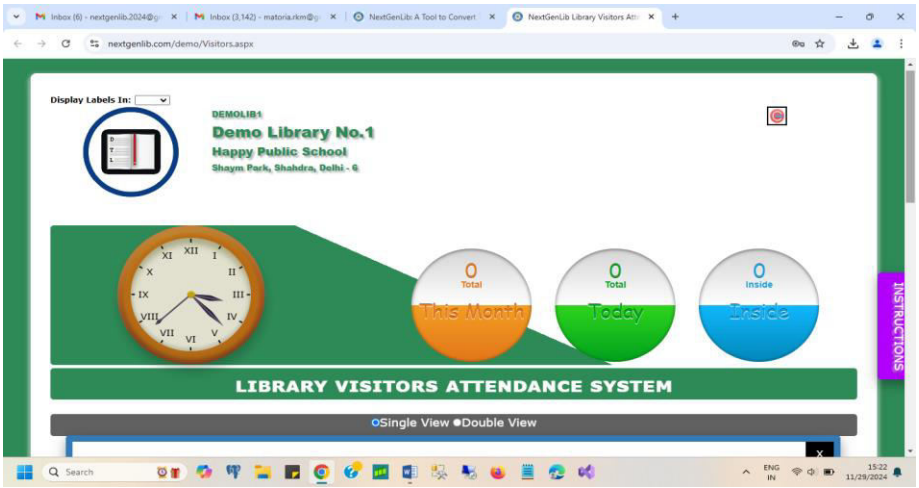

Fig.4: Library Visitors Attendance Interface

For further details please visit: Website: https://nextgenlib.com
For Demo and Implimentation: nextgenlib.2024@gmail.com
CC: madhusudanrailkar@gmail.com

Library Automation

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Abstract

This paper discussed aboutthe Library Automation in libraries refers to a higher level of automation in which machines carry out conservative and routine tasks or procedures with little or no human involvement. The numerous benefits of library automation could be similar to how simple information searching saves us time and makes decisions quickly, resulting in more effective communication, resource sharing, and stock verification. It inspires the library employees. This paper shelters the automation concept, its requirement and various components that help automate the library. Library computerizationdecreases the wearisomeness of boringphysicalenergies in library procedures by using library automation's collection, storage, management, processing, protectionand message, etc. Increase efficiency in standings of work and services.

Keyword

Library, Automation, Library Automation, Digital Library, RFID.

Introduction

Now a days, using antiquated tools is getting too much to handle. This abundance of information can only be transported under control for the reader's beneficial usage through automation. Accept modern ICT library automation tools now to make better use of library resources and provide more user-friendly access to the most recent information.Furthermore, they can access a library's collection at any time. This essay makes the case for digitization and automation planning for libraries. The idea of digitization, its goal, and the practice of digitizing library resources will all be covered in this essay. Because of the present issues and the requirement to go digital in order to provide online services, digitization is an essential duty for libraries in the twenty-first century.Library automation systems typically include integrated library management software, also known as an Integrated Library System (ILS) or Library Management System (LMS) that provides a range of functionalities such as cataloging, circulation,

acquisition, serials management, and online public access catalog (OPAC). In addition to these core functionalities, libraries can also integrate other technologies such as Radio Frequency Identification (RFID) systems, self-checkout machines, and electronic resource management systems into their automation infrastructure.

Library

Nowadays, the term "library" seems to be used in a wide variety of contexts, including digital and physical libraries. Librarians assist patrons in locating the most reliable source of information, be it a book, website, or database record, at public libraries and, in fact, all libraries.

What is Automation

The Greek term autosomes, which meaning something with the ability to move without warning or on its own, is where the word "automation" originates.D.S. Harder coined the term "automation" in 1936 while working for General Motors in the United States. He referred to the automatic handling of pieces in between successive production stages as automation. Automation is an automated working technology that integrates professional material handling, procedure, and design. This is an attempt to create a chain of processes that are automatic and self-regulating.The Third New International Dictionary of Webster states that "The techniques of making an apparatus, a process, or a system operate automatically" is how English defines automation. Stated differently, it is the apparatus that manipulates information storage, selection, presentation, and recording of internally created or input data. Mechanization of library house-keeping operations predominantly by computers is known as library automation. (Gove, 1986). According to Compendium of Library and Information Science, “automation is the technology concerned with the design and development of process and system that minimize the necessity of human intervention in operation”. (Kent, 1977) Conferringto McGraw Hill Encyclopedia of Science and Technology It describes automation as “a coined word having no precise generally accepted technical meaning but widely used to imply the concept, development, or use of highly automatic machinery or control systems”.

McGraw (1982) 75 The definition of "automatic" in Webster's Third New International Dictionary of English is “automatically controlled operation of an apparatus, process or system by mechanical or electronic device that

takes place of human organs of observation, effort and decision". (Gove, 1966) definite of the Oxford English Dictionary as defines
automation is "application of automatic control to any branch of industry or science by extension, the use of electronic or mechanical devices to replace human labour". (Simpson & Weiner, 1989).

Another significant benefit of automation is cost savings. By automating processes, organizations can reduce labor costs and optimize the use of resources. In everyday life, automation is also becoming increasingly present in smart homes, where devices like thermostats, lighting, and security systems are programmed to operate based on user preferences or environmental conditions. Overall, automation transforms processes, improving efficiency, reliability, and convenience.

Automation is using technology, machines, or software to achieve tasks with minimal human intervention. Automation aims to improve efficiency, reduce errors, and save time by replacing manual processes with automatic ones. This concept applies across various industries and sectors, from manufacturing and transportation to business processes and home devices. In its simplest form, automation allows repetitive tasks, such as data entry or machinery operation, to be handled by systems that follow pre-programmed instructions, reducing the need for constant human oversight.

Library Automation

As a growing organism, libraries need to be improved constantly to satisfy the needs of its patrons.
The development of the computer has caused society to shift quickly. Automation is therefore now absolutely necessary. In addition to enhancing the reputation of library employees, automation allows the current personnel to provide patrons more services. The effects of automation on libraries are self-evident; each function redefines the conventional organizational structure and turns it into a new institutional entry. This unit provides a concise synopsis of library automation.

Automation is definite as a method, a method, or a scheme which functionsmechanically. Conferring to the Encyclopedia of Library and Information Science, "Automation is the technology concerned with a design and development of the process and systems that minimize the necessity of human intervention in their operation."

Hefley Beryl F. and Swihart Stanley S. have defined the term 'library automation' as per "the processing of certain routine clerical function in the library with the assistance of computer or other mechanized or semi-automatic equipment". It might also be described as the process of automating all of a library's repetitious cleaning tasks. Acquisition, cataloging, circulation, serial control, references, and administrative tasks are all part of the housekeeping operation.

Libraries and library groups should be willing to support library automation. Libraries should be well funded and well organized. Software (operating system, system software, application software, library automation software, etc.), hardware (servers, UPS, scanners, printers, storage media, etc.), and skills are all necessary for library automation.

The first computer network was probably OCLC (Online Computer Library Center). Although microcomputers first appeared in 1971, they did not make an impact on libraries until 1981.This was because computers had limited storage capacity and did not have good software for loan applications. The development of OPAC in the 1980s was an important contribution to the field of library automation.

Among all the Indian institutions, University Library of Hyderabad was the first to develop an automation program using Libsys software. As part of its development, it received free software from Lybsys Corporation (now Libsys Ltd). The library has now been migrated to BTLSpackag.In North East India, all the universities have started automation. The work done by Tezpur University and NEHU University is quite interesting.When it comes to automation, university libraries in India lag behind their competitors in developing countries. However, libraries and librarians are slowly adapting to these changes by introducing some level of automation. Many libraries have also started computer conferencing and resource sharing.

OBJECTIVES OF LIBRARY AUTOMATION:

1. To progress control over collections.

2. To progress the standing facilities.

3. Near part excellently the resources among various libraries in a region

4. Do practice the services of the current staff efficiently

5. To have an efficiently control over the entire operation.

6. To afford access to information at a faster rate.

History of Library Automation

- At 1930, the first Library automation exertions began with use of punched cards for circulation and acquisition. The university of Texas library may have been the first to use punched cards in 1936.
- At 1940, vannevar bush's concept of a mechanical library, called the "memex" system, set the stage for future developments in hypertext and compiler operations.
- 1960 the coming of computer marked the second era of library automation. The machine-readable cataloguing (MARC) standards.
- 1970 the introduction of dummy terminals for accessing mainframe databases and turnkey library systems provided by vendors.
- Local Area Networks (LANs), CDROM technology, and microcomputers in the form of PCs first appeared in 1980.
- 1990 the internet uprising paved the path of Web-enabled integrated library systems.
- Open library systems powered by open standards, open source software, and real-time integration with open data and open contents first appeared in 2002.

The growth of digital libraries and electronic resources in the early 21st century extended access to numerous digital materials, including e-books and online databases. This period also observed the acceptance of open-source solutions like Koha, making library automation more cost-effective and customizable. More recently, libraries have integrated technologies like (RFID)Radio-Frequency Identification and artificial intellect to streamline circulation, enhance security, and improve user knowledges through AI-powered chatbots and data analytics.

Essential and Purpose of Library Automation

Library automation refers to the use of computer-based systems to manage and streamline library functions. It plays a crucial role in improving library services, operational efficiency, and user experience. Here are three key needs and purposes of library automation:

Effectiveness in Library Management

Library automation enhances the efficiency of library operations by automating repetitive and time-consuming tasks such as cataloging, circulation, acquisition, and inventory management.

- Speed up the cataloging process: New books, journals, and other resources are quickly added to the system, with metadata and classification details automatically recorded.
- Track library materials: Automated systems can track the movement of materials, reducing errors and ensuring accurate inventory records.
- Improve circulation management: Library staff can efficiently manage check-outs, returns, renewals, and overdue notices using automated systems.

Enhanced Access to Resources and Services

Automation makes it easier for users to access library resources and services. Key benefits include:

- **Online Public Access Catalog (OPAC)**: Users can search for books, articles, journals, and other resources through a digital catalog, improving their ability to find relevant information quickly.
- **Remote Access**: Automated systems allow users to access library resources and services online, which is especially important in the era of digital libraries and e-books.
- **Self-service Options**: Automated kiosks or systems allow users to check out materials and renew books without requiring assistance from library staff, reducing wait times and enhancing user satisfaction.

Data Management and Reporting

Library automation supports the collection, organization, and analysis of data to help library administrators make informed decisions. Benefits include:

- **Accurate and timely data**: Automated systems generate real-time reports on circulation statistics, collection usage, acquisitions, and budget tracking.
- **Decision-making**: Library managers can use this data to assess user needs, track trends, and make decisions about resource allocation, acquisitions, or weeding out outdated materials.
- **Enhanced record-keeping**: Automation ensures accurate and organized record-keeping for books, users, and library transactions, which is crucial for audits and long-term planning.

Advantage of Library Automation

- Growth in speed and saving of time
- Apprising record files much more quickly and easily;
- Greater library collaboration
- Improved library management
- Improve Staffing
- Innovative services
- Defense of records
- Report manufacture.

Benefits of Library Automation

- Improved productivity.
- Decrease staff.
- Decrease unit cost of operation.
- Recover control.
- Condense errors.
- Progress speed.
- Upgraded access.
- Growthvariety and depth of service.
- Simplify communication
- BesidesBy-products

Digital Library

Definition

Digital libraries define Larsona "global simulated library the library of thousands of networked electronic Libraries". He well-defined digital libraries as "no single stand-alone repositories of digital data. Instead they are a heterogeneous collection of protocols for users (and repository) interaction, data encoding and transmission.

digital library as: **Bawden and Rowlands (1999)** defined …. A library / information space, located in either a physical or virtual space, or a communication of a combination of both, in which a significant proportion of the resources, or a combination of both, in which a significant proportion of the resources available to users of that service exist only in digital form."

Service Providing by Digital Library

Digital libraries offer a wide range of services to their patrons. The services that digital libraries often offer are as follows. Databases such as catalogs, current awareness bulletins, databases for external purchases, CD-ROM databases, remote information services, internally published newsletters, reports, and journals, and online information sources E-mail, bulletin board services, and mirroring and cataloging Audio and video transmission, and a netnews system. Discussion boards and discussion groups; central storage facilities for hosting digital collections andindexes; tools for loading, storing, searching, and presenting digital objects; special collection services, etc.

Digital Library Automation:

Library automation is the use of computers to accomplish routine housekeeping tasks like acquisition, cataloging, circulation, and serials control.

Automation Software:

Alice for Libsys, Libsuite, Nexlib, Autolib, Lib-2000, Maitrayee, Sanjay, Wilisys, Nirmals, Softlink, Easylibsoft, Koha, webLibrarian Librarian, Cybrarian Soul, Slim21, E-Granthalaya, and others.

Librarian Software

Librarian is a sophisticated and forward-thinking library management system that CR2, India, designed and supports. Librarian software has revolutionized library automation across a range of institutions, including charities, schools, colleges, special, medical, and legal libraries, and other resource centers. More than 95% of websites that have ever bought Librarian are still in use today.

Cybrarian

The first SaaS-based Combined Library Automation Solution in Asia enables librarians to oversee their libraries effectively. Reputable search engines like Google, Yahoo, Live, and others have links to all security-based resources.

Readers from all over the world can now find your library by using the resource. Without having to spend a lot of money on pricey hardware and software, every librarian now has access to sophisticated capabilities like MARC21, Z39.50, Live webOPAC, Acquisition, Cataloguing, Customized Report Generation, and many more.
Librarians may also rest easy knowing that their database is fully protected, never tampered with, altered, or tampered with, and periodically backed up.

webLIBRARIAN Software
WebLIBRARIAN Software with the improved capability of multi-location and multi-branch organization, webLIBRARIAN is a comprehensive web-based library management and mechanization software that helps librarians, data managers, resource incharges, and information providers in bright locations to obtain and disseminate information from a variety of resources.

SOUL (Software for University and College Libraries)

- Established by INFLIBNET.
- User-friendly applications based on Windows.
- Elegant interfaces, well-organized features, and numerous support messages.
- Built using a client-server architecture.
- No extensive training is required.
- Access for multiple users.
- Enables the creation and viewing of records in regional languages (multilingual).
- Supports widely accepted standards such as AACR-2 and CCF.
- Inconsequential cost (Includes manuals, multilingual software, free future updates, installation, on-site training, and one year of support.)

Area of Automation

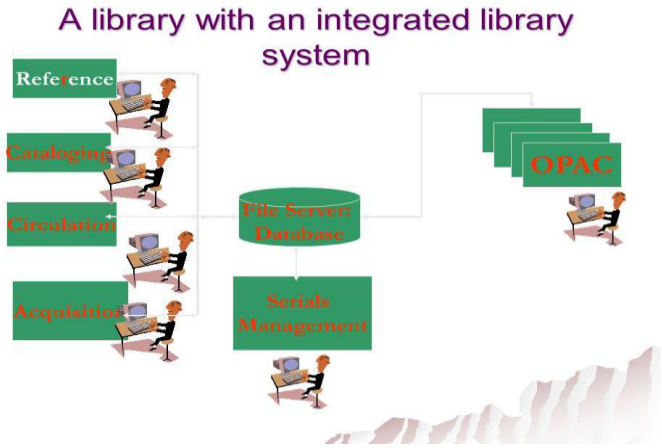

Fig.1: Area of Library Automation

OPAC (Online Public Access Catalogue)

Library resources are handled and retrieved using this online computerized catalogue. OPAC allows you to search for terms of your choosing across the database of books and other records that are held by your library. Boolean search, as well as basic and advanced searching.

1. Field-based search (source, author, subject, etc.)
2. Looking about.
3. Field-based.
4. It is hierarchical.
5. Personalized OPAC (My OPAC) Subject list, SDI, CAS, Reservation, DDC, and Outstanding Documents, among others.

Cataloguing

This unit allows for direct data entry for the library's new and leaving collections in addition to entering the complete cataloging details of the books acquired under the book acquisition make. The following forms can be found under the module.

Bibliographic records and indexes are created, stored, retrieved, and managed.

1. A facility for import/export.
   "E-resourcemanager."
2. Stock Verification
   Produce bar code labels.

Circulation

This unit is used to handle member registration and the issuance and return of library-available documents. Once book and monograph data entry is complete, the unit must be used. These are the activities that the unit will oversee.

• Document issuance, return, and renewal.
• Reservation, Cancellation, and Recall.
• E-mall reminders (manually)
• Organization of members.
• Reports.
• Issued/Returned Documents (Date, Subject, Type of Document, etc.)
• Well-known documents. (Max. Issued)
• A fine receipt.

Acquisition

This unit is used to automate the library's book purchase procedure. However, in order to accomplish the module's functions, users must fill out each form individually.

• The organization of suggestions.
• Oversee reminders, cancellations, approvals, and collation.
• Getting.
• Management of the budget.
• Management of master files, including publishers, vendors, and currency tables, among others.

Serial Control

The library's magazine and periodical subscriptions are managed by this department. The device must be used from the first menu to the last menu in order to finish the serial subscription plan, including paying and getting loose issues. The following activities will be overseen by the unit.
• Control the assistance.
• New Periodical Subscriptions.

• Establish order
• Journal renewal.
• Dispensation of invoices.
• Disbursements.
• New issues are received.
• Lost issue reminders.
• Problems with browsing.
• Producing reports.
• Control serials' bound volumes.

Administration and Reporting

- The staff file at the library.
- User IDF protection and encrypted passwords.
- Protection at the module level.
- Create a backup database.
- Modifying master files
- Establishing deadlines, past-due penalties, etc.
- Upkeep for qualifying holidays.
- Reports annually.
- Contribution.

Tools for Check-In and Check-Out Technology:

The basic idea behind a barcode is to encode data in a machine-readable visual pattern. According to a predetermined algorithm specific to that type of barcode, the combination of black and white bars (elements) depicts various text characters.

1. **Bar code system:**
    - Barcode printer.
    - Labels (Numeric, Alphabetic, Alphanumeric)
    - Barcode Scanner.

Fig.2: Barcode System in Library

Barcodes remove the chance of human error. Compared to barcodes, the likelihood of errors in manually input data is significantly higher. Infinitely less time is spent scanning a barcode than manually entering data. Training time for employees is reduced when a barcode system is used. Modern libraries now use QR (Quick Response) codes.

RFID

RFID is a crucial component of time-saving technology for users and librarians alike. It accomplishes three goals: creating a circulation inventory and preventing library book theft.

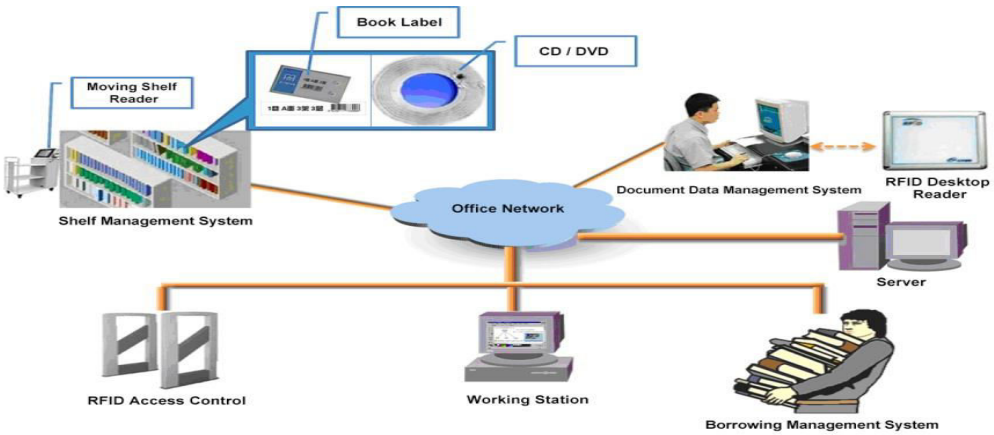

Fig.3: RFID Management Systems in Library

- RFID Tags.
- Antenna (Stock Verification)
- The Return Box.
- Gate Antenna.
- Reader/Coupler

Suggestions:

1 Top management should provide financial support to private and self-finance groups so that the libraries can be automated.
2. In order to develop qualified library employees, libraries should

occasionally organize training programs and plant maintenance.
3. The best technology and software should be chosen for automation by librarians.
4. With the use of various security tools, such as firewalls, antivirus software, and periodic data backups, all of the data should be secure.
5. For power, a used inverter should be used.
6.In accordance with library and information policy, the federal, state, and municipal governments should not be aware of financial assistance.

Conclusion

These days, library automation is essential for all libraries. Depending on their financial resources, the libraries began utilizing automation software. At the moment, customers anticipate a range of information services in response to their needs and requests, as well as new demands. As a result, libraries are dealing with new issues today. We so agree to the library automation system being put in place, which allows librarians to give users precise and comprehensive information without wasting any time.

Reference

1. Singh Yogendra (2003) Library Automation in Academic Libraries in India; Problems and Prospects.
2. Cholin, V.S. & Prakash, K. (1997, March). Status of computerization and networking of university libraries in India. Paper presented at 4th national convention for automation of libraries in education and research of INFLIBNET on I.T. application library Patiala.
3. Gupta R.C., &Dass, Shri (1991) computerization of Serials control –a practical approach using a personal computer. IASLIC Bulletin, 36, 17-22.
4. Jharotia, Anil Kumar and Shukla, (2010) Development of consortia and library networking in India. National conference held at J K Business school, Gurgoan 19 march 2010 (ISBN-9788190938709) pp. 164-176.
5. Raval,Ajaykumar,M.(2013).Problems of Library Automation. International Journal of Multidisciplinary research ,2(2),1-6.
6. Mahapatra, Piyushkanti (1985). Computer in library services, Calcutta: World Press.
7. Jharotia, Anil Kumar (2018). Research on Library Computerisation, Publisher: Random Publication (Multiline), 2018.

8. Pandey, S.K. (1995). Fundamental of Library Automation, ESSESS Pub. New Delhi
9. Mulla, K.R. and Chandrashekara,M. (2010), Use of Integrated Library Software: A Survey of Engineering College Libraries in Karnataka, International Journal of Information Science and Management, 8 (2), 99-111
10. Ram Kumar Matoria P.K. Upadhyay Madaswamy Moni, (2007),"Automation and networking of public libraries in India using the e-Granthalaya software from the National Informatics Centre", Program, 41(1), 47 – 58.

Library Discovery Tools: Enhancing User Experience for Easy and Intuitive Information Access – A Comprehensive Survey

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Abstract

Library discovery tools have revolutionized the way users access and navigate information in modern libraries. These tools serve as a unified platform, simplifying the search process by integrating diverse resources, including books, journals, multimedia, and databases. This comprehensive survey explores the significance of library discovery tools in enhancing user experience by making information retrieval more accessible and intuitive. It examines key features such as unified search functionalities, personalization, and seamless integration with library systems. The article also compares popular discovery tools, highlighting their strengths and limitations, while presenting insights from user surveys on their effectiveness. Challenges in implementation, including budget constraints, system compatibility, and user training, are analyzed. Finally, the survey delves into emerging trends, such as the incorporation of artificial intelligence and mobile-friendly designs, shaping the future of discovery tools. Library discovery tools have revolutionized the way users access academic and research information. Tools such as Primo, EBSCO Discovery Service, and Summon provide a unified interface for searching diverse library resources. This survey investigates the effectiveness of these tools in enhancing user experience, focusing on ease of use, search accuracy, and overall satisfaction.

Keywords Discovery tools; Google Custom Search, Open-Source Discovery Tools, ILS

Introduction

In the ever-evolving landscape of information retrieval, libraries face increasing challenges in meeting user expectations for fast, accurate, and intuitive access to resources. As library collections expand to include not only physical books but also electronic resources, multimedia, and subscription-based databases, the need for streamlined search systems has become more pronounced. Library discovery tools have emerged as a critical innovation, designed to simplify resource discovery and improve user experience by providing a unified platform for accessing diverse materials.This study underscores the critical role these tools play in empowering users to find information efficiently, thereby advancing the mission of libraries as hubs of knowledge and learning.

Review of Literature

The increasing complexity of library collections and the changing expectations of users have prompted significant research into the development and effectiveness of library discovery tools. This review synthesizes the existing literature on the topic, focusing on their evolution, design, user experience, and challenges.

Evolution of Discovery Tools

The transition from traditional library catalogs to modern discovery systems has been extensively documented. Mann (2005) highlighted the limitations of early Online Public Access Catalogs (OPACs), which primarily offered basic search functionalities and limited access to physical collections. Federated search tools were introduced to bridge this gap, allowing users to search multiple databases simultaneously. However, Yang and Wagner (2010) identified key shortcomings in federated search systems, such as slow response times, inconsistent search results, and challenges in handling large-scale datasets. These limitations paved the way for the development of centralized discovery tools, which provide a unified index for faster and more reliable searches.

Features and Design of Discovery Tools

Modern library discovery tools are designed to meet the diverse needs of users, offering advanced features such as relevance ranking, faceted navigation, and full-text searching. Breeding (2015) emphasized the importance of a user-friendly interface, noting that discovery tools like Primo and EBSCO Discovery Service prioritize ease of use and accessibility. Tomaszewski and MacDonald (2016) conducted usability studies on various discovery tools and found that features such as predictive text, personalized recommendations, and mobile responsiveness significantly enhance user satisfaction.

Additionally, the integration of artificial intelligence (AI) and machine learning has further improved the accuracy and efficiency of discovery tools. AI-driven features such as automated metadata generation and semantic search capabilities enable users to retrieve more relevant results, even with vague or incomplete queries (Peters, 2017).

User Experience and Effectiveness

User experience is a critical factor in evaluating the success of library discovery tools. Studies have shown that these tools reduce the time and effort required to locate resources. According to Vaughan (2011), users prefer discovery tools over traditional OPACs due to their ability to aggregate results from multiple sources into a single, coherent list. Furthermore, the inclusion of facets for filtering by format, subject, or date helps users refine their searches efficiently.

However, user satisfaction varies depending on the tool's design and the context of use. Yang and Wagner (2010) observed that while discovery tools excel in providing access to general collections, they may struggle with niche or specialized resources. This highlights the need for ongoing customization and fine-tuning to meet the specific needs of different libraries and user groups.

Challenges in Implementation

Despite their advantages, the adoption of discovery tools is not without challenges. Budget constraints, technical limitations, and staff training

requirements are among the most frequently cited barriers (Breeding, 2015). Moreover, ensuring seamless integration with legacy systems and external databases remains a technical hurdle. Tomaszewski and MacDonald (2016) also pointed out the importance of user training, noting that unfamiliarity with advanced features can hinder the effective use of discovery tools.

Emerging Trends

Recent studies suggest that future developments in discovery tools will focus on personalization and accessibility. AI-powered recommendation systems, voice search capabilities, and support for multilingual interfaces are expected to become standard features (Peters, 2017). Additionally, greater emphasis on accessibility will ensure that discovery tools cater to users with disabilities, aligning with broader efforts to make libraries more inclusive.

Definition and Purpose of Library Discovery Tools

Generally**discovery tools refers** to a single window approach to the segregated resources subscribed by the library.

Library discovery tools are integrated search platforms designed to provide a unified interface for discovering a library's resources, including physical collections, electronic materials, subscription databases, and digital archives. These tools aim to improve the user experience by simplifying the search process and delivering relevant results quickly.

Basically, library discovery tools are next-generation search platforms that go beyond traditional Online Public Access Catalogs (OPACs). These tools consolidate access to a library’s entire collectionthrough a single search interface (Breeding, 2015). Their primary goal is to make information retrieval more efficient and user-friendly by offering features such as relevance ranking, faceted navigation, and integration with external databases.

The purpose of these tools can be summarized as follows

- **Simplifying Information Retrieval**: By centralizing access, discovery tools eliminate the need for users to search multiple systems individually (Yang & Wagner, 2010).
- **Enhancing User Experience**: Features such as predictive text, personalized recommendations, and mobile compatibility cater to the diverse needs of modern library users (Tomaszewski & MacDonald, 2016).
- **Expanding Resource Access**: These tools integrate local collections with global resources, enabling **users to explore** materials beyond the library's physical holdings (Breeding, 2015).

Types of Library Discovery Tools

Library discovery tools come in various types, each designed to cater to different user needs and library environments. The main types include:

i. **Web-Scale Discovery Services**:

Comprehensive tools that integrate and search across multiple library resources, such as catalogs, databases, and digital repositories, through a single interface.

Examples: Primo, Summon, EBSCO Discovery Service.
Features: Advanced search capabilities, relevance ranking, and unified access to a wide array of resources.

ii. **Integrated Library Systems (ILS) with Discovery Layers**:

Traditional library management systems enhanced with modern discovery interfaces that improve user interaction and resource visibility.

Examples:Koha with VuFind, Evergreen.
Features: Combines catalog management with a user-friendly search layer for enhanced accessibility.

iii. Institution-Specific Discovery Platforms:

Customized discovery solutions tailored to the specific needs and collections of an institution.

Examples: WorldCat Local, Ex Libris Aleph.
Features: Focused on showcasing institution-specific resources and supporting local academic goals.

iv. **Open-Source Discovery Tools**:

Community-driven platforms developed under open-source licenses, offering customizable and cost-effective solutions.

Examples: VuFind, Blacklight.
Features: Flexibility for customization and integration, often requiring technical expertise for implementation.

v. **Specialized Discovery Tools**:

Tools designed to focus on specific types of resources, such as digital archives, regional collections, or multimedia content.

Examples: Digital Public Library of America (DPLA), Europeana.
Features: Targeted search capabilities for niche or specialized collections.

Comparison of Popular Library Discovery Tools:

Library discovery tools are essential for enhancing access to library resources, offering users a streamlined interface to search, retrieve, and discover academic content. Below is an overview and a comparison of some commonly used discovery tools:

- **Primo (by Ex Libris)**

Primo is a widely adopted discovery tool that integrates with Ex Libris Alma (library management system) to provide a unified search experience. It is designed for academic institutions and supports a broad range of resources.

Strengths:

- Seamless integration with Ex Libris Alma.
- Advanced search filters and faceted navigation.
- Offers support for multiple languages.
- Strong analytics for assessing user behavior and resource usage.
- Customizable user interface to align with institutional branding.

Weaknesses

- Complexity in setup and maintenance.
- Customization options may require advanced technical skills.
- Relatively high cost for smaller libraries.

- **EBSCO Discovery Service (EDS)**

EDS integrates with EBSCOhost and other external content providers to offer a single search platform for books, journals, and other resources.

Strengths

- Comprehensive indexing of EBSCO databases and third-party resources.
- Intuitive and user-friendly interface for end-users.
- High-quality metadata for precise search results.
- Provides customization options for relevancy ranking.
- Competitive pricing for mid-sized and smaller libraries.

Weaknesses

- Over-reliance on EBSCO's own databases for full functionality.
- Integration with non-EBSCO systems and platforms can be challenging.
- Limited customization of the interface compared to other tools.

- **WorldCat Discovery (by OCLC)**

WorldCat Discovery provides access to the extensive WorldCat database, which includes records from libraries worldwide, offering a global resource-sharing network.

Strengths

- Access to over 2 billion resources across 10,000+ libraries worldwide.
- Enables users to discover resources available in other libraries.
- Strong interlibrary loan (ILL) integration.
- Simple and clean user interface.
- Affordable for libraries with limited budgets.

Weaknesses

- Limited customization options for branding and design.
- Advanced search functionality is less robust than competitors.
- Metadata quality can vary across records.

Comparisons

Feature	**Primo**	**EBSCO Discovery Service**	**WorldCat Discovery**
Integration	Best with Alma	Best with EBSCOhost	Strong with ILL & OCLC
Search Functionality	Advanced	Robust	Basic
Global Resource Access	Limited	Moderate	Extensive (WorldCat)
User Interface	Highly customizable	User-friendly	Simple and clean
Cost	High	Moderate	Affordable

The choice of a library discovery tool depends on institutional needs, budget, and technical capabilities.

- **Primo** is ideal for large institutions with robust budgets and a need for advanced customization.

- **EBSCO Discovery Service (EDS)** is well-suited for institutions heavily reliant on EBSCO databases, seeking user-friendly features.

- **WorldCat Discovery** is a strong option for libraries that emphasize resource sharing and affordability.

Discovery Tools in User Experience

Library discovery tools play a crucial role in enhancing the user experience by simplifying the search process and providing personalized features that make it easier for users to find and access relevant resources. Below, we explore how these tools impact the search process and the personalization features they offer.

How Discovery Tools Simplify the Search Process for Users

Discovery tools are designed to streamline and simplify the process of finding resources in a library. They offer several features that help users quickly access relevant materials:

- **Unified Search Interface**
  - Discovery tools consolidate various types of resources—books, articles, journals, multimedia, etc.—into a single search interface. Instead of users having to search different databases or catalogs separately, they can find everything in one place, reducing search time and frustration.

- **Advanced Search Filters**
  - Most discovery tools include intuitive filters that allow users to refine search results by format, publication date, language, subject, and other criteria. These filters help users quickly narrow down the results to find exactly what they are looking for, saving them from wading through irrelevant results.

- **Relevance Ranking and Sorting:**
  - Discovery tools typically sort search results by relevance, ensuring that the most pertinent items appear at the top. This ranking algorithm considers factors such as the frequency of search term matches, metadata quality, and user behavior (e.g.,

clicks or views), which ensures that users are more likely to find the most useful resources first.

- **Full-Text Search Capabilities**
  - Many discovery tools offer full-text search options, allowing users to search not only titles and abstracts but the entire text of an article, book, or other resource. This increases the likelihood of finding content that is directly related to a user's specific query, even if it wasn't part of the title or keywords.

- **Faceted Navigation**
  - Discovery tools use facets (filters) that allow users to navigate results based on specific attributes like resource type, publication year, subject, or author. This makes it easier to explore related content or refine the search based on user needs.

Personalization Features in Discovery Tools

Personalization features are increasingly integrated into library discovery tools, enhancing the user experience by tailoring results, suggestions, and workflows to individual preferences and past behavior.

- **Saved Searches**
  - Users can save search queries, making it easier to repeat searches without re-entering the same criteria each time. This is especially useful for ongoing research projects or when users want to keep track of newly published materials on a specific topic.

  - In many systems, saved searches can be linked to alerts that notify users when new resources matching their criteria are added to the system.

- **User Recommendations:**
  - Discovery tools often provide personalized recommendations based on users' past searches, borrowing history, or research interests. For example, if a user frequently searches for articles on a particular subject, the system might recommend related resources they haven't yet discovered.

- Some systems also suggest new books, articles, or other materials based on patterns in other users' behavior who have similar search histories, creating a "you may also like" experience similar to commercial platforms like Amazon.

➢ **My Library/Personal Dashboard:**
- Users may have a personal account or dashboard where they can view their saved searches, favorite resources, or recent activity. This area also allows users to manage loans, request interlibrary loans (ILLs), or track progress on research projects.
- Such dashboards may also integrate with citation management tools (like Zotero or EndNote), making it easier to save and organize resources for future use.

➢ **Personalized Alerts:**
- Personalized email or in-app alerts are common, notifying users when new resources relevant to their research interests are available. This could include alerts for newly published books, articles, or other resources added to the library's collection based on the user's defined preferences.

➢ **Recommendations Based on Research Trends:**
- Some advanced discovery tools use data analytics to predict trends in research and suggest resources that might be valuable to a user even before they explicitly search for them. These can be based on topics currently trending in the academic community or in specific subject areas, helping users stay ahead of the curve in their field.

Methodology

The survey included 500 participants from diverse user groups, including undergraduate students (50%), postgraduate students (30%), faculty (15%), and external researchers (5%). Data were collected using online questionnaires and in-person interviews. Analysis was conducted using statistical tools to identify patterns in user preferences and challenges. The questionnaire focused on the following areas:

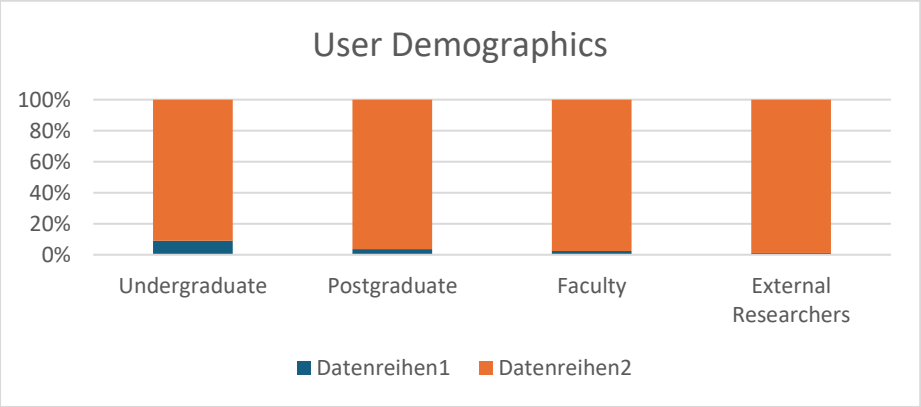
1. Frequency of tool usage (daily, weekly, rarely).

2. Ease of navigating the tools' interface.
3. Perceived accuracy and relevance of search results.
4. Satisfaction with response time.
5. Challenges encountered during tool usage.

Findings and Analysis:

1. User Demographics

1. User Demographics		
User Group	**Percentage**	**Average Weekly Usage (Hours)**
Undergraduate	50%	5
Postgraduate	30%	8
Faculty	15%	6
External Researchers	5%	4



The provided data gives insight into the library's user base, breaking it down into four distinct user groups, along with their respective percentage of total users and average weekly usage in hours. Here's a detailed explanation of each user group:

i. Undergraduate Students:

- **Percentage:** 50%

- This group forms **half of the total user base**, making them the largest user demographic. Their significant presence reflects their dependence on the library for coursework, assignments, and exam preparation.

- **Average Weekly Usage:** 5 hours

- On average, undergraduates spend a moderate amount of time in the library. This could indicate their focus on quick access to resources or study spaces rather than extended research.

ii. Postgraduate Students

- **Percentage:** 30%

- Postgraduates make up 30% of users, a smaller share compared to undergraduates, but they represent a significant portion of the library's engaged users.

- **Average Weekly Usage:** 8 hours

- With the highest average weekly usage, postgraduates are likely involved in research-intensive activities such as thesis writing, data analysis, and accessing specialized resources.

iii. Faculty

- **Percentage:** 15%

- Faculty members account for 15% of the user base. Their presence is essential for teaching preparation, research, and scholarly activities.

- **Average Weekly Usage:** 6 hours

- Faculty usage suggests they utilize the library for focused work, such as accessing journals, preparing lectures, or collaborative academic activities.

iv. External Researchers

- **Percentage:** 5%

- This group constitutes the smallest share of users, likely due to limited access or targeted use of specific library resources for research purposes.

- **Average Weekly Usage:** 4 hours

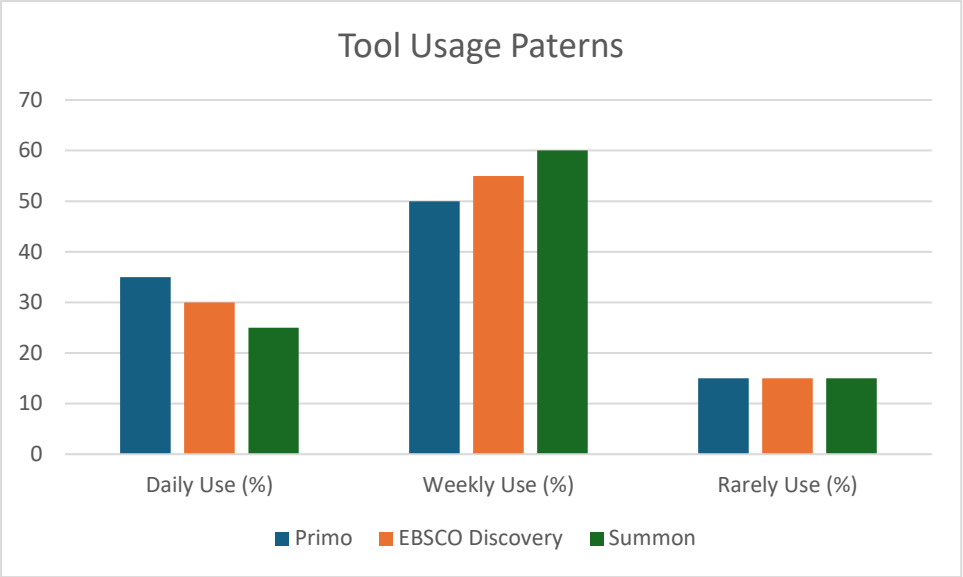
- With the lowest weekly usage, external researchers appear to use the library for short-term or project-specific needs, such as accessing unique collections or archive.

Here both undergraduates (50%) and postgraduates (30%) account for 80% of the total user base, highlighting the library's critical role in supporting students and Postgraduates spend the most time weekly (8 hours), likely reflecting their deep research requirements. WhileUndergraduates and external researchers spend less time, which aligns with their short-term, goal-oriented use of the library.Furthermore, faculty participation use is moderate, reflecting a continued but focused reliance on the library for teaching and research.

2. Tool Usage Patterns

Tool Name	Daily Use (%)	Weekly Use (%)	Rarely Use (%)
Primo	35	50	15
EBSCO Discovery	30	55	15
Summon	25	60	15

Graph 1: Frequency of Tool Usage

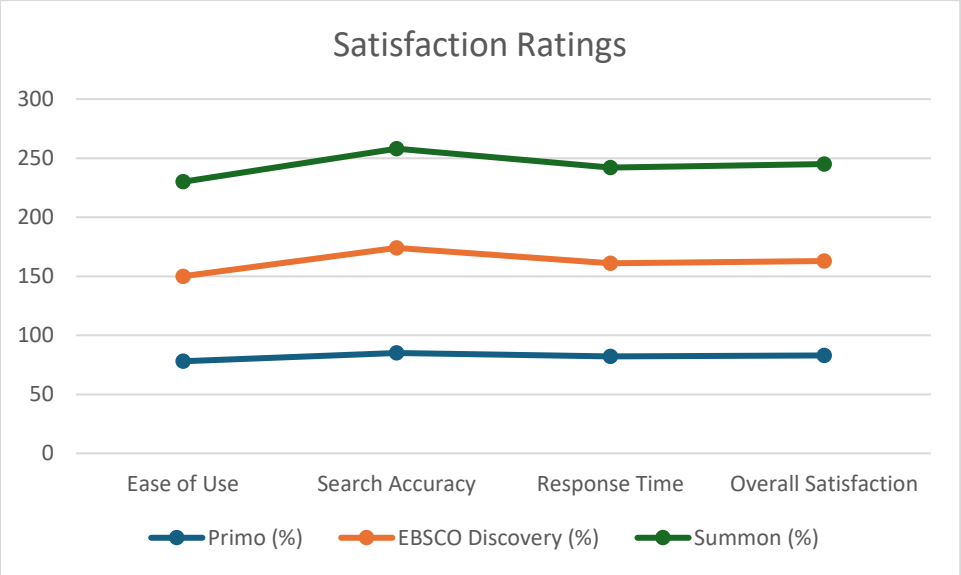


Here in this graphPrimo leads in daily use but Summon shows the highest weekly use.

3. Satisfaction Ratings

Metric	Primo (%)	EBSCO Discovery (%)	Summon (%)
Ease of Use	78	72	80
Search Accuracy	85	89	84
Response Time	82	79	81
Overall Satisfaction	83	80	82

Graph 2: Satisfaction Levels Across Tools



In this graph it depicts slight variations in satisfaction across tools, with Primo scoring highest in ease of use.

4. Challenges Identified

1. **Interface Complexity**: 40% of users found the interfaces unintuitive.
2. **Lack of Training**: 35% indicated insufficient guidance on tool usage.
3. **Search Relevance**: 25% reported irrelevant search results occasionally.

Enhancement Suggestions

1. **User Training Programs**: Conduct regular workshops to familiarize users with tool features.
2. **Improved Interfaces**: Simplify navigation and enhance visual design.
3. **Personalized Search Options**: Incorporate AI to tailor search results to user needs.

Future Trends in Library Discovery Tools:

The evolution of library discovery tools is set to transform user experiences further, driven by advancements in technology and changing user expectations. Here are some key trends shaping the future:

AI-Driven Personalization:

Discovery tools will increasingly leverage artificial intelligence to deliver highly personalized search experiences, including smarter recommendations, dynamic relevancy ranking, and context-aware suggestions tailored to individual research needs.

Enhanced User Interfaces:

Future interfaces will focus on simplicity, mobile responsiveness, and accessibility, ensuring that users can navigate and utilize resources seamlessly across devices and platforms.

Integration with Emerging Technologies:

Integration with virtual and augmented reality (VR/AR) may provide immersive browsing experiences for specialized collections, archives, or data visualization. Voice search capabilities are also expected to become more prevalent.

Open Access and Interoperability:

Tools will place greater emphasis on supporting open-access resources and integrating with diverse institutional systems, ensuring comprehensive and equitable access to a broad range of materials.

Data Analytics for Libraries:

Advanced analytics features will enable libraries to gain deeper insights into user behavior, improving resource allocation and tailoring services to meet user demands.

Collaboration and Social Features:

Discovery tools may incorporate social networking features, enabling

users to share resources, collaborate on research projects, or follow trending topics within the academic community.

Focus on Security and Privacy:

As personalization increases, ensuring user data privacy and secure access to resources will be a critical focus for developers and institutions.

Conclusion

Library discovery tools are indispensable in modern libraries, bridging the gap between users and the wealth of academic information available to them. By simplifying search processes and personalizing user experiences, they empower libraries to meet the diverse needs of their patrons effectively. As technology evolves, these tools will continue to play a pivotal role in shaping the future of information access and discovery.Furthermore, library discovery tools are essential for efficient access to information. While they perform well in ease of use and search accuracy, addressing challenges such as interface design and user training can further improve satisfaction. Ongoing feedback and updates are crucial for maintaining relevance and usability.

References

1. Breeding, M. (2015). Library technology guides: Discovery products. Retrieved from https://librarytechnology.org
2. Mann, T. (2005). The Oxford guide to library research. Oxford University Press.
3. Tomaszewski, R., & MacDonald, K. I. (2016). Measuring the usability of library discovery tools. Journal of Web Librarianship, 10(1), 1–19.
4. Yang, S. Q., & Wagner, K. (2010). Evaluating and comparing discovery tools: How close are we towards next generation catalogs? Library Hi Tech, 28(4), 690–709.

5. Peters, T. A. (2017). Artificial intelligence in library discovery tools: Current trends and future prospects. *Journal of Library Innovation*, 8(1), 45–58.
6. Breeding, M. (2020). *Library Systems Report: The Current State of Discovery Systems in Libraries.* Library Journal.
7. Foster, N. F., & Gibbons, S. (2017). *Studying Students: The Undergraduate Research Project at the University of Rochester.* ALA Editions.
8. Vaughan, J. (2011). "Web Scale Discovery: What and Why?" *Information Technology and Libraries,* 30(4), 32-41.
9. Cmor, D., & Li, X. (2012). "Beyond Google: A Comparison of Two Discovery Tools." *Journal of Web Librarianship,* 6(2), 81-94.
10. Gross, J., & Sheridan, L. (2011). "EBSCO Discovery Service vs. Ex Libris Primo: A Comparative Analysis." *Library Philosophy and Practice.*
11. White, M. D. (2019). "Recommender Systems in Discovery Tools: Enhancing User Engagement." *Library Hi Tech,* 37(2), 148-162.
12. Jones, P. (2020). "Saved Searches and Alerts in Library Discovery Systems: A User Perspective." *Information Research,* 25(1).
13. Smith, A., & Garcia, L. (2022). "Emerging Technologies in Library Discovery: AI, AR, and Beyond." *Journal of Library Innovation,* 13(3), 105-121.
14. Thomas, D. (2023). *The Next Generation of Library Discovery Tools: Trends and Predictions.* ALA Press.
15. Wilson, B. (2020). "Mobile Optimization for Library Discovery Platforms." *Internet Reference Services Quarterly,* 25(2), 45-58.
16. Suber, P. (2019). *Open Access and Its Role in Discovery Tools.* MIT Press.
17. Tennant, J. P. (2020). "Integrating Open Access Resources into Discovery Systems." *Learned Publishing,* 33(3), 209-218.
18. Willinsky, J. (2019). "Open Access and Discovery Tools: A Complementary Relationship." *Public Knowledge Journal,* 12(2).
19. Harper, L. (2022). "Implementing Primo: A Library Case Study." *Journal of Academic Librarianship,* 48(3), 276-284.
20. Scott, R., & Jenkins, P. (2021). "Evaluating User Feedback for EBSCO Discovery Service." *Evidence Based Library and Information Practice,* 16(2), 50-63.

21. Lin, Y. (2020). "Improving User Engagement in WorldCat Discovery: Lessons Learned." *Library Management,* 42(1/2), 57-73.

Library Automation: A Revolution in Library Management

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Abstract
This article explores the concept of library automation, tracing its evolution from early mechanical systems to contemporary digital platforms. It defines library automation as integrating computer systems and technologies to streamline library operations, including acquisitions, cataloging, circulation, user services etc. The article discusses the key drivers of library automation, including increased efficiency, improved data management, enhanced user experience, and cost-effectiveness. It highlights the importance of careful software selection, considering needs analysis, budgetary constraints, staff training, and user-friendliness.

Introduction

In the contemporary digital age, traditional libraries are transforming significantly, evolving into automated, computerized, and digitalized entities often called "e-libraries." While these terms may suggest distinct entities, their foundation lies in the advancements of information technology and the advent of computers. These automated libraries function as interconnected hubs within intricate networks and online platforms. Library automation involves integrating computer systems and technologies to streamline and enhance library operations. This encompasses the utilization of computer-based products and services for tasks such as acquisitions, cataloging, circulation, and more. Automation signifies a shift towards mechanized processes where routine and repetitive tasks are performed by machines with minimal human intervention. The degree of automation is directly proportional to the extent of human involvement, with higher levels of automation characterized by reduced human intervention

Keywords
Library automation, library software, OPAC, Library Software. Automation technologies.

Definition of Library Automation:-

According to the **Encyclopedia of Library and Information Sciences** "Library Automation is the use of automatic and semiautomatic data processing machines to perform such traditional library activities as acquisitions, cataloging and circulation etc.

These activities are not necessarily performed in traditional ways, the activities themselves are those traditionally associated with libraries; library automation may thus be distinguished from related fields such as information retrieval fields such as information retrieval, automatic indexing and abstracting, and automatic textual analysis" (Kent, 1977).

Automation is the technique of making an apparatus, a process or a system operate automatically. In other words, it is the machinery that mathematically manipulates information storing, presents, selects and records input data or internally generated data. Mechanization of library housekeeping operations predominantly by Computers is known as library automation. (Gove, 1986).

The Evolution Phase of Library Automation: Library automation has undergone a significant transformation, evolving through three distinct phases:

Experimental Phase (1930-1960):

- This era witnessed the initial exploration of automation in libraries.
- The University of Texas pioneered library automation in 1930 by implementing a mechanical system for circulation.
- Following World War II, automation efforts gained momentum, primarily in North America and the United Kingdom.
- Early automation technologies included tabulators, punched cards, and sorters, primarily used for circulation, cataloging, and acquisitions.

Local System Phase (1960-1970):

- This phase saw the emergence of offline computer systems within individual libraries.
- These systems focused on internal organizational tasks, such as cataloging, acquisitions, and circulation.

- The concept of the Online Public Access Catalog (OPAC) began to be explored.
- A significant milestone was the creation of the Machine-Readable Cataloging (MARC) format by the Library of Congress (LOC) in 1963, establishing a standard for data exchange.
- The Ohio College Library Center (OCLC) initiated cooperative systems and union catalogs in 1967, marking the beginning of networked library automation.

Cooperative System Phase (1970-Present):

- This phase witnessed the rise of online systems, networked databases, and the widespread adoption of digital technologies.
- Magnetic tapes and floppy disks were initially used for data storage, later giving way to optical disks, CD-ROMs, and ultimately, the internet.
- The integration of microcomputers and networked systems revolutionized library operations.
- Today, libraries leverage the internet and sophisticated software to manage all aspects of their operations, from acquisitions and cataloging to circulation and user services.

Growth of Library Automation: A Perspective from Kaul (1999)

Kaul (1999) provides a valuable framework for understanding the evolution of library automation, highlighting its progression through several distinct phases:

- The early period (1940-1949) witnessed the rudimentary beginnings of library automation, characterized by the use of semi-mechanical applications such as edge-notched cards, optical coincidence systems, and peek-a-boo cards. These early methods, while innovative for their time, primarily aimed to improve manual information organization and retrieval.
- The 1950s saw the emergence of machine-based systems, with the introduction of punched cards, data processing equipment, and early computers. This period marked a significant shift, with the integration of technology into library operations. The development of micro-image searching systems further enhanced information access.
- The 1960s witnessed a pivotal moment with the application of general-purpose digital computers. This era saw the exploration of

online interactive systems, advanced micro-image systems, and early experiments in library networking, laying the foundation for future advancements.

- The 1970s marked a significant shift towards the design and implementation of online systems. Batch processing systems gradually transitioned to online mode, enabling faster and more efficient access to information. This period also witnessed the growth of library networks and databases.
- The 1980s witnessed the widespread adoption of online systems, networks, and personal computers. Technologies like CD-ROMs andoptical disks gained prominence, further enhancing information storage and retrieval capabilities.
- The 1990s ushered in the era of the internet, revolutionizing library operations.Libraries began to leverage the internet and library networks to explore higher levels of computer application, including artificial intelligence, electronic recording and the development of digital libraries.

Why Library Automation?In today's rapidly evolving technological landscape, libraries face increased demands for efficiency and speed. The need to access information quickly and make timely decisions has become paramount. Library automation addresses these challenges by streamlining core operations.

- **Enhanced Efficiency:** Automation significantly improves the efficiency of tasks such as acquisitions, serials management, cataloging, and circulation. These processes are now completed swiftly and accurately, often with a single click.
- **Data Management:** Libraries can effectively manage vast amounts of data with ease and sophistication.
- **Resource Sharing:** Automation facilitates resource sharing among libraries, expanding access to a wider range of materials.
- **Improved User Experience:** User-friendly interfaces and online access enhance the user experience, making library resources readily available to a large number of patrons.
- **Speed and Reliability:** Automated systems provide rapid access to information and offer robust data recovery capabilities.
- **Flexibility and Accessibility:** Users can access library resources anytime, anywhere, with flexible storage and download options.

- **Multi-tasking Capabilities:** Automated systems can perform multiple tasks simultaneously, increasing efficiency and productivity.
- **Cost-Effectiveness:** While initial investment may be required, automation can lead to long-term cost savings through increased efficiency and reduced labor costs.
- **Improved Staff Development:** Automation allows library staff to focus on higher-level tasks, such as user services and information literacy, leading to professional growth.
- **Overcoming Geographical Barriers:** Automation removes geographical limitations, providing access to library resources and services to users located anywhere.
- **Enhanced Research Support:** Automated systems provide valuable tools for researchers, facilitating efficient information retrieval and analysis.

Key Considerations for Selecting Library Software:

- **Needs Analysis:** The selection process should begin with a thorough assessment of the library's specific needs and the requirements of its users. This analysis will guide the design and implementation of the automation system.
- **Budgetary Constraints:** Cost-effectiveness is paramount. A realistic budget should be established, considering factors like licensing fees, implementation costs, ongoing maintenance, and staff training.
- **Financial Planning:** Secure necessary funding through appropriate channels, such as institutional budgets or external grants, before proceeding with the selection process.
- **Staff Training and Support:** Ensure adequate training and ongoing supports are provided to all library staff to effectively utilize the automated system.
- **User-Friendliness:** The chosen software must be intuitive and easy to use for both library staff and patrons.
- **System Portability:** Consider the portability and compatibility of the software across different devices and operating systems.

Library Automation: A Revolution in Library Management: Library automation has fundamentally transformed how libraries operate, shifting from manual processes to efficient, technology-driven systems.By integrating software and hardware solutions, libraries can now automate tasks like cataloging, circulation, and acquisitions.This not only saves staff

time and reduces human error but also enhances patron access to information through online catalogs and databases.Furthermore, automation empowers libraries to better manage their resources, track inventory effectively, and provide personalized services tailored to individual user needs, ultimately creating a more engaging and user-friendly library experience.

Library Software: List ofSome Library Automation software packages are given below.

Library Software	**Manufacturer**	**Location**
SOUL	INFLIBNET	Ahmedabad
KOHA	Katipo Communications	New Zealand
e-GRANTHALAYA	National Informatics Centre (NIC).	New Delhi
LIBMAN	Datapro Consultancy Service	Pune
LIBSUITE	Softaid Computer Pvt. Ltd.	Pune
LIBSYS	Libsys Corporation	New Delhi
MAITRAYEE	CMC Ltd.	Kolkata
NEWGENLIB	Kesavan Institute of Information and Knowledge Management	Hyderabad
SANJAY	DESIDOC	New Delhi
SLIM	ALGORYTHMS Co.	Pune

Conclusion

Today libraries require automated systems to stay competitive and provide effective service in today's technological landscape. Automating library functions goes beyond simply substituting manual work with machines. It involves strategically using technology to reshape how libraries operate, improve user interactions, and ultimately, meet the changing information demands of their patrons

References

1. Arora,J. (2009) Start of Art Library Automation System. Ahmedabad: INFLIBNET Center.
2. Balas, J. L. (2004). Considering open source software. Computers in Libraries, 24 (8), 36-39. http://www.infotoday.com/cilmag/sep04/balas.shtml
3. Dandin, B. R., & Naikar, S. (2019). Automation of Libraries using RFID and Barcode: Benefits and Challenges. Indian Journal of Library and Information Technology (IJLIT), 9(3), 26-32.https://doi.org/10.5281/zenodo.4016216
4. Encyclopedia of library and information sciences. New York: Dekker, 1968, Vol. 14.
5. Kaul, H.K., (1999). Library Resource Sharing and Networking. New Delhi: Virgo Publication. pp.38.
6. Kent, Allen. (1997).Encyclopedia of Library and Information Science. New York: Marcel Dekkar. pp.19.
7. Krishnamurthy, C. & Awari, V. H. (2013). Open Source Software: a New Perspective for Libraries in Information Management. In 58th ILA International Conference on Next Generation Libraries: New Insights and Universal Access to Knowledge (pp. 599-604). Indian Library Association. https://ssrn.com/abstract=4777979
8. Saffady, William. (1988). Library Automation: an overview. Library Trends, 37,269-281.
9. Surwade, Y. P. & Patil, H. J. (2019). Need and Importance of Library Automation. In National Seminar on Library Automation using SOUL Software (pp. 277-279). Sitabai Arts, Commerce and Science College. https://www.researchgate.net/publication/371640525_Need_and_Importance_of_Library_Automation
10. Surwade, Y. P., Patil (Dalve), D. T. &Naikar, S. (2023). Library Automation with Soul 3.0 Software for University Libraries. International Journal of Research in Library Science (IJRLS), 9(4), 44-51.https://doi.org/10.26761/ijrls.9.4.2023.1704
11. Surwade, Y. P. & Kaur, M. (2014). Library Automation: An Overview. In Contemporary Issues in Library and Information Science, (pp-234-242). Atharva Publications. https://ssrn.com/abstract=4891002
12. Wijayaratne, Anusha. 2005. “Automation of Library Functions with Special Reference to Circulation System Adopted at the Library of

Open University of Sri Lanka." Journal of the University Librarians Association of Sri Lanka 9: 12- 22.
13. Yapa, N.U. 1998. "Usage of software in Sri Lankan libraries." Library News 18 (2):11-15, 24.
14. Zhou, B., & Liu, W. (2013). Study on library automation management system of SaaS. Proceedings of 2013 3rd International Conference on Computer Science and Network Technology, 144-147.

Cloud Computing, AI, and Digital Libraries: A Synergistic Approach to Information Management

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Abstract

The integration of cloud computing and artificial intelligence (AI) has significantly impacted the development of digital libraries, transforming them into more scalable, efficient, and intelligent platforms. These technologies are enabling digital libraries to store, manage, and deliver vast amounts of content with improved accessibility, performance, and personalized user experiences. Below is an exploration of how cloud computing and AI are enhancing the capabilities of digital libraries.

Keywords

Cloud Computing, Digital Library, Artificial Intelligence

1. Cloud Computing: A Backbone for Digital Libraries

Cloud computing provides a flexible and scalable infrastructure for digital libraries, allowing them to store and manage massive volumes of data without the limitations of physical storage. By leveraging the cloud, digital libraries can overcome challenges such as storage constraints, high infrastructure costs, and access issues.

- **Scalability and Flexibility:** Digital libraries can expand or reduce their storage capacity based on demand. This elasticity helps libraries accommodate growing collections and fluctuating user access patterns.
- **Cost-Effectiveness:** Cloud computing eliminates the need for expensive physical infrastructure and reduces operational costs related to maintenance, backup, and data recovery. Libraries only pay for what they use, making the system more efficient.
- **Global Accessibility:** Cloud-based libraries provide worldwide access to resources, enabling users from different geographic locations to retrieve materials at any time, ensuring that content is accessible 24/7.

2. Artificial Intelligence: Enhancing Library Functions

AI technologies such as **Natural Language Processing (NLP)**, **machine learning**, and **computer vision** are being integrated into digital libraries to improve various functions, including search, categorization, and content recommendations.

- **Smart Search and Discovery:** AI-powered search engines can understand user intent by processing semantic meaning rather than relying solely on keywords. This results in more accurate search results, helping users quickly find relevant resources.
- **Personalized Recommendations:** AI algorithms analyze user behavior and preferences to suggest content tailored to individual interests, improving the user experience.
- **Content Classification and Organization:** AI can automate the classification of digital content by analyzing texts, images, and other media, ensuring resources are accurately categorized and easily searchable.
- **Metadata Generation:** AI can automatically generate metadata, such as tags, summaries, and keywords, by processing textual and multimedia content. This enhances content discoverability and streamlines library management.

3. Cloud Computing and AI: A Combined Force in Digital Libraries

When cloud computing and AI are combined, digital libraries can achieve a new level of performance and sophistication. The cloud provides the infrastructure needed to handle large amounts of data, while AI adds intelligence to the way that data is processed, analyzed, and delivered to users.

- **AI and Cloud Integration for Efficient Data Management:** Cloud computing offers the storage and processing power necessary for AI applications. AI algorithms, such as machine learning models, require large datasets for training, which cloud platforms can provide with high performance and scalability.
- **Enhanced User Experience:** With AI-driven personalization and cloud infrastructure's seamless delivery, users can receive more relevant content faster and with fewer obstacles. Whether it's recommendations, real-time assistance through AI chatbots, or intelligent search, the user experience becomes more intuitive and efficient.
- **Automated Content Preservation:** Cloud services allow for the automatic backup and preservation of digital content, while AI can

detect potential issues related to data degradation. This ensures that digital library content remains intact over time.

4. Improving Collaboration and Accessibility

Cloud-based digital libraries enable global collaboration among researchers, institutions, and users. They can share resources, tools, and insights in real time, overcoming the barriers of distance and location. AI also facilitates collaboration by automating tasks and supporting multilingual access to resources.

- **AI-Driven Multilingual Search:** AI-powered translation services and language processing can ensure that digital libraries offer content in multiple languages, improving access to knowledge across linguistic barriers.
- **Global Collaboration:** Researchers and users can work together in cloud environments, contributing to shared digital collections and expanding access to diverse resources.

5. Data Security and Privacy with Cloud Computing and AI

While cloud computing provides great benefits in scalability and accessibility, security remains a critical concern. Combining AI with cloud computing can enhance security measures within digital libraries by detecting and preventing unauthorized access or data breaches.

- **AI-Powered Security Monitoring:** AI algorithms can be used to monitor user activity, detect anomalies, and identify potential threats in real time. This helps protect sensitive digital content and ensures that only authorized individuals have access to it.
- **Encryption and Data Protection:** Cloud providers often offer robust encryption methods for data storage and transmission. Coupled with AI-driven security, digital libraries can better protect their users' data and ensure compliance with privacy regulations.

6. Big Data Analytics and User Insights

Cloud computing enables the storage and processing of **big data**, while AI applies advanced analytics to interpret and extract actionable insights from large datasets. This helps digital libraries optimize their resources and services.

- **User Behavior Analysis:** AI can analyze user activity to identify trends and preferences, providing insights into how users interact

with the library's content. This data can be used to improve content curation, search functions, and user engagement.

- **Predictive Analytics:** AI-driven predictive analytics can help digital libraries forecast demand for certain types of content, guiding the library's acquisition strategies and resource allocation.

7. Content Enrichment through AI and Cloud

Cloud-based systems, combined with AI, can enrich the content available in digital libraries, allowing libraries to manage more than just traditional text-based materials.

- **Image and Video Recognition:** AI technologies such as computer vision can automatically categorize and tag images, scanned documents, and videos, making it easier to store and retrieve multimedia content.
- **Document Understanding:** AI can assist in processing non-traditional documents, such as handwritten texts or rare manuscripts, by using OCR (Optical Character Recognition) to convert them into machine-readable formats.

8. The Future of Digital Libraries with Cloud and AI

As both AI and cloud technologies continue to evolve, their role in the development of digital libraries will only become more prominent. Future developments could include:

- **Advanced AI Models:** More sophisticated AI models could lead to even better recommendations, search capabilities, and content analysis.
- **Real-Time Collaboration and Virtual Libraries:** Cloud and AI will enable the development of real-time collaborative digital libraries, where users can not only access content but also create, discuss, and share knowledge interactively.
- **Seamless Integration with Emerging Technologies:** Digital libraries might integrate with other advanced technologies such as augmented reality (AR) and virtual reality (VR) to offer immersive and interactive learning experiences.

Conclusion

The integration of **cloud computing** and **artificial intelligence** in digital libraries is a game-changer, providing scalable storage, enhanced search functionality, automated management, and personalized user experiences. Together, these technologies are laying the foundation for a more accessible, efficient, and secure future for digital libraries. As digital content continues to grow, AI and cloud computing will ensure that libraries can scale effectively, manage complex data, and deliver knowledge to users worldwide in innovative and meaningful ways.

Findings

Scalability and Efficiency: Cloud computing provides the scalability needed to accommodate growing collections and fluctuating access patterns, while AI enhances the functionality of these libraries through intelligent content management and automation.

Personalization and User Experience: AI-driven features such as smart search, personalized recommendations, and content classification greatly improve the user experience by tailoring services to individual needs.

Collaboration and Accessibility: Cloud computing facilitates global access to resources, and AI enables multilingual support, ensuring greater inclusivity and collaboration across diverse communities.

Security and Data Protection: The combination of cloud and AI enhances security protocols, enabling real-time monitoring, anomaly detection, and improved compliance with data privacy regulations.

Content Enrichment: AI-powered systems are enabling digital libraries to manage non-traditional content like images, videos, and handwritten documents, which expands the range of materials accessible to users.

References

1. Binns, M. (2021). The Role of Artificial Intelligence in Libraries and Information Science. Journal of Library & Information Science, 42(3), 267-278. https://doi.org/10.1016/j.lis.2021.06.004
2. Liu, Q., & Lee, H. (2020). Cloud Computing in Digital Libraries: Challenges and Future Prospects. International Journal of Digital Libraries, 21(1), 43-58.
3. Smith, A. M., & Voss, C. (2022). Artificial Intelligence in Information Management: New Opportunities for Libraries. Library Technology Reports, 58(6), 12-19.
4. Zhang, Z., & Wang, Y. (2020). Big Data and AI: Enhancing Library Services for the Digital Age. Library Review, 69(7), 473-489.

Application of Artificial Intelligence in Libraires

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Abstract
The application of Artificial Intelligence (AI) in libraries is revolutionizing the management and delivery of information services. AI technologies such as Expert Systems, Natural Language Processing (NLP), and robotics enhance various library operations, including cataloguing, classification, acquisition, and reference services. These systems improve efficiency, enable advanced information retrieval, and address challenges such as space constraints and resource handling. By integrating tools like automated indexing, knowledge-based systems, and optical character recognition, libraries can seamlessly merge digital and print collections, providing users with personalized, real-time access to resources. This paper explores the diverse applications of AI in libraries, highlighting its role in transforming traditional practices to meet the evolving needs of information seekers in the digital age.

Keyword
Patent, Intellectual Property, Innovation, Design

1.Introduction

Artificial Intelligence (AI) is transforming industries worldwide, and libraries are no exception. Libraries, as traditional centres of knowledge and learning, are evolving into dynamic spaces that integrate advanced technologies to enhance their services, operations, and user experiences. AI, with its ability to analyse vast datasets, automate routine tasks, and deliver personalized recommendations, has become a key enabler in this transformation. By leveraging AI, libraries can improve cataloguing processes, optimize resource discovery, and offer innovative services that cater to diverse user needs. AI-driven solutions, such as chatbots, virtual assistants, and advanced search algorithms, make information access quicker and more intuitive. Additionally, predictive analytics helps libraries anticipate user demands, streamline acquisitions, and manage resources more efficiently. In a rapidly digitizing world, the integration of AI ensures libraries remain relevant, accessible, and responsive. This introduction explores how AI is being applied across various facets of library operations, contributing to their mission of fostering knowledge dissemination and lifelong learning.

2.Types of Artificial Intelligence

2.1 Machine Learning (ML)

Machine Learning (ML) is a branch of artificial intelligence (AI) that focuses on creating systems capable of learning and improving from experience without being explicitly programmed. At its core, ML uses data and algorithms to mimic human learning and make predictions or decisions.

How Machine Learning Works

Data Collection: The foundation of ML is data, which can come from various sources such as sensors, databases, images, and text.

Preprocessing: Data is cleaned and transformed into a format suitable for analysis. This step involves handling missing values, normalizing data, and feature extraction.

Model Selection: Choose a machine learning algorithm based on the problem (e.g., regression, classification, or clustering).

Training: The algorithm learns patterns by analysing the data and adjusting parameters to minimize error.

Testing: Evaluate the model on unseen data to assess its accuracy and generalizability.

Deployment: A trained model is integrated into real-world applications to make predictions or decisions.

2.2 Expert System

An **Expert System** is a type of AI program designed to simulate the decision-making abilities of a human expert in a specific domain. These systems use knowledge and inference to solve complex problems that usually require human expertise. Expert systems were among the earliest forms of AI, laying the groundwork for modern AI techniques.

Key Components of Expert Systems

1. **Knowledge Base (KB):**
    - Stores domain-specific facts, rules, and heuristics.
    - The knowledge is often expressed in "if-then" rules or through semantic networks, frames, or ontologies.
    -
2. **Inference Engine:**
    - Acts as the reasoning mechanism.
    - It applies logical rules to the knowledge base to deduce new facts or reach conclusions.

- Two common reasoning methods:
  - **Forward Chaining:** Starts with known facts and applies rules to infer new facts (data-driven).
  - **Backward Chaining:** Starts with a goal and works backward to verify if known facts support it (goal-driven).

3. **User Interface (UI):**
   - Allows users to interact with the system.
   - Users input queries or data, and the system provides recommendations, explanations, or solutions

Expert systems continue to play a significant role in industries where structured decision-making is essential. While more advanced AI techniques like machine learning and neural networks dominate today, expert systems remain valuable for their interpretability and precision in specialized domains.

2.3 Robotics in AI refers to the integration of artificial intelligence into robotic systems to enhance their capabilities. AI enables robots to sense their environment, process data, and perform complex tasks autonomously or with minimal human intervention. This makes robots not just mechanical devices but intelligent entities capable of problem-solving and adaptive behaviour.

Components of Robotics in AI

1. **Perception**:
   - Involves using sensors to perceive the environment.
   - Examples: Cameras for vision, microphones for sound, LIDAR for mapping.
2. **Decision-Making and Planning**:
   - AI algorithms analyze sensory input and determine appropriate actions.
   - Example: Path planning for autonomous vehicles.
3. **Actuation**:
   - Robots perform actions through motors and actuators based on the AI's decisions.
   - Example: A robotic arm assembling components on a production line.
4. **Learning and Adaptation**:
   - Robots improve their performance over time using AI techniques like machine learning.

- Example: Training robots to identify and handle new objects.

Robotics in AI is revolutionizing industries and shaping the future of work and daily life. As AI continues to advance, robots will become even more intelligent, adaptive, and capable of tackling increasingly complex challenges.

3. Application of Artificial Intelligence in Library Services

3.1 Expert Systems: The role of an Expert System in providing reference services in libraries, serving as a substitute for a reference librarian in several ways:

1. **Research Assistance**: The system is designed to recommend sources to answer specific questions, teach reference skills, and support reference librarians and information specialists through computerized tools.
2. **Pointer Functionality**: Acting as a knowledge-based system, it guides patrons to appropriate reference sources using computer-assisted programs.
3. **Online Reference Assistance (ORA)**: Designed to simulate an academic reference librarian for low-to-medium complexity questions, ORA employs technologies like videotext databases, computer-assisted instruction modules, and knowledge-based systems. It also handles directional transactions, such as providing information about library locations, services, and policies.

This system enhances the efficiency and accessibility of library reference services through advanced technological solutions.

3.2. Application of Artificial Intelligence in Books Classification

Classification is a core activity in organizing knowledge, playing a vital role in all systems used in libraries and information centres. Expert Systems are applied in library classification through the following:

- **Coal SORT**: A conceptual browser designed for searching or indexing. It features a frame-based semantic network and software that enables users to navigate the conceptual structure. The system's expert knowledge is embedded in the semantic network.
- **EP-X (Environmental Pollution Expert)**: Similar to Coal SORT, it focuses on improving interfaces with a knowledge-based approach. Its knowledge base includes a hierarchical frame-based semantic

network and templates that define the pragmatic relationships among concepts, referred to as conceptual information.

- **BIOSIS**: A knowledge-based indexing tool that uses procedural knowledge to categorize documents automatically. It relies on the titles of biological documents to assign categories, often matching human indexers' work. The indexing language is structured, enabling effective AI applications.

These systems enhance classification tasks through advanced AI and semantic technologies.

3.3 **Application of Expert Systems in Books Acquisition**

The application of Expert Systems in library acquisition focuses on enhancing collection development, a key library function. Librarians and information officers play central roles, while library users contribute by providing input to build electronic collections.

One significant development is the **Monograph Selection Advisor**, which applies emerging technology to support subject bibliographers in making item-by-item decisions for selecting monographic materials. The system requires a broad knowledge base and user-friendly interfaces to ensure libraries can effectively retrieve the necessary information.

This integration streamlines acquisition processes, improving efficiency and decision-making in collection development.

3.4. Applications of Natural Language Processing in Library Activities

Natural Language Processing and Linguistics (NLPL) enables machines to understand and process human language, whether spoken or written. In library and information science, NLPL is particularly useful for improving database searches, such as in Online Public Access Catalogues (OPAC).

In document retrieval, indexing is crucial. Its primary goal is to enhance **precision** (retrieving relevant documents) and **recall** (retrieving all relevant documents). By applying NLPL, libraries can significantly improve search accuracy and efficiency, providing more relevant results for users.

3.5. Applications of Robotics in the Library Activities

Robots are versatile, programmable machines designed for various automation tasks, operating in fixed or mobile modes. In libraries, robotic

technology addresses the challenge of managing both digital and print collections, especially in space-constrained academic research libraries.

The Comprehensive Access to Printed Material (CAPM) system integrates robotics to enable on-demand and batch scanning of printed materials. Users can browse and request items through a web interface, prompting a robot to retrieve the material. Another robotic system opens the item and automatically turns its pages.

Using scanners, optical character recognition (OCR), and indexing software developed by the Digital Knowledge Centre, the CAPM system facilitates real-time text browsing, full-text searching, and analysis, enhancing access to library resources.

4. Conclusion

The application of Artificial Intelligence (AI) in libraries has transformed traditional library services, enhancing efficiency, accessibility, and user experience. AI-powered systems streamline operations such as cataloguing, classification, acquisition, and reference services. Tools like Expert Systems and Natural Language Processing improve information retrieval, while robotics address challenges like space constraints and physical material handling. By integrating AI technologies, libraries can offer personalized, user-centric services, bridging the gap between digital and print resources. As AI continues to evolve, it will play a pivotal role in redefining library services, ensuring they remain relevant and adaptable to the needs of modern users.

References

1. Vijayakumar, S., & Sheshadri, K. N. (2019). Applications of artificial intelligence in academic libraries. International Journal of Computer Sciences and Engineering, 7(16), 136-140.
2. Das, R. K., & Islam, M. S. U. (2021). Application of artificial intelligence and machine learning in libraries: a systematic review. arXiv preprint arXiv:2112.04573.
3. Jha, S. K. (2023). Application of artificial intelligence in libraries and information centers services: prospects and challenges. Library Hi Tech News, 40(7), 1-5.
4. Subaveerapandiyan, A. (2023). Application of Artificial Intelligence (AI) In Libraries and Its Impact on Library Operations Review. Library Philosophy & Practice.
5. MISAU, A. Y. (2021). APPLICATION OF ARTIFICIAL INTELLIGENCE IN ACADEMIC LIBRARIES IN NIGERIA.

6. Asim, M., Arif, M., Rafiq, M., & Ahmad, R. (2023). Investigating applications of Artificial Intelligence in university libraries of Pakistan: An empirical study. The Journal of Academic Librarianship, 49(6), 102803.

A Study on Role of Advanced Artificial Intelligence based Products & Services in Academic Library & Information Centers.

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Abstract
An Academic Library & Information Center can improve their services, increase productivity, and give their patrons a more individualized experience by utilizing AI. The Impact of AI on libraries can be summarized as follows:

Better Information Recovery: AI-driven search engines are able to comprehend user intent, context, and complex queries, producing more precise and pertinent search results. AI can find connections between ideas by deciphering the meaning of words, which increases the accuracy of search results. NLP facilitates information retrieval by allowing users to communicate with library systems in natural language.

Tailored Services:AI-driven technologies may adjust to each user's unique learning preferences and speed, making learning more efficient.
Hence, this study tries to determine the Role of Artificial Intelligence based products in Academic Library and Information Center by analysing all aspects related to it

Keywords
Artificial Intelligence, Chat-bot, Information Retrieval Systems, Automation, Information Resources, Academic Library, Hybrid Library, Digital Library, Information Science.

Introduction

There is a great deal of concern about the impact of newer technologies like AI on Job sector. It has become increasingly evident that many Academic institutions in Private Sector have minimal or very less Employees. But this cannot be attributed to AI alone. Unfortunately, this is as a result of lack on understanding the importance of Library in any Academic Institution. Furthermore, being a not-for-profit Department further impacts Library's Staff Employment Decision of the Higher Management. There are many

Schools, College and even Self-Financed Universities that have understaffed Library & Information Centers.

AI plays no role in the attitude of Higher Management & Decision makers in Academic Institution especially in Private Sector who see Academic Institution as merely a Business. Changing the view on AI Technology as a Saviour that rescues Librarian or Library Staff from problems that arises in its Operations due to lack of Staff is thus very important. AI can save time and effort by automating the categorization and metadata creation process for books, journals, and other items.

AI-powered robots can help with inventory management and shelf-reading, guaranteeing precise documentation and effective organizing.By automating repetitive administrative duties like data input and document processing, librarians can concentrate onmore calculated effort.By translating library materials into several languages, AI-powered translation technologies can increase their accessibility to a larger audience. New advances like Generative AI that facilitates Text-to-Image, Text-to-Speech, Text-to-Video, Speech-to-Text technologies can facilitate information access for people who have reading or vision disabilities.

Review of Existing Literature

1. Jha, S. K. (2023) emphasizes that Artificial intelligence is a very lucrative technology that can be utilized in delivering library products and services in an article of Library Hi Tech News. However, there are a number of barriers that prevent AI from being fully implemented in library operations, including a lack of funding, librarian attitudes, and technical expertise. The results also show that libraries will go more quickly in the proper direction if AI is used in library operations.
2. Kumar, C. R. (1995) in his thesis titled “An investigation on application of AI techniques on GIS” explores the possibility of implementing modern Expert System and related products in Geographical Information Systems. Its focus is mainly on Analysis of Spatial Data and Information from multiple sources. Although the study is limited to a specific information system but it highlights many other aspects of Information Systems along with AI application which is relevant to interdisciplinary studies and research.
3. Lynch, B. P., & Smith, K. R. (2001) performed rigorous content analysis and authored an Article in College & Research Libraries. He concluded

that computer technologies were routinely used in all academic library occupations. Reference work now involved instruction and behavioral skills particularly the ability to communicate verbally and in writing had become new requirements for employment. The study is very important source of information for conducting research projects on large scale in the field of Computer Application, Information Technology, Artificial Intelligence and Library 7 Information Science.

4. Massis, B. (2018) in article titled “Artificial intelligence arrives in the library” tries to emphasize the fact that Any new technology's disruptive qualities could be seen as a danger to the library and other organizations. However, given the eventual adoption and integration of AI into its offerings, it is reasonable to assume that this most recent technological "intrusion" may also present numerous potential benefits for a wide range of library services.
5. Negnevitsky, M. (2001) in his book “Artificial Intelligence: a guide to intelligent systems” provides an overview of computer intelligence. Knowledge engineering, artificial neural networks, rule-based expert systems, fuzzy expert systems, frame-based expert systems, evolutionary computation, and hybrid intelligent systems are all covered. Considering and gaining insights on these different type of concepts require a brief understanding of them. This book and all its chapters broadens understanding in legible language and with ample amount of illustrations.
6. Townley, C. T. (2001) in his article titled “Knowledge management and academic libraries” concludes that many library operations can be made more effective by including knowledge management. Furthermore, it provides the chance to increase the function of libraries in the academic community and build ties with associated organizations both within and beyond the university. The entire article helps us develop right perspective towards Library as Information or Knowledge Management Centers and Librarians as Knowledge Managers. With this perspective Librarians can reduce the distress in the library Staff related to the disruptive nature of AI.

Role of AI In Academic Library Centers

In the age of information explosion, AI has the potential to completely transform the function of libraries. Libraries may improve user experiences, streamline operations, and stimulate creativity by implementing AI technologies. However, in order to guarantee AI's responsible and advantageous application in libraries, it is imperative to address the difficulties and moral issues surrounding it.

Artificial Intelligence based Products & Services

Artificial Intelligence (AI) has become a disruptive force that is changing industries and how we work and live. AI-powered products and services are finding their way into our everyday lives more and more.

Most Common AI-Powered Products and Services include but are not limited to the following:

- **AI powered Automation Systems**: Examples of this are the Management Information systems, Human Resource Information System, Financial management and Analysis Information Systems, Integrated Library Management Systems that deploy AI techniques like Expert Systems, Intelligent Systems for Automation of process and operations.

- **Information Retrieval System driven by AI**: Examples of the same are Search Engine Optimization technique, Intelligent Search, Prompt Engineering products, Advanced Query formulations (by means of Combination of Customizable dropdowns, Expert Search, Boolean Operators, Wild Card, Parenthisis, Thesauri, Semantic Search, Text-to-Speech, etc.) and advanced database management systems for information retrieval.

- **Personal Assistants Driven by AI**: It includes Virtual assistants with their ability to comprehend natural language, carry out activities, and provide information. Examples include Siri, Alexa, and Google Assistant have become vital companions. This also includes chat-bots and query resolver by means of FAQ system. The AI systems can be trained to understand the query by matching the input with FAQ to provide satisfactory resolution. This applies to all virtual assistants like voice assistant to chat-bot or 3D AI model.

- **AI driven Identity Detection & Profiling systems**: AI maximizes the accuracy of its results by customizing instructional materials to each student's needs. Firstly, AI analyses and records the profile of the users. The search history, download history, prompts by users are analyzed and stored by these systems. This helps them to create profile based data for various users. It helps in automation of repetitive search queries, increases reliability and proficiency of services. Pattern recognition helps the AI in behavioral analysis and to provide suggestions.

- **AI powered Intelligent Tutoring/Learning Management Systems**: These AI-driven tutoring programs offer individualized guidance and feedback. These systems use online course material designed by experts and uploaded in the database to provide systematic learning modules. The learning material could be video, audio, text. AI further analyses it and can use it to enhance its generative capabilities and develop new content. This helps in further enrichment of the content. Also, many simulations are created for practical explanation of concepts. Nowadays many Edtech Companies develop and provide products and services around this which give them edge on traditional Learning Management System which only included recordings.

Application of AI based products in Academic Libraries

To increase and maximize the efficiency of Library operations like Collection Development, Cataloguing, Dissemination of Information, Knowledge Organization, etc. It also aids in automating tech-based services like Online CAS, Online SDI, Email Alerting Services, Digital Reference Service etc.
Modern AI Products & Services to Library can be applied in following Areas:

- **AI application to Integrated Library Management System**

The concept of Integrated Library Management System encompasses all basic to advanced Library Operations. It involves automation of these system either entirely or completely by means of Technological products and services like:
i. AI for Library management Software (Koha, NewgenLib, etc.): Application of Artificial intelligence can be done to facilitate formulate simulations and testing the capability of new technological products. AI driven Virtual Screens with Voice assistants or chat-bots can be placed at Circulation Desk

that will provide basic instructions and query resolution. The automatic circulation Machine can be customized to create AI based User Interface. ii.

ii. AI powered products Electronic Article Surveillance systems: Barcode System can be automated by applying AI tools for customizing its size as per books. Radio Frequency Identification System and Electro-magnetic Title Tape System, etc. require a interface to provide input and resuth display. By application of Voice recognition this can be enhanced. Pattern Recognition method used in modern AI models can be applied to trace missing/lost
resources. RFAID™: AI-powered RFID systems showcased by Datamars Textile ID is an example of AI in RFID.

iii. AI application to Library website and Online Public Access Catalogue: Artificial Intelligence products like chat-bots, AI powered Voice Assistant, Intelligent Search, Interactive Interfaces/Videos, Augmented Reality and Virtual Reality can be applied on web pages of both Library Website and Online Public Access Catalaogue.

- **AI application to Library Databases and Digital Library**

For Digitization, Automated Scanners with advanced features like Optical Character Recognition recognition are required. It also needs state of the art Scanning software. Specialized AI based software includes ScanFlow which is an AI-powered scanning app for smartphones and tablets can automatically detect and capture text, barcodes, and other information from physical documents and Microblink software that offers a range of AI-powered mobile scanning solutions, including ID document scanning, credit card scanning, and barcode scanning. Databases and Digital Libraries can be modernized by AI Techniques Used in Information Retrieval like Deep Learning, Natural Language Processing and Machine Learning, etc.

Furthermore there are many Digital Libraries and IR Systems are now implementing AI which include but are not limited to:

i. Project Gutenberg: It leverages AI to enhance the accessibility and discoverability of its vast collection of free eBooks. Uses AI for text analysis, language translation, and automated formatting.

ii. HathiTrust: A digital library of millions of volumes, many digitized from physical copies.Uses AI for text mining, topic modeling, and automated metadata creation.

iii. Microsoft Academic Search: A search engine for academic papers, theses, and books. It uses AI to improve search relevance and discoverability.

General Search engines like Google and Bing have also developed AI. Digital Libraries and databases can include search bar of Google that reads powered by google to make use of it.

- **Library Centers transformation to AI backed Learning Center**

Libraries have played a vital role as provider of Informal Education Infrastructure. Many Libraries conduct courses, webinars, seminars, training workshops, Web-based user education, Orientation programs, etc. The Online portal of Libraries can be used for deploying online course material. All these services can be enhanced by implementing AI products. Examples of AI products include Docebo which uses AI-powered learning paths, personalized recommendations as well as intelligent search and automated content curation, Other examples include WorkRamp, Paradiso LMS, EdApp, TalentLMS, Thinkific Plus, etc.

- **AI application to Tech-based Library Services**

These services are usually delivered online by using the internet. It includes but is not limited to Current Awareness Service, Selective Dissemination of Information, Email Notifications, Bulletin Boards, Circulation Alerts, New Arrivals alerts, Ask-A-Librarian Service, Online Reference Service, RSS feeds or Atom feeds, electronic document delivery services, real-time reference service, personal settings, saved searches and articles, etcAll these services can be automated by AI driven products like:

i. OCLC Wise:i.OCLC Wise: It offers automated cataloging, automated metadata creation, personalized user suggestions, and predictive analytics, etc.

ii. Ex Libris Alma: This cloud-based library services platform incorporates AI-driven analytics to support decision-making and streamline workflows.

iii. Gmail: Google's AI-powered features, such as Smart Compose and Smart Reply, help you write emails faster and more efficiently.

iv. Microsoft Outlook: Outlook's AI-powered features, such as Focused Inbox and Clutter, help you prioritize important emails and reduce distractions.

v. Other AI-Powered Email Tools: Various third-party tools, such as SaneBox and Grammarly, offer advanced AI features to improve your email workflow.

Challenges and Future Potential by means of SWOT Analysis

Strength, Weakness, Opportunities and Threats which are 4 parameters of SWOT Analysis used to analyse the potential and decide upon implementing any Strategy or Plan. In this cases it is used to analyse the Implementation of AI.

- **Strengths of AI Implementation**

i. Enhanced Decision-Making by Data-Driven Insights: AI can process vast amounts of data to identify patterns and trends that humans might miss.
ii. Predictive Analytics: AI can forecast future outcomes based on historical data, enabling proactive decision-making.
iii. Reduced Bias: By removing human biases, AI can make more objective and fair decisions.
iv. Automation of Tasks for Improved Efficiency: AI can automate repetitive tasks, freeing up human workers for more complex and creative work.
v. 24/7 Availability: AI systems can work tirelessly, improving productivity and reducing downtime.
vi. Error Reduction: AI can minimize errors associated with manual tasks.
vii. Improved Complex Problem Solving: AI can tackle complex problems that require significant computational power and analysis.
viii. Accelerated Research: AI can accelerate scientific discovery by automating data analysis and hypothesis generation.

- **Weakness in Implementation of AI**

i. Lack of Common Sense and Contextual Understanding:AI systems often struggle to understand nuances, context, and common sense, leading to errors or misunderstandings.They may not be able to adapt to unexpected situations or make decisions that require human intuition.

ii. Dependence on Quality Data:AI models are only as good as the data they are trained on. Biased or inaccurate data can lead to biased and unreliable outputs.

Acquiring and cleaning large datasets can be time-consuming and expensive.E

iii. High Cost of Development and Implementation:Developing and implementing AI systems can be costly, requiring significant investment in hardware, software, and skilled personnel.

iv. Job Displacement:Automation of tasks through AI can lead to job displacement in certain industries.

v. Lack of Creativity and Originality:While AI can generate creative content, it often lacks the originality and innovation of human creativity.
vi. Security Vulnerabilities:AI systems can be vulnerable to cyberattacks, which could compromise sensitive data and disrupt critical systems.

- **Opportunities created by Implementation of AI or its Future Potential**

i. Achieving Near Complete Automation: A completely Automated Library by means of AI Expert systems, AI based Robots and Associated Technologies may turn into a reality in coming future.
ii. Transition from Traditional and Hybrid to completely Digital Libraries: Many libraries are still undergoing or have undergone this but majority of Academic Libraries are still either completely traditional or have implemented minimal computerization. With AI implementation, there is a possibility that the situation reverses wherein majority of the Academic Libraries turn into Hybrid or Digital in Future.
iii. Information Retrieval with Maximum possible Accuracy: Enhanced AI search and Information Tools with Machine Learning techniques could possibly achieve maximum possible accuracy in results in coming times.
iv. Tech-based Job Opportunities: Many Tech-based specific courses, software training are frequently conducted by Major Institutions both public and Private which creates unique Niche of Job opportunities as they are based on developing practical expertise in new technologies. AI implementation would in turn lead to formulations of new such courses and skill development initiatives and thus new job opportunities.
v. Specialized Innovations: AI models are still under development and many Library scientists, Computer Scientists and engineers are working towards creating new ones which would lead to specialized innovations.
vi. Major shift toward Open Access Publishing: The implementation of AI will open doors to many restricted or less discovered data-sets and information rapidly which may lead to increase in open access publishing as expensive subscription models would be least preferred.

- **Threats or Challenges in Implementation of AI**

i. Digital Divide: Access to AI technology and its benefits may be unevenly distributed, exacerbating existing social and economic inequalities.
ii. Misinformation and Disinformation: AI can be used to generate misleading or

false information, which can have serious consequences.

iii. Regulatory Challenges: Developing effective regulations for AI is complex, as it
requires coherence of it with Law system.

iv. Data quality issues: It includes noise, bias, and inconsistency that can significantly impact model performance.

v. Privacy Concerns: AI systems can often collect and process personal data.

Conclusion

On broader perspective there are literature published from decades ago regarding the possible advantages of the same. In the Light of all these facts it is safe to conclude that AI can play a significant role in development of Library and Information Centers of Academic Institutions and will continue doing so in Future. Libraries are being revolutionized by AI. AI is increasing the efficiency and usability of libraries by automating processes, enhancing search capabilities, and customizing user experiences. Among the main uses of AI includes Automating processes such as reference services, cataloging, and circulation and Enhanced Search and Discovery using tailored recommendations and semantic search to improve search results. It also aids in Customizing educational experiences to meet the needs of each individual is known as personalized learning. Using language translation and text-to-speech technology to make library materials available and accessible to a larger audience. The SWOT Analysis of Strategic Implementation of AI products and services has shown that its strengths and opportunities have an edge over its weakness and threats although the comparison was too close.

References:

1. Bhardwaj, R. K., Borgohain, D. J., &Verma, M. K. (2022). Mapping the literature on the application of artificial intelligence in libraries (AAIL): a scientometric analysis. Library Hi Tech, 42(1), 149–179. https://doi.org/10.1108/lht-07-2022-0331
2. Henry, C., & Marcum, D. (2009). Council on Library and Information Resources (CLIR). In CRC Press eBooks (pp. 1332–1336). https://doi.org/10.1081/e-elis3-120043884

3. Jha, S. K. (2023). Application of artificial intelligence in libraries and information centers services: prospects and challenges. Library Hi Tech News, 40(7), 1–5. https://doi.org/10.1108/lhtn-06-2023-0102.
4. Kumar, C. R. (1995). An investigation on application of AI techniques on GIS. In INFLIBNET. https://shodhganga.inflibnet.ac.in/handle/10603/1543
5. Lynch, B. P., & Smith, K. R. (2001). The changing nature of work in academic libraries. College & Research Libraries, 62(5), 407–420. https://doi.org/10.5860/crl.62.5.407
6. Massis, B. (2018). Artificial intelligence arrives in the library. Information and Learning Sciences, 119(7/8), 456–459. https://doi.org/10.1108/ils-02-2018-0011
7. Negnevitsky, M. (2001). Artificial Intelligence: a guide to intelligent systems. http://ci.nii.ac.jp/ncid/BA71258502
8. Townley, C. T. (2001). Knowledge management and academic libraries. College & Research Libraries, 62(1), 44–55. https://doi.org/10.5860/crl.62.1.44
9. Vitthalbhai, P. P. (1995). Contributions to AI operations research methodologies. In Shodhganga. https://shodhganga.inflibnet.ac.in/handle/10603/75482

AI (ARTIFICIAL INTELLIGENCE) Disruption In Academic Libraries

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Abstract
Artificial intelligence (AI) has significantly transformed numerous fields, including academic libraries. As centers for knowledge dissemination, academic libraries are adopting AI to enhance their services, optimize resource management, and meet evolving user expectations. This article explores the implications of AI in academic libraries, highlighting opportunities, challenges, and ethical considerations. Artificial Intelligence (AI) is transforming academic libraries, redefining how they manage resources and deliver services. AI-driven technologies enable advanced cataloging, personalized recommendations, and efficient information retrieval, enhancing user experiences. These innovations also streamline library operations, from collection management to digital preservation. However, the integration of AI raises critical concerns about data privacy, ethics, and the evolving role of librarians. This article explores the disruptive impact of AI in academic libraries, emphasizing its potential to revolutionize knowledge access while addressing associated challenges.

Keywords
AI, Artificial Intelligence, AI disruption, Academic libraries, AI-driven technologies, Libraries and education

1. Introduction

Libraries have always been at the forefront of adopting innovative technologies to enhance their services, manage resources, and meet the evolving needs of users. In recent years, artificial intelligence (AI) has emerged as a transformative force, reshaping how libraries operate and interact with their communities. By leveraging AI, libraries can streamline operations, improve user experiences, and unlock new opportunities for knowledge discovery and dissemination.

From automating cataloguing processes to providing personalized recommendations, AI is redefining the traditional library landscape. It enables intelligent search capabilities, predictive analytics for collection management, and even the creation of virtual assistants to guide users

through complex information ecosystems. Furthermore, AI-powered tools are being used to digitize and preserve rare collections, ensuring that cultural heritage is accessible to future generations.

As libraries navigate this era of digital transformation, the integration of AI raises important questions about ethics, data privacy, and the role of librarians in an AI-driven environment. By exploring these challenges and opportunities, libraries can position themselves as innovative hubs of learning and collaboration in the 21st century. This article delves into the applications, benefits, and implications of artificial intelligence in libraries, highlighting its potential to revolutionize library services while maintaining their core mission of fostering knowledge and education.

2. Definitional Analysis Of Conceptual Terms

2.1 Meaning of Artificial Intelligence (AI)

Artificial Intelligence (AI) refers to the simulation of human intelligence in machines that are programmed to think, learn, and perform tasks that typically require human intelligence. AI systems can process vast amounts of data, recognize patterns, make decisions, and improve over time through learning algorithms.

2.2 Applications of AI in different sectors:

- **Healthcare**: AI is used for diagnostics, personalized treatment plans, drug discovery, and robotic surgery.
- **Finance**: AI algorithms help with fraud detection, credit scoring, algorithmic trading, and personalized financial advice.
- **Customer Service**: AI-powered chat bots and virtual assistants provide customer support and answer queries around the clock.
- **Education**: AI tools assist with personalized learning, grading, and administrative tasks in educational institutions.
- **Transportation**: AI is used in autonomous vehicles, traffic management systems, and predictive maintenance of transport infrastructure.

2.3 Meaning of DISRUPTION

The term disruption generally refers to a significant disturbance or interruption in the normal flow or functioning of something. In a broader context, disruption involves introducing a change that significantly alters an existing system, process, or industry, often in a way that challenges established practices and norms.

2.4 What is AI DISRUPTION?

AI disruption refers to the significant changes and transformations brought about by the introduction and widespread adoption of artificial intelligence (AI) technologies across various industries and sectors. This disruption can fundamentally alter traditional practices, business models, workflows, and ways of interacting with technology and data. Here's a breakdown of what AI disruption entails:

2.5 AI disruption In Different Contexts:

1. ***Business and Technology****:* Disruption often refers to innovations or technologies that radically change how industries operate, leading to shifts in market dynamics. For example, streaming services like Netflix disrupted the traditional television and movie rental industries by offering on-demand content over the internet.
2. ***Social and Cultural Contexts****:* Disruption can refer to changes that significantly impact social norms, behaviors, or cultural practices. For example, social media platforms have disrupted traditional communication and information-sharing methods, influencing how people interact and consume news.
3. ***Libraries and Education****:* In the context of libraries and education, disruption could involve technological advancements (like AI and digital resources) that change how libraries operate and deliver services, potentially challenging traditional roles and functions.

Overall, disruption implies a shift from the status quo, often bringing both challenges and opportunities for adaptation and growth.

3. What Is Ai Disruption In Libraries

AI disruption in libraries refers to the significant changes and challenges that artificial intelligence (AI) technologies bring to the traditional roles, operations, and services of libraries. While AI presents many opportunities for enhancing library services, it also disrupts existing practices and requires libraries to adapt to new technological environments. Here are some of the key aspects of AI disruption in libraries:

3.1 Automation of Library Services

- Automated Cataloguing and Classification: AI can automate the process of cataloguing and classifying books and other materials, reducing the need for manual input and potentially increasing accuracy. However, this can lead to job displacement for staff traditionally involved in these tasks.
- Chat bots and Virtual Assistants: Libraries are increasingly using AI-powered chat bots and virtual assistants to handle routine patron

inquiries, such as locating books or accessing digital resources. This automation can free up staff time for more complex tasks but may also reduce the personal interaction between patrons and librarians.

3.2 Enhanced Search and Discovery Tools

- Improved Search Capabilities: AI can enhance search and discovery tools in libraries, enabling patrons to find resources more quickly and accurately through natural language processing, semantic search, and personalized recommendations.
- Personalized User Experience: AI algorithms can analyze user behaviour and preferences to provide personalized content recommendations and reading suggestions, tailoring the library experience to individual needs.

3.3 Digital Collections and Preservation

- Automated Digitization: AI technologies can automate the digitization of library materials, including books, manuscripts, and audio-visual content. This makes it easier to preserve rare and fragile items and provides broader access to digital collections.
- Text and Image Recognition: AI-driven optical character recognition (OCR) and image recognition tools can convert physical documents into searchable digital text, enhancing access to historical documents and archives.

3.4 Data Analytics and Decision-Making

- Usage Analytics: AI can analyze library usage data to identify trends and patterns, helping libraries make data-driven decisions about collection development, space utilization, and service offerings.
- Resource Management: AI can optimize resource management by predicting demand for specific materials, automating inventory management, and improving the allocation of library resources.

3.5 AI-Driven Research Assistance

- Automated Research Support: AI tools can assist with complex research queries, helping patrons find relevant academic articles, data sets, or other resources more efficiently. These tools can also provide citation management and automated summarization of research topics.
- AI for Information Literacy: AI can be used to develop tutorials and learning modules that enhance patrons' information literacy skills, teaching them how to effectively use library resources and critically evaluate information sources.

3.6 Challenges of Data Privacy and Ethics

- Data Privacy Concerns: The use of AI in libraries often involves collecting and analyzing patron data to personalize services or improve operations. This raises concerns about data privacy, security, and the ethical use of personal information.
- Bias in AI Systems: AI algorithms can inadvertently reflect biases present in the data they are trained on, potentially leading to biased recommendations or search results that do not align with the library's values of neutrality and inclusivity.

3.7 Impact on Librarian Roles and Skills

- Shift in Librarian Roles: As AI takes over routine tasks; librarians' roles may shift towards more specialized functions such as digital curation, data management, and teaching information literacy. This requires librarians to develop new skills and adapt to changing job requirements.
- Training and Up skilling: Libraries need to invest in ongoing training and professional development to equip staff with the skills needed to work with AI tools and understand their ethical implications.

3.8 Potential Reduction in Human Interaction

- Less Human Interaction: The use of AI to automate services could reduce face-to-face interactions between librarians and patrons, potentially impacting the personalized service and community engagement that are hallmarks of library services.

3.9 Ethical Use of AI in Collections and Content Management

- Curating AI-Generated Content: Libraries may face ethical dilemmas about including AI-generated content in their collections and how to ensure that this content meets their standards for accuracy, reliability, and relevance.
- Managing AI-Enhanced Content: Libraries will need to consider how to integrate and manage AI-enhanced content, such as digitally restored audio or video materials, while maintaining the integrity of original works.

3.10 Increased Expectations for Digital Services

- Expanding Digital Services: As AI capabilities grow, there may be increased expectations from patrons for digital services, such as 24/7 access to digital collections, automated assistance, and personalized content delivery. Libraries must adapt to meet these evolving demands.

4. IDENTIFYING CHALLENGES OF AI DISRUPTION IN LIBRARIES

AI disruption in libraries presents several unique challenges that need to be carefully considered to ensure that the integration of AI technologies aligns with the library's mission and values. Here are some of the key challenges of AI disruption in libraries:

- Data Privacy and Security Concerns
- Bias and Fairness in AI Systems
- Job Displacement and Changing Roles
- Ethical Use of AI Technologies
- Accessibility and Digital Divide
- Loss of Human Interaction and Personalized Service
- Financial and Resource Constraints
- Integration and Interoperability Issues
- Lack of Awareness and Understanding
- Navigating Rapid Technological Change

5. How To Preserve Libraries In The Age Of Ai Disruption

Preserving libraries in the age of Artificial Intelligence (AI) disruption involves adapting to new technologies while maintaining the core values and functions of libraries. Here are some strategies to help libraries thrive in this evolving landscape:

5.1 Embrace AI and Technology

- Integrate AI Tools: Use AI to enhance cataloging, automate repetitive tasks, and improve data retrieval through natural language processing. For example, AI can be used to recommend books, digitize texts, and automate the categorization process.
- AI-Enhanced Search and Discovery: Develop advanced search tools using AI to help patrons discover resources more effectively, including personalized recommendations and smart search functionalities.

5.2 Expand Digital Collections

- Digitization of Resources: Continue to digitize rare books, manuscripts, and other resources to make them more accessible and preserve them for future generations.
- Digital Lending and eBooks: Offer eBooks and digital lending options that integrate with AI to track trends in borrowing and usage, allowing libraries to curate their collections better.

5.3 Focus on Digital Literacy

- Digital Literacy Programs: Teach patrons how to use AI tools and navigate digital resources effectively. This includes understanding AI

ethics, privacy concerns, and how AI can be leveraged for personal or academic research.

- Workshops and Training: Provide training sessions for both staff and users on how to utilize AI tools for research, data management, and information retrieval.

5.4 Preserve the Human Touch

- Curated Services: Offer curated services that combine the expertise of librarians with AI-powered recommendations, maintaining the personal touch and professional insight that AI alone cannot provide.
- Community Spaces and Events: Focus on the role of the library as a community space where people can gather, collaborate, and learn in person, which AI and digital resources cannot replace.

5.5 Develop Ethical Guidelines

- Data Privacy and Ethics: Create policies to protect user privacy and data security, especially when implementing AI systems that might collect and analyze user data.
- AI Literacy for Librarians: Train librarians to understand AI's implications and potential biases, enabling them to guide users in critically assessing AI-generated content.

5.6 Collaborate with Technology Partners

- Partnerships with Tech Companies: Collaborate with tech companies to develop AI tools tailored for libraries and explore ways to integrate these technologies into library services.
- Research and Development: Engage in R&D projects focusing on AI applications in libraries, possibly in collaboration with academic institutions and tech firms.

5.7 Redefine the Library's Role

- Information Hubs: Position libraries as central hubs for accurate, reliable, and unbiased information, contrasting with AI-generated content that may sometimes lack context or be biased.
- Support for Open Access: Advocate for and support open access initiatives to ensure that knowledge remains accessible to all, regardless of the rise of AI-driven content curation services.

5.8 Leverage AI for Data-Driven Decisions

- Analytics and Insights: Use AI to analyze user behaviour and preferences to better understand community needs and tailor services accordingly.

- Resource Management: Implement AI tools for more efficient resource management, from predicting demand to optimizing the physical space of the library.

5.9 Stay Flexible and Adaptive

- Continuous Learning: Encourage a culture of continuous learning and adaptation among library staff to stay updated on the latest AI trends and how they can be leveraged or countered.
- User Feedback and Engagement: Regularly seek feedback from patrons to ensure that library services are meeting their needs in the context of a rapidly changing technological landscape.

By combining these strategies, libraries can remain relevant, resilient, and central to their communities, even in the face of AI disruption.

Conclusion

AI disruption in libraries brings both opportunities and challenges. Libraries can harness AI to improve services, enhance user experiences, and manage collections more effectively. However, they must also navigate ethical considerations, data privacy concerns, and the need for ongoing staff training and adaptation. Balancing the integration of AI technologies with the library's mission of equitable access to information, community engagement, and education is essential for successfully navigating AI disruption.

AI disruption in libraries presents a range of challenges, from ethical considerations and data privacy issues to the potential for job displacement and the digital divide. To navigate these challenges effectively, libraries must carefully balance the benefits of AI with the need to uphold their core values of equity, access, and community engagement. This requires thoughtful planning, ongoing education and training, and a commitment to ethical and responsible AI use.

References

1. Breeding, M. (2020). *The Role of Artificial Intelligence in Libraries: Current Applications and Future Directions.* Computers in Libraries, 40(6), 12-15.
2. Cox, A. M., Pinfield, S., & Rutter, S. (2019). *The Intelligent Library: Thought Leadership and the Application of AI in Libraries.* Library Hi Tech, 37(3), 418-435.

3. McMillan, M. (2021). *AI-Powered Libraries: Transforming Academic Resources and User Services.* Journal of Library Administration, 61(5), 457-475.
4. Smith, J. E., & Wong, G. K. W. (2020). *Artificial Intelligence for Digital Preservation in Libraries.* Journal of Documentation, 76(4), 892-914.
5. JISC. (2021). *Artificial Intelligence in Tertiary Education: Enhancing Library Services and User Engagement.* Available at: https://www.jisc.ac.uk
6. IFLA (International Federation of Library Associations). (2019). *AI and Machine Learning in Libraries: Opportunities and Challenges.* Available at: https://www.ifla.org/publications
7. Chowdhury, G. (2020). *Sustainability of Digital Libraries: The Role of AI and Machine Learning.* International Journal of Digital Library Systems, 11(2), 25-38.
8. Garcia, L. M., & Rowe, R. K. (2020). *Integrating AI Tools in Academic Libraries: A Case Study Approach.* College & Research Libraries, 81(7), 1205-1221.
9. Brynjolfsson, E., & McAfee, A. (2017). *The Business of Artificial Intelligence: The Library Perspective.* Harvard Business Review, 95(4), 46-54.
10. The Chronicle of Higher Education. (2022). *AI in Academia: How Libraries are Adapting to the New Frontier.* Available at: https://www.chronicle.com

The Future of Libraries: Harnessing the Power of Artificial Intelligence Tools

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Abstract
The way libraries operate, manage resources, and assist communities is being completely transformed by the incorporation of artificial intelligence (AI) into library systems. Information is improved by AI-powered semantic search, tailored recommendations, and automated cataloguing systems. User experience, operational efficacy, and accessibility Digital preservation requires artificial intelligence in order to restore historical documents and artifacts. AI-powered technologies analyse large datasets, identify trends, and visualize data, enhancing research support services and academic performance. Automation of administrative tasks frees up library employees for specialized tasks. AI-powered educational systems enable lifelong learning. However, ethical issues like algorithmic bias and data privacy need to be addressed. Libraries must adapt AI technologies while ensuring fair knowledge distribution.

Keywords Digital Preservation, Natural Language Processing, artificial Intelligence, and Libraries

Introduction

Libraries are undergoing a significant transformation in the digital landscape, transitioning from traditional knowledge repositories to advanced, tech-driven spaces. Artificial intelligence (AI) techniques are driving this growth, transforming library services by increasing productivity, facilitating better information management, and improving user experience. AI methods that automate complicated processes, speed up repetitive chores, and personalize services include robots, machine learning, natural language processing (NLP), and expert systems. AI applications in libraries are already impacting user engagement, reference

services, cataloguing, and information retrieval. Machine learning algorithms automate metadata creation, while NLP tools improve access to information by enabling more accurate and user-friendly search features. AI-powered systems can also provide tailored suggestions based on user preferences. Automation and robotics are addressing space limitations in academic libraries, allowing for faster and more efficient service provision. Intelligent interfaces are changing patron engagement with library databases by facilitating more intuitive and user-friendly access to content. Despite the enormous promise of AI, librarians still play essential role in knowledge curation, expert advice, and inclusive, ethical, and accessible services. Balancing the use of AI tools with the human element is crucial as libraries embrace AI. The emerging of libraries must consider the effects of AI on administration, service provision, and the changing role of librarians. While maintaining the principles of research, education, and community development, the future holds both opportunities and problems as libraries sustain utilization of AI tools to fulfil the requirements of a digital-first society.

Literature Review

1. Mukherjee, S. and; Patra, S (2024) This paper explores the application of AI tools in library services, focusing on chatbots, which simulate human conversations using artificial intelligence and natural language processing algorithms. These chatbots can undertake various tasks like providing information, guiding users through processes, and answering frequently asked questions. They are used in various industries like customer support, e-commerce, healthcare, and education. However, they also latest challenges like job displacement fears, skill gaps, algorithmic bias, and overreliance on technology. Library and information professionals must adapt these technologies, invest in training programs, and be aware of potential biases to ensure fair and inclusive experiences. Balancing automation and human connection are crucial for modern library services.
2. Bairagi, M.; Lihitkar, S. (2024) This paper explores the use of AI-driven tools in library operations, such as Natural Language Processing (NLP), Large Language Model (LLM), Expert System (ES), AI-Powered Indexing Tools, and Chatbots These AI tools seek to construct devices that are able to cognitive functions that are comparable to those of the human brain, enabling libraries to overcome physical limitations and become more intelligent and accessible. The study evaluates the usability of AI

technology in library workflow, explores innovative techniques for sustainability, optimizes collection management, and meets diverse information needs. AI systems can manage collection development effectively and economically.

3. Teel, Z. (2024). This paper explores the synergy of AI and archival research, Analysing how these two fields interact. AI can assist in making decisions about which materials to preserve, streamlining the process, and retaining materials that might otherwise be dismissed based on physical storage space. AI can improve cost-effectiveness and reduce strain, allowing more time to focus on documents and less time on the system. Recent advancements in technology, particularly in digitizing, have significantly eased the task of preserving cultural heritage.
4. Mamedova, S. I. (2023). This study focuses on the application of artificial intelligence in libraries, the dimensions of human brain and intelligence, the scope and historical development of artificial intelligence, and the content of artificial intelligence applications used in libraries. It also analyses the current state of artificial intelligence applications in the world, their use in libraries, and the study of library applications in this field.
5. Wheatley, A.; Hervieux, S. (2019). This study on academic libraries' engagement with artificial intelligence (AI) found a lack of awareness and response to the AI trend. Top research universities in the US and Canada were examined, aiming to identify those leading the charge. Critics argue that libraries have failed to digitize, raising the capitalistic aims of the information industry. The study examines how librarians and librarianship are reacting to the increase in AI-related research and technology. Associations like the International Federation of Library Associations, American Library Association, and Canadian Federation of Library Associations acknowledge AI's role in the future of librarianship.
6. Asemi, A., & Asemi, A. (2018). This article examines how artificial intelligence (AI) is being used in Iranian library systems, with a focus on management, technical, and public services. To find the best AI methods, it employs exploratory factor analysis. The most advanced

AI systems are recommender systems (RM), whereas the least advanced are natural language processing (NLP). Additionally, AI can be applied to robot librarians, machine translation, and speech recognition. For knowledge-based services like technical services, collection development, subject indexing, reference services, database searching, document delivery, and descriptive cataloguing, library systems leverage artificial intelligence (AI) technologies.

Objectives:

1. To Understand the AI role in Libraries.
2. To Enhance User Experience.
3. To Streamline Library Operations
4. To Address Ethical and Social Implications
5. To Evaluate Long-term Impact

1. Redefining Access to Information

AI technologies are transforming library patrons' access to information. Artificial intelligence-driven semantic search, which comprehends user intent and context, is replacing conventional keyword-based search systems. This implies that even if users ask questions in natural language, AI systems will still return precise and pertinent replies. Real-time help is provided by chatbots and virtual assistants that employ natural language processing (NLP) to answer complicated questions and make resource search simple. These developments improve library accessibility, particularly for individuals with disabilities or those unfamiliar with traditional cataloguing systems.

2. AI-Powered Personalization

The hallmark of contemporary library services is personalization. In order to provide personalized book, article, and other resource recommendations, AI systems examine user behaviour, preferences, and search history. For example, user studying climate change, for instance, would be recommended books, journal articles, and multimedia materials that are relevant to their particular areas of interest, such renewable energy or the ramifications for policy. Libraries are essential for both academic and personal development because of this strategy, which also increases user happiness and encourages deeper connection with library collections.

3. Streamlined Cataloguing and Metadata Creation

AI is revolutionizing the manual cataloguing and metadata creation process. Texts, photos, and multimedia can all be analysed by machine learning algorithms to produce precise metadata that guarantees reliable and effective resource organization. For instance, even for complicated or abstract subjects, AI is able to categorize books and resources according to themes, genres, or keywords. Additionally, by helping to update and standardize legacy information, these technologies enhance the discoverability of resources in both digital and physical collections. Additionally, AI-powered tools can spot duplicate or incorrectly labelled entries, making library catalogue maintenance easier.

4. Digital Preservation and Content Enrichment

Libraries are essential to the preservation of cultural heritage, and artificial intelligence is enhancing these initiatives. Fragile texts, pictures, and artworks can be enhanced and digitized thanks to sophisticated image recognition and restoration algorithms. Artificial intelligence (AI) techniques can fix broken language, bring back the colour of faded photos, and even reconstruct portions of old documents that have been lost. AI tools can also analyse, translate, and transcribe historical records, increasing their accessibility for the general public and scholars. These features increase access to rare resources while assisting libraries in protecting their holdings for future generations.

5. Enhanced Research Support

AI is changing the way that research support services are provided. AI-powered tools are being integrated into libraries to assist academics in finding pertinent literature, analysing patterns, and visualizing data. Libraries can foresee and satisfy changing research demands thanks to AI systems' ability to analyse massive databases and find new subjects. It would be challenging for academics to find patterns and insights by hand, but tools like sentiment analysis, topic modelling, and data visualization platforms let them do so. This enhances the Caliber and reach of scholarly papers in addition to expediting the research process.

6. Automation of Routine Tasks

AI automates common administrative duties, such as tracking past-due returns and organizing book loans, freeing up library employees to concentrate on more specialized workloads. In order to ensure effective use of collections, automated inventory management systems

continuously check the availability of resources. AI can automatically reorganize popular books or notify workers about resources that aren't being used, for instance. When AI is implemented into self-service kiosks, checkout and return processes are streamlined, cutting down on consumer wait times.

7. Supporting Lifelong Learning

Libraries are being reimagined into centres for lifelong learning by AI-powered technologies. Virtual tutors, adaptive learning platforms, and AI-powered course recommendations are examples of interactive tools that give users the chance to learn new things and advance their skills. In order to provide specialized educational materials and content, libraries can also include AI with e-learning systems. A user who is interested in learning a new language, for instance, might be given suggestions for practice materials, e-books, and language classes. With these services, libraries are positioned as essential collaborators for both professional and personal growth.

8. Addressing Challenges and Ethical Considerations

Although AI has a lot of potential in libraries, there are drawbacks:

• Data Privacy: Strict privacy regulations are required because AI systems depend on user data to deliver individualized services. To make users feel safe, libraries must provide strong data encryption and anonymization procedures.

• Fairness and Bias: Libraries need to make sure AI technologies are made to reduce biases and encourage fair access to knowledge. This necessitates constant assessment of algorithms and their results.

• Staff Training: As AI tools become more widely used, library staff members require training to use and operate these tools efficiently. Programs for ongoing professional development are crucial for closing the knowledge gap.

9. Future Directions

Libraries' future depends on their capacity to use AI while adhering to their core purpose of providing equal access to knowledge. The following are some possible paths:

• AI- Driven Community Services: Libraries might employ AI to assess community needs and create focused initiatives, including literacy campaigns or workshops on cutting-edge technologies. The integration of artificial intelligence (AI) and augmented reality (AR) has the potential to produce immersive educational experiences, including interactive

storytelling sessions or virtual tours of historical events.
• Collaborative AI Platforms: Libraries and other organizations could collaborate to create common AI tools that promote resource sharing and innovation. To improve efficiency, for example, centralized AI solutions for collaborative cataloguing or interlibrary loan administration might be developed.

Advantages

1. Enhanced User Experience
   AI-driven technologies, such recommendation engines and chatbots, offer individualized and user-friendly services.
   Information retrieval is enhanced by sophisticated search features that use natural language processing (NLP).
   Increased Efficiency
   Staff workload is decreased by automating repetitive processes including cataloguing, indexing, and circulation.
   AI simplifies processes, enabling libraries to efficiently handle enormous collections.
2. Improved Access to Information
   AI helps people with impairments by providing them with assistive technologies, language translation, and text-to-speech.
   It makes virtual help available around-the-clock, guaranteeing that consumers can access resources at any time.
3. Data-Driven Decision Making
   AI examines usage trends to assist libraries with service planning and resource optimization.
   Strategic planning can be improved by using predictive analytics to identify future trends and demands.
4. Support for Research and Learning
   Researchers and academics can benefit from the insights that AI tools can pull from massive databases.
   Recommendation systems make learning more focused by recommending pertinent resources.
5. Cost Savings
   Automating procedures optimizes resource use and lowers administrative expenses.
6. Integration with Emerging Technologies
   AI promotes library innovation by integrating easily with cloud, augmented reality, and IoT devices.

Disadvantages

1. High Initial Costs
   Implementing AI systems involves significant upfront investment in technology and infrastructure.
2. Skill Gaps Among Staff
   Library professionals may need extensive training to use and manage AI tools effectively.
   Resistance to change from staff accustomed to traditional systems can slow adoption.
3. Ethical Concerns
   AI tools may inadvertently introduce bias or discrimination in service delivery.
   Issues of data privacy and security arise with the use of personal and usage data for AI training.
4. Dependence on Technology
   Over-reliance on AI could lead to reduced human interaction, potentially alienating some users.
   System failures or malfunctions can disrupt services, especially for critical operations.
5. Digital Divide
   Not all users may have the skills or access needed to interact with AI-driven systems, widening inequality.
   Small libraries with limited resources might struggle to adopt and sustain AI technologies.
6. Quality Control Challenges
   AI tools might provide inaccurate or irrelevant information, requiring human oversight.
   Maintaining the accuracy and relevance of AI algorithms can be complex.
7. Long-term Sustainability
   Rapid advancements in AI technology can render current systems obsolete, requiring constant upgrades.
   Balancing innovation with traditional library values and roles could be challenging.

Examples of AI Tools using in Library

1. Virtual Assistants and Chatbots

The National Library Board of Singapore utilizes AI-powered chatbots, such as Spring Share's Library Answers and Emma the Chatbot, to provide 24/7 library assistance.

2. Recommendation Systems

Ex Libris Alma utilizes machine learning to optimize library management systems and recommend resources, while Biblio Commons offers personalized reading recommendations for enhanced user experience.

3. Smart Cataloguing and Indexing

OCLC World Cat Metadata Services and Marc Edit utilize AI for faster and more accurate metadata generation and MARC record improvement in library collections.

4. Advanced Search and Discovery

EBSCO Discovery Service utilizes AI to refine search queries, while Yewno Discover is an AI-powered tool that maps concept relationships, enabling users to explore related topics.

5. Assistive Technologies

Sensus Access converts documents into accessible formats for users with disabilities, while Google AI for OCR digitizes and makes archival documents searchable.

6. Automation and Workflow Optimization

Innovative Sierra integrates AI for workflow optimization, automating book lending and return processes, while RFID-enabled systems are used in libraries for inventory management and self-service checkouts.

7. Data Analysis and Insights

Clarivate Analytics and Altmetric Explorer are AI tools used for research impact analysis and trend identification in academic libraries**.**

8. Digital Archiving and Preservation

Preservation is an AI-based digital preservation tool for managing and safeguarding digital collections, while Rosetta by Ex Libris handles complex digital archiving tasks.

9. Language Translation and NLP Tools

Google Translate API aids libraries in multilingual support, while Natural Reader converts text documents into speech for accessibility.

10. Plagiarism and Copyright Tools

Turnitin is a widely used tool in academic libraries to detect plagiarism, while the Copyright Clearance Centre (CCC) uses AI for proper licensing and rights management of library materials.

The examples showcase how AI tools improve library services, efficiency, and accessibility for diverse user groups.

Conclusion

As AI continues to evolve, its integration into libraries will redefine how knowledge is curated, accessed, and utilized. By embracing AI tools, libraries can remain indispensable in an increasingly digital world, empowering communities and advancing lifelong learning. The future of libraries is not just about adapting to change but leading it—transforming challenges into opportunities for growth and innovation. By addressing ethical considerations and prioritizing inclusivity, libraries can harness AI to unlock their full potential as dynamic, future-ready institutions.

References

1. Mukherjee, S., & Patra, S. (2024). Artificial Intelligence Tools and the Future of Librarians.
2. Obande, B. O., Adegoriola, A. S., & Ado, M. B. (2024). Artificial Intelligence (Ai) Research Tools to Enhance the Productivity of Academic Librarians in Higher Educational Institutions: An Overview. Omanarp International Journal of Library & Information Science, 1(1), 84-95.
3. Sonawane, A. (2024). The Role of Artificial Intelligence in Streamlining University Library Operations. *Library Progress International*, *44*(1), 51-66.
4. Teel, Z. (2024). Artificial Intelligence's Role in Digitally Preserving Historic Archives. *Preservation, Digital Technology & Culture*, *53*(1), 29-33.
5. Mamedova, S. I. (2023). Artificial intelligence applications in libraries in the context of digital transformation of society.
6. Saeidnia, H. R. (2023). Ethical artificial intelligence (AI): confronting bias and discrimination in the library and information industry. *Library Hi Tech News*.
7. Bairagi, M., & Lihitkar, S. (2020). Empowering Libraries: AI-Driven Tools and Techniques for Digital Transformation and Sustainable Innovation.

In *One Day, National Conference on 'Preserving Indian Knowledge System and Envisioning the role of Libraries in NEP* (pp. 388-396).

8. Vijayakumar, S., & Sheshadri, K. N. (2019). Applications of artificial intelligence in academic libraries. *International Journal of Computer Sciences and Engineering*, *7*(16), 136-140.
9. Wheatley, A., & Hervieux, S. (2019). Artificial intelligence in academic libraries: An environmental scan. *Information Services & Use*, *39*(4), 347-356.
10. Asemi, A., & Asemi, A. (2018). Artificial Intelligence (AI) application in Library Systems in Iran: A taxonomy study. *Library Philosophy and Practice*, *2*(2).

Evaluation of Artificial Intelligence (AI) Tools for Literature Reviews: SciSpace, LitMaps, Connected Papers and Research Rabbit

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Abstract
Artificial intelligence (AI) has emerged to relieve humans of repetitive tasks that require specialized human skills. Academic work has undergone significant change since the introduction of artificial intelligence. AI-powered tools such as SciSpace, LitMaps, Connected Papers, ResearchRabbit and others are transforming the academic research landscape. These tools make literature reviews more efficient because they can automatically retrieve relevant papers, provide simplified abstracts and illustrate the complicated relationships among research articles.Despite the many advantages of these tools, their use must be critically considered. To fully utilize AI in research human expertise and machine learning must be combined in a collaborative way.Researchers should use these tools as valuable aids but not as a substitute for careful critical thinking and human judgment.

Keywords
AI-Tools, SciSpace, LitMaps, Research Rabbit, Connected Papers, Literature Reviews

Introduction

The idea of automating literature reviews is older than the current spring of generative AI (Jonnalagadda, Goyal, and Huffman 2015). Comparatively, the introduction of AI tools for automating the entire process is an exciting development in the field of literature reviews which is expected to continue to grow in the years to come. This increased level of interest indicates that the time is right to investigate AI approaches proposed as solutions to various tasks related to review of literature (Zala et al. 2024). A major obstacle for researchers trying to stay current in the rapidly changing world of academia is the constant stream of new research papers.Earlier locating

literature and reading all the research articles used to be a laborious and time consuming tedious activity.

AI technologies effectively address this issue from multiple perspectives making them valuable partners in this endeavour.The integration of artificial intelligence (AI) tools into research practices has transformed the landscape of academic research, revolutionising how scholars access, analyse, and convey information. In addition to saving researchers valuable time by reading and thoroughly summarizing complex research papers AI tools are also excellent at managing literature references which further streamlines the research process. It enables researchers to assess whether the articles are relevant and decide whether to read them thoroughly. The field of scientific research is developing at an accelerated rate, hence the need for AI tools that can help augment research, both qualitatively and quantitatively, is more pronounced than ever. Researchers should however approach AI-generated summaries critically and confirm their accuracy by contrasting them with the source material. With this combination of abilities researchers can effectively and efficiently navigate the vast world of academic literature allowing them to stay at the forefront of their respective fields (TSE 2024).

This article evaluates four popular AI tools which are used by researchers for review of literature namely SciSpace, LitMaps, Connected Papers and ResearchRabbit.

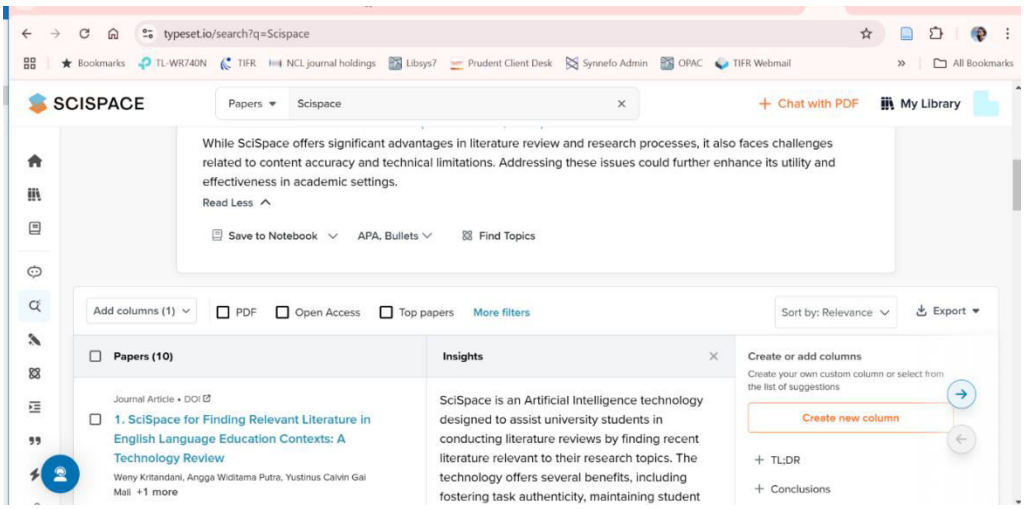
SciSpace

One such online tool is SciSpace that is revolutionising the research process. Analytical reading is necessary when one tries to understand and comprehend complicated terms, equations, tables and diagrams. Even experienced researchers find it challenging to read and interpret complex terms while reading through the research literature. SciSpace is one of the most fascinating developments of the AI era with the goal of making reading research articles easier.

SciSpace is an AI-powered research assistant that expedites the literature review process by decoding simplifying and explaining research papers. It goes beyond traditional research instruments by offering real-time explanations, simplifying technical jargon and promoting interactive interaction with the topic being studied. It provides research paper publishing, formatting, teamwork and quick responses based on AI-influenced insights. Typeset developed this innovative research assistant. Its aim is to simplify the research process by providing a number of innovative

features in light of complex scientific literature currently available. It utilizes AI algorithms potential to transform how scholars interact with scientific publications. It helps users to filter and narrow results by year, publication type or PDF (Jain, Sibbu, and Kuri 2023).

Even though SciSpace Copilot provides AI powered extensive literature search, it is important to know that there are inherent limitations to its competencies. Users need to be aware that the chatbot's capabilities might not cover all the nuanced details that individuals may be looking for while conducting research queries. The limitation emphasises the need for users to balance their understanding of the tool's abilities and use it along with other methods of research to obtain results. In addition to this, the papers linked via DOI links still request proper journal subscription or other means of authorisation for access, even if they provide PDF download options that are similar to Elicit. This restricts access for users who do not have permission to view certain documents. Here, without the necessary subscription to the journal, would-be researchers will not find themselves able to read certain papers, limiting their research experience.

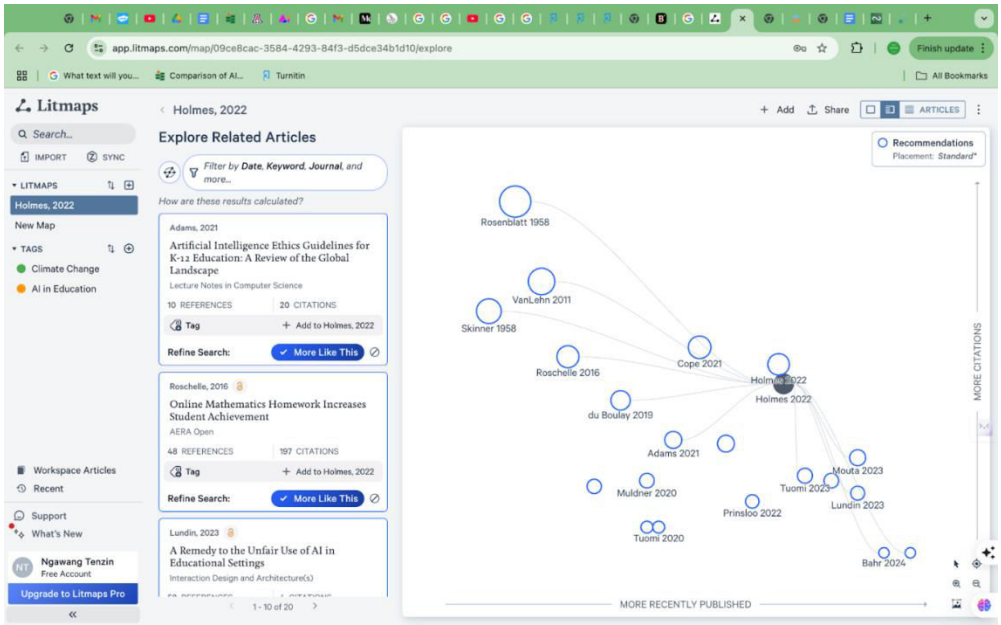


LitMaps

LitMaps is another wonderful AI tool for research assistance as it has a 2D citation-recency. layout of papers. The usability and clarity are much better than other tools. It does not overwhelm you with 1000s of related papers, and it has great extra features like monitoring the field and conducting research. However, it is a paid version. LitMaps has three main functions: Seed Maps, Discover and Visualize. **Seed Maps**is a visual map

that shows you the relevant research paper. A “seed” is any article, either one you’ve searched through DOI or keywords, or one you’ve uploaded into LitMaps or one you’ve saved previously. **Discover**feature will give you a very fast way to do an exhaustive literature search. The LitMap will search and find the 5 most relevant articles. It can further go deeper by finding papers that cite your papers. We can then select the most relevant papers with additional input and then run the whole thing again to search for more relevant papers. **Visualise** features is one of the best features of all the literature review AI tools, which generates a great visual to understand better how these papers are related to each other. You can even move the maps around as you wish to understand better and see how different lines of research have progressed and how they are related to each other.

The limitation is that many good features, like monitoring, are available with LitMaps Pro with advanced search facilities. The drawback is that without the advanced search option, researchers may not go deep diving to finish out really good research articles which will limit the literature review.



Connected Papers

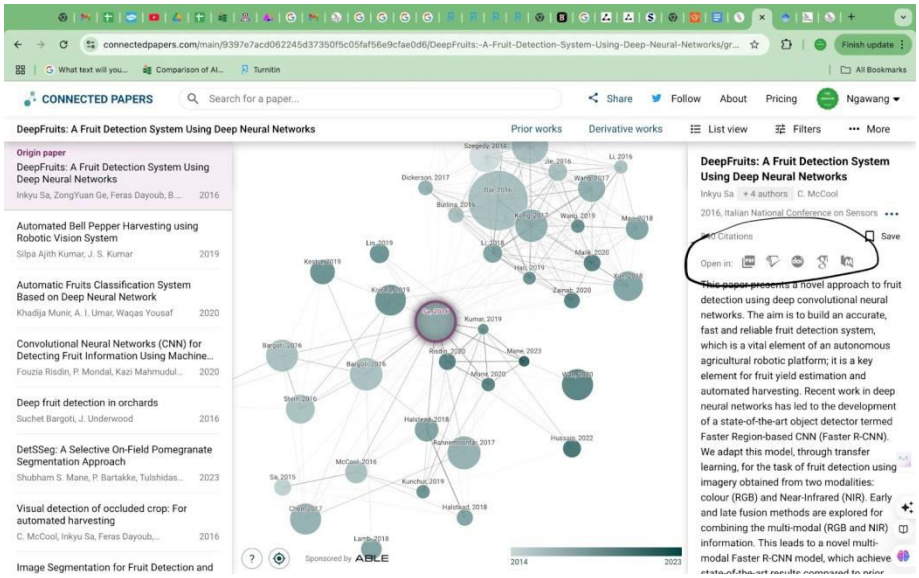
Connected Papers is another novel literature mapping tool that allows researchers to quickly find and explore papers relevant to their field of work, generating them as a graph to easily navigate through. Connected papers is comparatively new AI tool for review of literature as compared to other AI research review tools. Here, researchers will be able to visualise

related papers by means of co-citation and bibliographic coupling. It is especially helpful for literature reviews and tracking down papers applicable in their area. The format is easy to use and very simple.Connected papers build upon the Semantic Scholar database of hundreds of millions of papers. This means that even not directly citing those papers that are strongly connected and close in distance from each other are also included.

Connected papers begin with a single seed paper and then build the visual graphics. The connected paper has a better user interface, and it is much easier to use. It can toggle between the default graph view and a list view, where you can sort the results by year, citations, references, or similarity to the source paper.It means with connected papers you can identify relevant past papers and derivative papers of a specific research paper. The first paper is considered seminal or foundational works that led to the present paper, the second derivative papers that were based on the original work. This allows the researchers to save their time and get a better view of the research topic and have deeper insights about its background and factors leading to the current study.

Connected papers integrate with Semantic Scholar, Google Scholar, and other tools. Researchers can quickly move for more detailed searches or to find the text in papers.This seamless integration enhances the literature search process, making it easier to find and explore papers relevant to the research.Another interesting feature is the ability to save your search results. By logging into Connected Papers with your Gmail or creating an account, you can save graphs of interesting papers for future reference.

One of the best features of connected paper is that if you keep the cursor on any bubble showing in the visual graph, the abstract of that paper will appear immediately on the right side of the interface. It also has the option of opening the specific articles in different formats, like DOI, semantic scholar, PDF, and Google Scholar, which is highlighted below.



Research Rabbit:

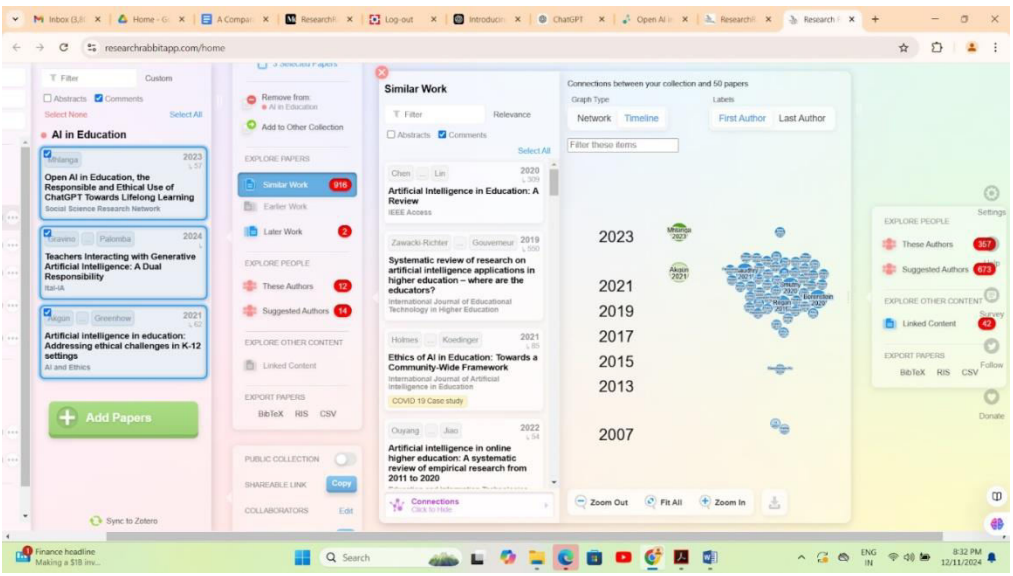
ResearchRabbit is a free online "citation-based literature mapping tool." This tool is very beneficial for researchers while preparing to plan an essay, minor project, or literature review and to maximize time spent on searching references. It allows users to find applicable papers and resources with the aid of beginning with seed papers. The primary aim of ResearchRabbit is to optimize research efforts, eliminating the need to exchange between various databases and search modes and averting the rabbit hole of citation mining.

ResearchRabbit is designed to streamline the research procedure, allowing users to effectively transition between papers. A key function is the ability to quickly discover and get access to all the citations related to a specific paper. With a single click on, researchers can instantly generate a list of applicable papers, each starting in a separate column for smooth navigation. Additionally, the platform permits users to delve deeper into a newly observed paper via producing a column of references, facilitating similar exploration and evaluation.

ResearchRabbit is built to facilitate and optimize such workflows as you tumble down this rabbit hole. Hence it is aptly called ResearchRabbit. ResearchRabbit is just one of many literature mapping tools available online, some of them requiring an account and some not. ResearchRabbit is free to use completely.It is also among the first few tools that support cohomology graphs, which provide another dimension for the researcher to

navigate the forest of literature and track publications made by authors, unlike many of its peers.

Additionally, by enabling the public collection feature, which enables users to collaborate on collections, ResearchRabbit promotes user collaboration. With the help of this tool, users can send shared links or email invitations to colleagues or collaborators, giving them access to edit and add to their collections. Along with its other features, ResearchRabbit makes it easy for users to access and store research materials by enabling them to download papers in PDF format.



The ResearchRabbit interface is a bit overwhelming as it is not like the Litmaps or Connected Papers. As we go from one study to another, it is bit challenging to keep up with the numerous visual graphs. The fact that Research Rabbit's data source is the semantic scholar is one of its main drawbacks; as a result, there may be a gap in the literature finding (Tay 2021).

A Comparison Chart for SciSpace, Litmaps, Connected Papers & ResearchRabbit(Weng 2024)

A Comparison Chart for SciSpace, Litmaps, Connected Papers & ResearchRabbit(Weng 2024)

AI Tools	Source	Technique	Features	AI-text Generation	Full - text analysis	Zotero Integra -tion	Cost
SciSpace	HPC data centres distributed geographic-ally	Similarity &Citation Chain	• AI-Chat • Literature review tool • Citation generator • AI Paraphraser • AI generated content detection	Yes	Yes	Yes	Free + Paid
Litmaps	Semantic Scholar, Crossref, and OpenAlex	Similarity & Citation Chain	• Monitoring • Sharing of Maps • Semantic search • Co-Authorship search	No	No	Yes	Free + Paid
Connected Papers	Semantic Scholar database	Similarity & Citation Chain	• Rapid Citation Analysis • Advanced Similarity Metrics • Flexible View Options • Customizable Sorting • Open Access Filtering • Prior Work Identification • Collaborative Potential	No	No	No	Free + Paid
Research Rabbit	Semantic Scholar	Similarity & Citation Chain	• Visual Citation Network • Simplified Search Customization • Reference Management tool Integration	No	No	Yes	Free

Discussion

There are primarily two kinds of literature search tools: those that are based on citations and those that apply semantics. Citation based tools are those which indicate that a paper that is not in your collection is referenced in all of the papers in your collection while Semantics based tools find papers using a plain text query tools (Shabanov 2024). Citation-based tools are considered better and trustworthy, because of their dependence on human knowledge i.e. the human-generated references and citations between papers.Most AI tools search a variety of open scholarly literature indexes such as Semantic Scholar,

CrossRef, OpenAlex, Dimensions and others. The responses and summaries from AI tools vary based on the access details. Full open access articles and citation/abstract metadata still miss a great deal of academic research that is found in full-text paywalled articles. Although most of the AI tools don't usually fabricate citations they might cite an actual source in a way that distorts its meaning. Additionally, it was discovered that these tools are not appropriate for performing systematic review searches which necessitate clear, transparent and reproducible search strategies (Castello 2024). Even though artificial intelligence (AI) tools have many benefits there are questions regarding the dependability and correctness of the data they produce. There have been reported problems like the creation of false references and content in some cases, requiring human verification and supervision. Given the apparent falsified and inaccurate information it is crucial that AI tools used to produce research literature undergo thorough evaluation and validation especially when it comes to topics with limited resources (Zybaczynska et al. 2024).Important techniques for critically assessing such information include developing media literacy, challenging sources, cross-referencing information and comprehending the technology underlying AI-generated content (Septiawan 2024).

Conclusion

AI-based research tools like SciSpace, LitMaps, ResearchRabbit, and Connected Papers help streamline the early stages of research by assisting with problem identification, literature reviews, and hypothesis generation. As a result, finding sources has become simple and researchers can save time. Each tool offers unique features, benefits, and limitations, making it essential for researchers to select tools that suit their specific needs. While these tools improve research efficiency, their reliability and relevance can vary. It has been observed that these tools have a tendency to give incorrect citations. Even though these tools are evolving and becoming more efficient.

Despite their potential, these AI tools are prone to biases stemming from training data, algorithms, and user interactions. Transparency in algorithm design and active efforts to mitigate biases are crucial for responsible use. Although AI tools can speed up processes like literature discovery, they cannot fully replace the nuanced analysis of human researchers. Challenges remain in aligning papers accurately with research goals and ensuring high-quality references. On the other hand, except for Research Rabbit, the rest of the other AI tools are paid tools, which restrict the researchers from using these tools. Alternatively, AI research tools offer significant time-saving

benefits and enhance the research process, particularly in the initial stages. However, human oversight is necessary to address biases and ensure fairness and quality. The future lies in a collaborative approach where AI tools and human intellect work together to optimise research outcomes.

References

1. Castello, Olivia Given. 2024. “Research Guides: AI Tools for Research: Searching Literature.” Retrieved December 18, 2024 (https://guides.temple.edu/ai-research-tools/searching).
2. Jain, Sanmati Jinendran, Kush Sibbu, and Ramesh Kuri. 2023. “Conducting Effective Research Using SciSpace: A Practical Approach.”
3. Jonnalagadda, Siddhartha R., Pawan Goyal, and Mark D. Huffman. 2015. “Automating Data Extraction in Systematic Reviews: A Systematic Review.” *Systematic Reviews* 4(1):78. doi: 10.1186/s13643-015-0066-7.
4. Septiawan, Riski. 2024. “Critical Analysis of AI-Produced Media: A Study of the Implications of Deepfake Technology.” *Devotion : Journal of Research and Community Service* 5(7):735–41. doi: 10.59188/devotion.v5i7.747.
5. Shabanov, Ilya. 2024. “Litmaps vs ResearchRabbit vs Connected Papers - The Best Literature Review Tool in 2025.” *The Effortless Academic*. Retrieved December 17, 2024 (https://effortlessacademic.com/litmaps-vs-researchrabbit-vs-connected-papers-the-best-literature-review-tool-in-2025/).
6. Tay, Aaron. 2021. “ResearchRabbit Is out of Beta- My Review of This New Literature Mapping Tool.” Retrieved December 16, 2024 (https://medium.com/a-academic-librarians-thoughts-on-open-access/researchrabbit-is-out-of-beta-my-review-of-this-new-literature-mapping-tool-3c593d061c63).
7. TSE, Yan Lui. 2024. “Evaluation of aI-Based Research Assistance Tools a Case Study Research.Pdf.”
8. Weng, Lu. 2024. “Guides: AI Research Tools for Literature Reviews: Introduction.” Retrieved December 16, 2024 (https://libguides.eduhk.hk/c.php?g=966618&p=7025801).

9. Zala, Kirtirajsinh, Biswaranjan Acharya, Madhav Mashru, Damodharan Palaniappan, Vassilis C. Gerogiannis, Andreas Kanavos, and Ioannis Karamitsos. 2024. “Transformative Automation: AI in Scientific Literature Reviews.” *International Journal of Advanced Computer*

Artificial Intelligence-Powered Personalized Learning in E-Learning Environment

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Abstract
Artificial Intelligence has emerged as one of the most potent forces that have reshaped e-learning. This paper examines how AI-driven personalized learning is utilized in the context of e-learning. Personalized learning, with learning tailored to the needs, tastes, and styles of learners, is a promising approach to advance educational outcomes, as well as AI brings to the table unprecedented like vast data analysis capabilities, content adaptation, and the development of Intelligent Tutoring System. After searching online information at Google, opera, and other search engines, this paper discusses learner data analysis, delivery of adaptive content, ITS, and intelligent tutoring and, also analyzes the present status of AI-powered personalized learning, its potential benefits, and challenges to derive valuable insights for educators, researchers, and policymakers. Since technology is rapidly changing the face of education like AI, so there is a need to discuss the strategies designed to facilitate the implementation of personalized learning in an e-learning environment that will successfully enhance educational outcomes for learners everywhere.

Keywords
Adaptive Learning, E-Learning System, Education, Artificial Intelligence, AI, Intelligent Tutoring System, ITS

Introduction

The deployment of artificial intelligence (AI) in e-learning systems has opened new vistas of individualized learning. Such AI-based systems can personalize learning according to the needs, preferences, and styles of learning of different individuals. The role of AI in achieving personalization, and the potential benefits and challenges of AI-powered personalized learning in e-learning. Customized learning is a pedagogical approach that

delivers to each learner a unique learning experience considering his or her needs, interests, and abilities. Such changes include changing the instructional strategies, content, and pace according to the specific needs of every learner. Personalized learning is, in most instances, characterized by some key elements such as learner-centered, adaptive, flexible, and collaborative.

E-Learning

It is straightforward; it means electronic learning, to put it in the most simplistic layman's terms, educational content stored or recorded in an electronic or digital mode is transmitted through satellite or airwaves or cable or internet and reaches the students through various devices like TV, radio, mobile phone computer tablets movies screen and few others. E-learning can be more academic, sports, music movies paintings, or anything else it's all about information that can educate us. The cost of e-learning is less compared to traditional classes of rooms; teaching content creators can afford to charge lower fees because content created once can reach any country or city to any student for years. And in e-learning, students can watch any content at any given time anywhere 24x7 and 365 days, and they can pause it and play anytime according to their understanding of that particular topic. E-learning will bring a level playing field for all students, and it offers the right to quality and equal education, lowering the cost of e-learning.

Artificial Intelligence in Education

AI in an educational scenario sounds promising for the future: one that offers a learning experience tailored to individual needs and enhances teaching methodology. With the help of AI tools, one can process humongous data about the students, their learning styles, strengths, and weaknesses, and the processes allow educators to tailor instructions for more targeted feedback and support. AI-driven Intelligent Tutoring System (ITS) simulates a human tutor and offers real-time guidance and practice exercises. Technologies of virtual and augmented reality (VR/AR), powered by AI, bring immersive learning environments thereby making difficult and complex concepts engaging and better understandable. AI can automate very routine administrative tasks while allowing more valuable time for teachers to engage with students meaningfully. The adoption of AI in education also brings forth the anxiety of data privacy and ethics, and there's a possibility that algorithms will decide to favor or prefer certain

characteristics when making judgments. This calls for a course of action to deal with these challenges so that AI may be used responsibly and effectively towards improvements in education.

Literature Review

Sarnato, Ahmad Zain., Sari, Windy Dian., et.al. (2024), this study describes Information Communication Technology that brings changes in e-learning that allow one to learn anywhere anytime. The author examines shifting from u-learning to e-learning and further adaptation to AI learning system which offers personalized learning experiences and improves efficiency and accuracy.

First, Mehmet. (2023), The paper describes Open AI`s GPT -3 and research on the use of Artificial Intelligence in e-learning processes and integration into learning management systems with real-life examples. The author represented the practical applications by using GPT-3 plugins for Moodle with using sample Jawa Script code for using ChatGPT in Moodle.

Hirankerd, Kongkiat. & Kittisunthonphisarn, Nattapakal. (2020), In this article the author explains the practical skills of AR, VR, and MR (merges physical and virtual objects) technologies in developing an e-learning system for skill training. Various skills have been utilized in favor of safety reasons like resources, location, time, and limitations. The storage format for video has been also discussed for AI to be used in management system skills.

Hastungkara, Dardya Putra., & Triastuti, Endah. (2019),This paper explores the innovation and exploration of AI in the education system in Indonesia. The study concerns on influence of AI in the e-learning system and its integration for the advancement of the education system in India. The author studied in depth for potential and impact of Artificial Intelligence in e-learning systems and information communication technology in Indonesia.

Artificial Intelligence in E-Learning

Artificial intelligence has indeed transformed e-learning from being less interactive and based on more cursory, traditional teaching methods to experiencing personalized, adaptive, and engaging learning. AI-powered learning management platforms can analyze learner data based on individual strengths, weaknesses, and even learning styles. This information

is applied to tailor content, provide targeted feedback, and recommend relevant resources so that each learner can get the most effective instruction available. It will be the same role a tutor plays. Intelligent tutoring systems can mimic a human tutor and provide personalized guiding support. This includes identifying gaps in knowledge, explaining abstract notions, and providing practice targeted at improvement in a specific area. Moreover, AI is the biggest opportunity to engage the students with more gamification: whereas elements from games are certainly integrated into learning experiences, it makes learning more fun and motivating for the learner and long-enduring interest.Further, AI can optimize learning outcomes by giving meaningful insights into students' performance and where improvement is required. AI-based learning analytics can scrutinize student data to determine patterns and trends that help educatorsunderstand how students learn and where they may fail. Such information may be incorporated into decision-making, leading to the improvement of instructional practices.

Uses of Artificial Intelligence in E-Learning

1. **Learning Analytics**:Learning analytics refers to the measurement, collection, analysis, and reporting of data about learners and their contexts to understand and optimize learning environments. Amongst the greatest benefits that learning analytics offers is discovering ways through which students learn and what they struggle with. Data on these elements related to student performance, engagement, and behavior is analyzed by teachers to discover the areas where patterns emerge so interventions and support can be targeted.

2. **Language Translation**:Translation into languages is a critical aspect that opens up much of the reach of e-learning content to learners around the world. This enables access by individuals to break barriers and pursue quality education content while joining global learning communities. With the latest improvements in machine translation technology, it has become easier and less expensive to translate large volumes of text, and thus e-learning reaches more people in the world. Still, machine translation is not always perfect. Sometimes human translation is needed to translate specialized or culturally relevant material.

3. **Speech Recognition and Natural Language Processing**: In fact, Natural Language Programming (NLP) has greatly improved the accessibility of e-learning and enhanced its effectiveness. Speech recognition allows learners to type with speech; it enables learners to access an e-learning portal using voice commands, which is easier for those individuals who suffer from a disability or for those who simply like the experience not to be hand-based. For example, they can navigate course materials using voice commands, ask questions, and receive verbal feedback. NLP, however, enables an e-learning platform to also realize understanding and response to the natural language input. Learners can now have far more natural, conversational interactions with the platform a question in plain language, and get the appropriate explanation or answers accordingly. It is also possible with NLP to analyze learner responses, identify possible misconceptions, and provide targeted feedback. Speech recognition coupled with NLP advances the process of e-learning towards becoming a reality. These technologies aid the learners by enriching interactive involvement between learners and the platform through natural communication.

4. **Adaptive Learning**:Adaptive Learning is a learning practice that uses the computer as an interactive instructional tool. Adaptation involves presenting educational content toward better learning based on responses, questions, and tasks experienced by a learner. The root of this technology draws resources from several disciplines including computer science, education, psychology, and brain science. Adaptive learning is a part of the much broader domains of personalized learning and incorporates several elements, including an expert model, a student model, an instructional model, and an instructional environment.

5. **Content Creation**:Content Creation saves both time and costs by automating content creation processes and providing value as a reference library, structuring the content by supplying relevant materials. The ability to personalize the tone and level of the content to each learner increases ROI because the material is interesting and effective. Furthermore, AI's power to analyze previous learner performance and scores allows for the development of highly targeted and accurate learner personas. This further increases the

ROI and saves costs, for instance, in Jasper, Caption AI, Lovo AI, Courseau, Learning Studio AI, and Minicourse generator. Additionally, with ineffective upgrades, the content will never go out of date, thus supporting total cost savings and effective learning.

Transformation of E-Learning through Artificial Intelligence

1. **Computer-Assisted Instruction (CAI):** One of the earliest instructional computer systems was developed in the 1960s by IBM utilizing a minicomputer. It is an interactive instructional technique where a computer is used to both present the instructional material and monitor the learning that takes place. It is defined as teaching concepts or skills through the use of computers and software applications, whereby the combination of text, graphics, sound, and video are used to enhance the learning process.CAI is a technique of self-learning typically online/offline, in which the student interacts with programmed instructional material.

2. **Intelligent Agent:** An intelligent agent is the thing that decides; thus, it enables artificial intelligence to be put into action. It can also be said as a software entity that performs activities at the place of users or programs after sensing the environment. It uses actuators to initiate action in that environment. For example, AI assistants such as Alexa, and Siri, use sensors to perceive a request from the user and collect data from the internet automatically without any assistance from the user. They can be also used to inform their perceived environment, whether or when something is available.

3. **Intelligent Tutoring System:** Intelligent Tutoring System or learning analytical tools provide personalized support to learners making the educational process more efficient and effective in one section. These systems provide personalized instructions and feedback adapting to unique learning needs and they use algorithms to monitor your progress and provide tailored support helping you understand complex concepts at your pace. It also provides real-time feedback and support, identifying areas where students struggle and offering targeted assistance.

4. **Gamification**- Gamification is the process of adopting elements of games (levels, points, challenges, etc. to non-game situations in life. Gamification mainly aims at making our obligatory, routine, or formal

activities easier or more entertaining. Gamification and e-learning satisfy many basic human needs such as ego gratification pride of mastery and many other emotional rewards. E-Learning is more engaging and effective to use an analogy, e-learning is the foundation onto which we can bolt all the additional engagement and information retention boosting layers. Gamification already exists in the world of learning similarly gamification technique creates the difference between gamification and gamification learning in that game-based learning is presented in the form of games.

5. **Automated Assessment-**Most of the application of conversational interfaces, like chatbots and virtual assistants, is found in e-learning at present. This is because it offers learners a more intuitive and natural way to access educational content. Most of the learners tend to query when they conversationally need clarification or guidance. Therefore, conversational interfaces can make learning more interactive and engaging so that the experience of learning can be enhanced. They can also give learners instant feedback and support, keeping them on track and motivated.

6. **Cognitive Computing**- Cognitive computing is one of the subsets of AI systems, which simulate human thought processes, such as learning, reasoning, and problem-solving in e-learning. It enables the use of intelligent tutoring systems through which one can adapt to the different needs of learners for guidance. For instance, they may analyze learner data, identify knowledge gaps, and generate targeted explanations and practice exercises. Cognitive Computing can mimic human cognitive ability to enhance student learning and improve results.

Benefits of AI in E-Learning

The use of AI in e-learning has the potential to revolutionize the way we teach and learn providing a more personalized efficient and effective learning experience. Some of the following benefits are: -

1. **Personalization**- AI uses data such as learning styles performance and progress to tailor the learning experiences to the individual learners.
2. **Content Creation**- The use of AI in E-Learning allows for the development of more interactive and engaging content. For example,

one automated content creation is Open Elm`s AI which can generate e-learning content in seconds directly from text prompts or documents.

3. **Assessment and Evaluation**-AI enables the evaluation of learning by understanding the inputs and providing automated scoring feedback and guidance. One of the most promising contributions of AI in e-learning is the development of adaptive learning systems.
4. **Personalized Learning Experience**- AI tailors learning paths based on individual preferences history and goals offering a truly customized experience unlike the one-size-fits approach of traditional methods.

Possible AI Tools for E-Learning Environment

1. **Midjourney-** Midjourney is one of the most fun AI tools on the market at the moment. Midjourney is an image-creation AI engine that has been trained on millions of images in a variety of styles and uses that knowledge to create images from scratch. Midjourney works through the discord chat engine, simply add the Midjourney serverand type an/image command and a processed image will be generated and can be utilized in e-learning to create immersive environments. Midjourney has also have various versions such as Midjourney 4 and Midjourney.

MIdjourney

2. **Descript-**Descript works on Windows and Mac OS and allows you to record the screen, and create your voice for speech generation and private workspace.Descript is an amazing tool that saves time in doing voiceover, this idea will train the AI to learn a voice, and then when a voiceover task is needed you simply type those words, and a studio-quality voiceover is created. Descript is as easy as using docs and slides which transcribe and make better specific text in industry-leading and transformed the way one can create and edit their video or audio content with this software. You can change videos and podcasts just as easily as you would while writing a document. All thanks to the AI features within it, such as automated transcriptions, filler word deletion, and even voice cloning for professionals at any level of creation.

3. **D-ID-**D-ID is AI technology for video manipulation that creates real-sounding synthetic video and audio. It uses algorithms of computer vision to sort facial expressions and gestures in existing videos, then deep learning networks that generate new video and audio mimicking the original footage. The firm produces synthetic media that resembles actual life. It uses algorithms and voice cloning techniques coupled with speech synthesis to clone voices and make new audio from them. This technology has been massively applied in developing communications videos that are internal communications, marketing videos, and training material, among so many.

4. **Learning Studio AI**- Simple AI authoring for making things online course creation using Learning Studio AI. Curation of content is done in automatic form, customized pathways to learn can be built in; and always have all-around analytics to take up informed decisions for teaching, therefore faculty can spare precious time over the actual content developed without having to indulge much on tech matters with a resultant consistent look and feel, ensuring across devices for that excellent experience for learning. All of this comes as support since, now through the integration with all the current systems every good-quality educational unique piece of content, thus reaching delivery without trouble or hitches.

Conclusion

AI has transformed the whole concept of learning through e-learning in such a way that it is making the learning process much more personalized.
The

possibility of making the content, pace, and level of difficulty adaptive to the individual learner's requirement allows AI, through adaptive learning, to evoke more involvement and learning on the part of the learner. Algorithms for this purpose may be used in learning portals to customize the content for learners who will be able to absorb the material without any trouble and get themselves involved with it. Learner data analysis gives information to AI, which can be used by instructors to modify the curriculum to suit the learners and ensure support to learners who may need it. Further, this will move more toward optimal learning and teaching even better results, and increased learner satisfaction. In addition, AI-driven intelligent systems for tutoring make it even possible to quickly respond and guide as learners become more efficient. There are some issues or problems associated with data privacy and ethical considerations in algorithms that still surround AI. Yet, its potential to revolutionize e-learning is undeniable with the need for qualified instructors who must be prepared and guide learners on how to approach the construction of AI-based learning. This is important because with AI still evolving and AI technology still improving, there are prospects for even more innovative and effective personal learning that can be experienced in the future.

References

1. Sarnato, A. Z., Sari, W. D., Rahmawati S. T., Hidayat, R. & Patry, H. (2024). Theevolution of e-learning platforms: from u-learning to ai-driven adaptive learning systems. Journal of Social Science Utilizing Technology, 2(2), 289–300.Retrieved from https://doi.org/10.70177/jssut.v2i2.1131.
2. Mehmet. F. (2023). Integrating AI applications into learning management systems to enhance e-learning.Instructional Technology and Lifelong Learning, 4(1), 1-14. Retrieved from https://dergipark.org.tr/tr/pub/itall.
3. Sinha, M., Fukey, L. N., & Sinha, A. (2021). AI in e-learning. E-learning Methodologies. Fundamentals, technologies and applications, 107-131. Retrieved from https://www.academia.edu/download/76353229/AI_in_E_learning_E_learning_Methodologies_Fundamentals_technologies_and_applications.pdf.
4. Orozov, B. I., & Orozov, D. A. (2021) An AI application in E-Learning. Education and Research in the Information Society, 76-80.Retrieved fromhttps://ceur-ws.org/Vol-3061/ERIS_2021-art08(sh).pdf.

5. Hirankerd, K., &Nattapakal, K. (2020).E-Learning Management System Based on Reality Technology with AI. International Journal of Information and Education Technology, 10(4),259-264. Retrieved from https://www.ijiet.org/show-137-1599-1.html.
6. Hastungkara, D. P.,& Triastuti, Endah. (2019). Application of E-Learning and Artificial Intelligence in Education Systems in Indonesia.ResearchGate, 10(2), 117-133. Retrieved from https://www.researchgate.net/publication/339320666
7. Potode, A.& Manjare, P. (2015). E-Learning Using Artificial Intelligence.International Journal of Computer Science and Information Technology Research, 3(1),78-82. Retrieved from https://www.academia.edu/download/37430568/E-Learning_Using_Artificial_Intelligence-1034.pdf.
8. Garrido, A., Morales, L., & Serina, I. (2012). Using AI Planning to Enhance E-Learning Processes. Proceedings of the International Conference on Automated Planning and Scheduling, 22(1), 47-55. Retrieved fromhttps://doi.org/ 10.1609/icaps.v22i1.13508.
9. Giotopoulos, K., Alexakos, C.,&Beligiannis, G. (2010). Bringing AI to e-learning: The case of a Modular, highly adaptive system. International Journal of Information and Communication Technology Education, 6(2),24-35. Retrieved from https://www.igi-global.com/article/bringing-learning-case-modularhighly/42139.
10. Upadhyay, N.& Dharaskar, R. V. (2006). Role of AI in Effective E-Learning. In Proceedings of National Conference on Cyber Security, Data Mining and ICT for Society", CCSDIS06 (paper 24). Retrieved from https://www.researchgate.net/publication/324603628

Integrating Generative Artificial Intelligence (AI) in library databases

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Abstract
The influx of Generative AI, a category of Artificial Intelligence (AI) is proving to be a turning point in the field of academics. This has changed the manner in which the academic community made use of AI. Libraries being an integral part of academic community adopted this technology in them and accepted and applied the numerous changes that followed. Apart from adding value to the library collections, AI is revolutionizing the library services that include personalized services and enhanced user interfaces. One of the key areas of Generative AI is evident in the improved applications available in the library databases some of which have been highlighted in this paper. Additionally, the paper points out at the changing role of the librarians wherein they can take the lead in creating an awareness about ethical use of AI, take initiative in framing institutional policy or suggest that AI literacy becomes a part of the academic curriculum.

Keywords
Artificial Intelligence (AI); Generative AI; Library databases; Information professionals; AI literacy

1 Introduction

Merriam Webster dictionary defines 'Intelligence' as the ability to think, learn and understand as well as the ability to apply knowledge. In similar lines to this definition, Yann LeCun, Chief AI Scientist at Facebook & Silver Professor at the Courant Institute, New York University quotes 'Our intelligence is what makes us human, and Artificial Intelligence (AI) is an extension of that quality'. In addition to being able to learn, machines with intelligence are also set up to accomplish tasks more effectively over time without explicit programming since they are designed to identify and absorb patterns more effectively than humans do.

Artificial intelligence (AI) means the creation of computer systems that can execute activities like recognizing speech, taking decisions, describing patterns and others which originally calls for human intelligence. AI is a

broad term which includes various technologies, like machine learning (ML), deep learning (DL), and natural language processing (NLP).
AI constitutes wide ranging technologies of which many applications we see and apply in our daily life – ranging from apps that recommend TV shows to chatbots that provide customer support in real time. These applications are used by most people in daily life without understanding the technology or the principle behind it. A large category of users are unaware that the various applications they use are as a result of Artificial Intelligence!

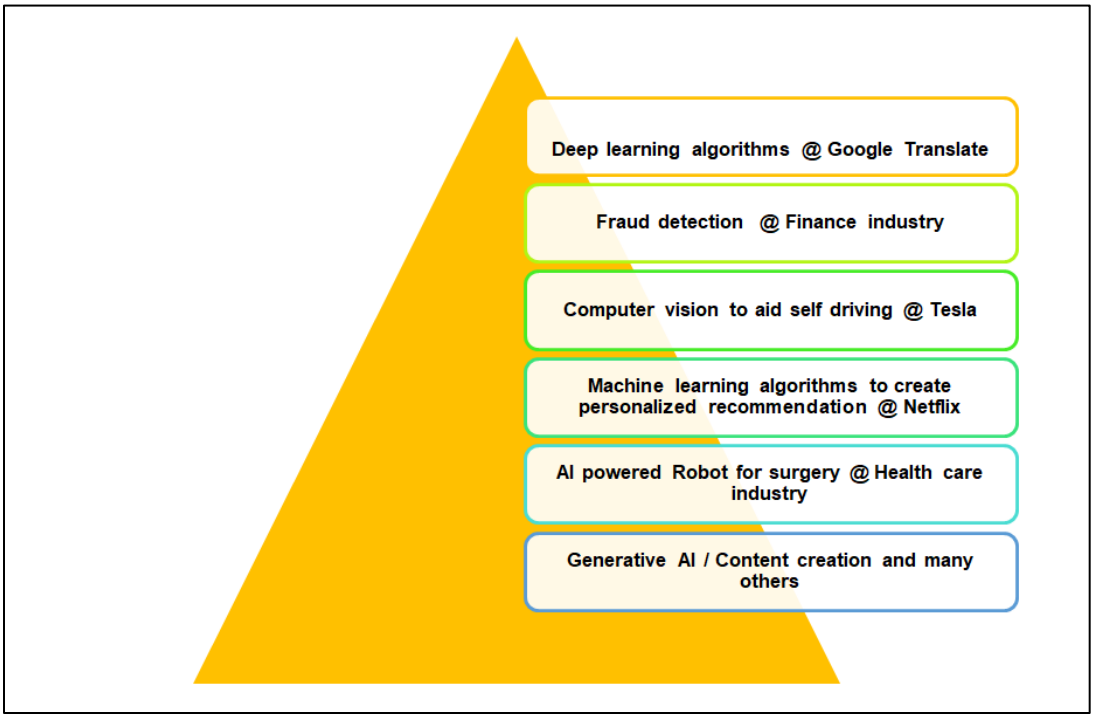

Fig. 1 Applications of Artificial Intelligence (AI)

2 AI in education and libraries

The advent of digital technology has led to the development of different applications in various fields. The same is reflected in the domain of academics which has transformed from the traditional classroom teaching to the hybrid mode and migrated to online teaching as well. Libraries also known as information centres that are an integral part of teaching and research have correspondingly adopted the digital technology. This has resulted in the shift from the traditional libraries which housed print collections to the hybrid libraries that constitutes both print and electronic collections.

2.1 Changing nature of libraries

The purpose of a library has always been that of collection, organisation, dissemination and preservation of all types of information. The library serves an entire community and facilitates the process of retrieval and dissemination of the required information. With the technological advancements, information is now widely available both in the printed and electronic formats. In this digital age, the information media has been striving to remain up to date with technology so as to meet the demands of library users. In the light of a number of digital advancements and considering the fact that a large portion of information media is stored in electronic/digital networks, the present library system uses a variety of resources to provide the services to the library users. Irrespective of the resource format and whether the requirement relates to a general request or a specific inquiry, the librarian holds the responsibility of ensuring optimal access to its users. Libraries have invested in, incorporated, and evolved through various technological revolutions, including those involving clay tablets, stones, papyrus, parchments, paper, microforms, computers, the Internet, virtual libraries, library 2.0, cloud computing, and more, in order to meet the constantly evolving needs of their patrons and maintain their relevance in this dynamic society.

3 Role of AI in library services

The most recent technological advancement is the artificial intelligence that has got enormous potential in library applications. The benefit of applying artificial intelligent systems in libraries is that they are less prone to errors in comparison to human beings and they can work continuously without getting tired thereby freeing the librarians to do other jobs.

The role of Artificial Intelligence (AI) in library services is transformative, enhancing the efficiency, accessibility, and relevance of library functions.

Library databases

Along with the emergence of technology, databases were transformed as web-based resources and they are heavily relied upon by the academic community for their teaching and research purposes. These databases are either only a collection of eJournals or a combination of eJournals, eBooks, transactions, conference papers, and others. The advantage of the Web based format of databases is that they offer different innovative searching options along with the actual content instead of providing only the record. Library databases whether they are bibliographic, full-text; or multimedia

along with content quality also provide other features like abstract information, basic/advanced keyword searching; controlled vocabulary terms; etc. Access to these databases can be limited to the institutional campus and can also be made available to the users remotely through appropriate software. With the expansion of Generative AI there is an opportunity for use of AI in library databases as well. This arises due to the increasing demand for efficiency, accuracy, and enhanced user experiences in handling and accessing vast volumes of information.
The opportunity of application of AI in library database can be given as follows:

3.1 Keeping pace with the technological advancement

libraries need to integrate AI in order to remain pertinent in an increasingly digital world. With the advent of digital collections libraries are not limited to the traditional collections which constitute of physical books and journals but also comprises of vast digital archives, multimedia, and e-resources. AI helps organize, classify, and catalog these resources reducing the time and effort required to handle large datasets and making these resources accessible.
Due to the availability of information and communication technologies as well as networking in libraries the nature of library services has greatly changed. There is an expectation from the library users with greater demand for personalised library services. AI library services can understand user preferences and provide tailored recommendations, thus providing more relevant search results. Also, the dynamic information needs of the users can be satisfied with improved search facilities which would lead to better information retrieval.

3.2 Automating tasks and optimising work flows

Repetitive activities like cataloging, metadata generation, sorting etc is time-consuming and if automated with AI, would reduce human errors and library professionals can direct themselves towards strategic activities. Effective use of AI can reshape the use of library databases by improving their accessibility and user experience.

3.3 Sharpening resource discovery and access

Natural language processing (NLP) can be utilized in libraries to create intelligent expert reference or information retrieval systems that allow users to communicate with the system directly. The computer receives natural language as input, evaluates and processes it, and then provides the necessary information in response. NLP has been utilized as an object/input

for processing in automatic text translation or text summarization, as well as a medium of interaction in database management systems.

Driven by natural language processing and machine learning, conversational AI-powered search engines enable enhanced querying of databases resulting in improved information retrieval. This also enables the users to converse with the system using everyday language, making the system intuitive and user-friendly. Rather than only relying on keywords, AI-powered semantic search improves search results by understanding the context and meaning behind queries. AI-powered translation tools make the resources accessible in multiple languages.

3.4 User assistance and personalised recommendations

AI is also instrumental in providing customised recommendations to users. Machine learning algorithms make this feasible by analyzing user behavior, preferences, and historical data to generate personalized recommendations. With the help of this the system can suggest various articles that are tailored to the user preferences. AI-driven bots and virtual assistants can become research assistants and guide users through the library database, answer questions, and provide recommendations. AI-powered systems can guide the users through **a**ssistive technologies like text-to-speech, audio indexing, and screen reader support that enhance accessibility for visually impaired users. Generative AI must be developed and implemented in the research tools that include input and guidance from the research community.

4 Use of Generative AI in library databases

Artificial intelligence (AI) captured the world's attention in 2023 with the emergence of pre-trained models such as Generative Pre-Trained Transformer (GPT), on which the conversational AI system ChatGPT is based. Beyond improving conventional functions, Generative AI has significantly transformed libraries. This change has enabled libraries to better manage resources, leading to advanced user experience, enabling researchers and students to access important academic publications.

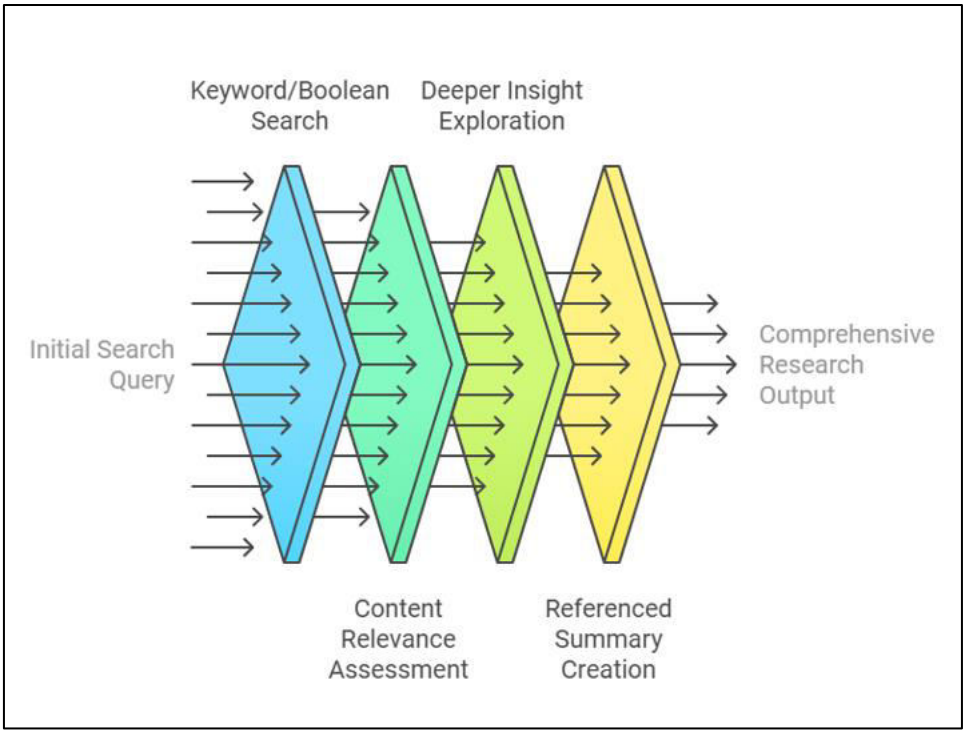

Fig. 2 Refining AI enhanced search results

Uses of Generative AI can be best described with the below examples from various library databases.

4.1 Scopus from Elsevier -

Scopus from Elsevier is a multidisciplinary abstract and citation database developed to help the research community navigate scholarly literature. With the introduction of ChatGPT, Scopus build a generative AI tool Scopus AI which was released in August 2023. Natural language processing is used by Scopus AI. One can use common language to type a question, statement, or hypothetical rather than looking for the appropriate keywords or Boolean operators. Scopus AI's Copilot query tool determines whether to employ a vector and/or keyword search based on the query in order to find pertinent papers from the database's 7,000+ publishers, with a particular emphasis on those released since 2003. It combines the information from the abstracts of various publications to produce a quick, understandable, and cited synopsis of the data.

Features of Scopus AI

- **Saves time by providing an independent and comprehensible research summary**

With the use of the patent-pending RAG fusion technology, Scopus AI creates a subject summary and an expanded summary after receiving a query and synthesizing abstracts from pertinent publications. The topic summaries are created almost immediately.

- **Builds and deepens new knowledge with unique features**
  Developing questions and phrasing them effectively could be quite a challenging task.
  The 'Go deeper' suggestions in Scopus AI help to investigate and widen the understanding in the specific field.
- **Instant access to foundational papers**
  Scopus AI searches the whole Scopus database to generate a list of foundational documents, or high-impact papers that are most frequently mentioned by the articles
- **Complete picture with the feature of concept maps**
  Scopus AI creates an interactive idea map using keywords from research abstracts. This aids in gaining a broad awareness of the subject and a more comprehensive understanding of the theme including how it relates to other fields of study.

Fig. 3 Scopus AI

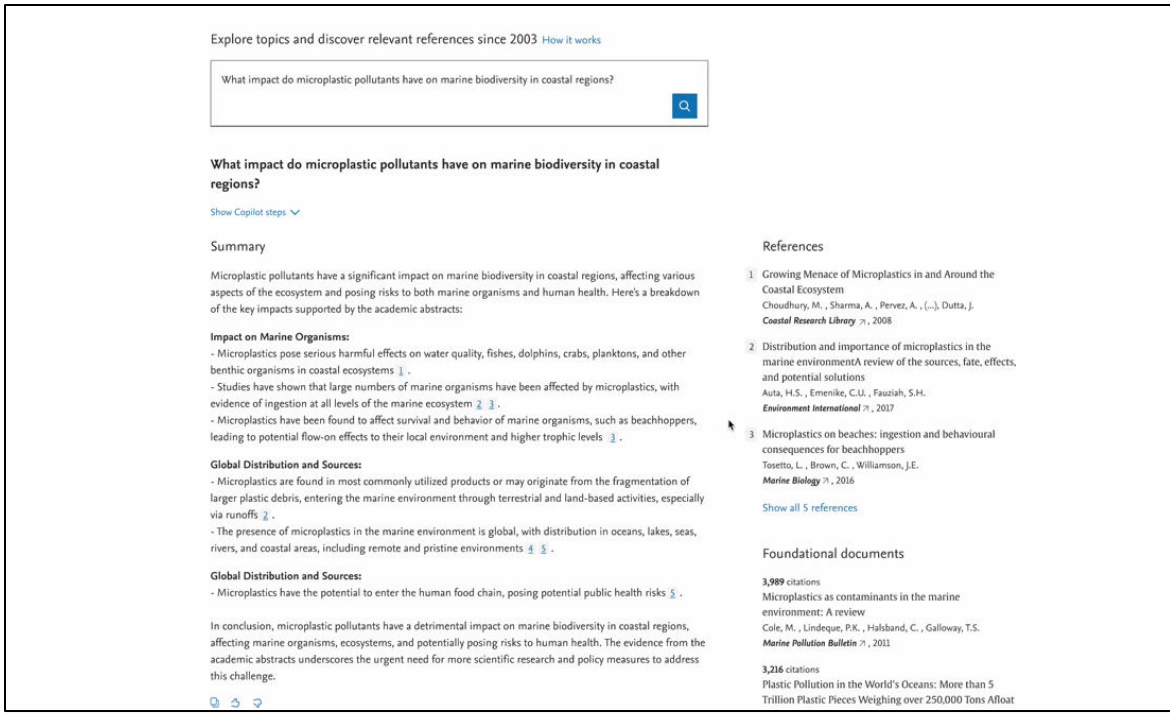

Fig. 4 Scopus AI (comprehensive research summary)

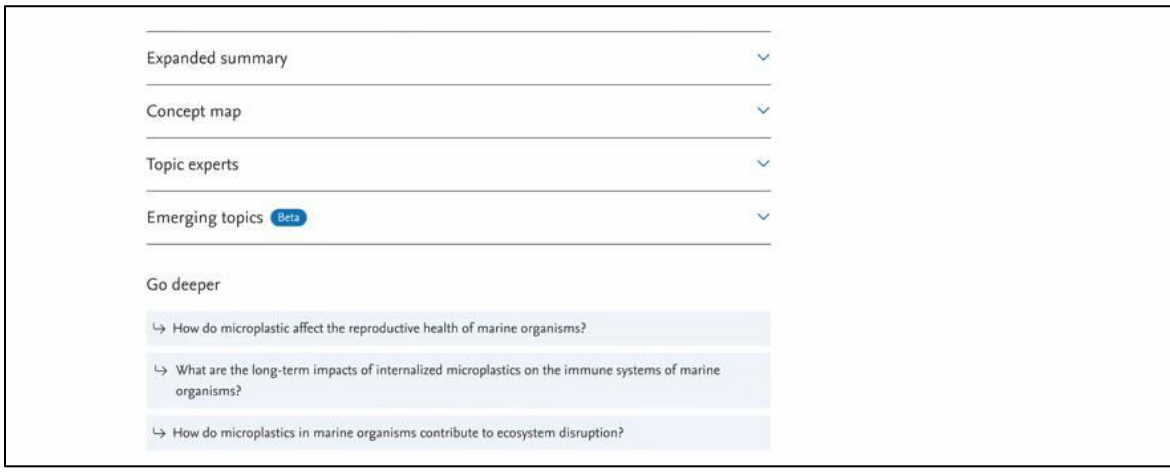

Fig. 5 Scopus AI (deeper insights)

4.2 JSTOR

JSTOR is a digital library which provides access to more than 12million journal articles, books, images, and primary resources in 75 languages.

Using AI and other technologies, JSTOR's interactive research tool in beta enables users to go deeper and broaden their study using JSTOR's reliable library.

The purpose of this tool is to provide researchers, librarians, instructors, and students with cutting-edge resources that enhance research and learning and make it easier for them to interact with difficult material. This research tool uses artificial intelligence to assist users:

- Quickly find pertinent information by highlighting the main ideas and arguments in the text.
- Explore new subjects and material in the JSTOR collection, opening up new avenues for research.
- Using conversational method by prompting questions about the text that is being viewed.
- Conducting searches using the semantic search feature which performs better for natural language searches than conventional keyword search.

Assess content relevance

After the query is entered, the tool browses over the text and highlights the important details so the user can determine how relevant it is. Additionally, the system indicates whether the text is relevant to the search terms used in the query.

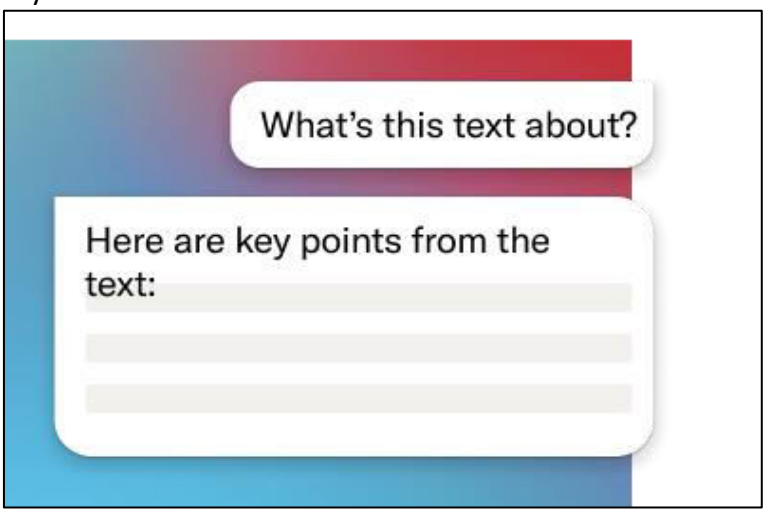

Fig. 6 JSTOR AI

Deepen the research

The search query discovers related topics, providing with similar content from the JSTOR collection, and thus establishing new ways of searching. This gives the researcher a deeper insight to the research area and helps understand the related topics.

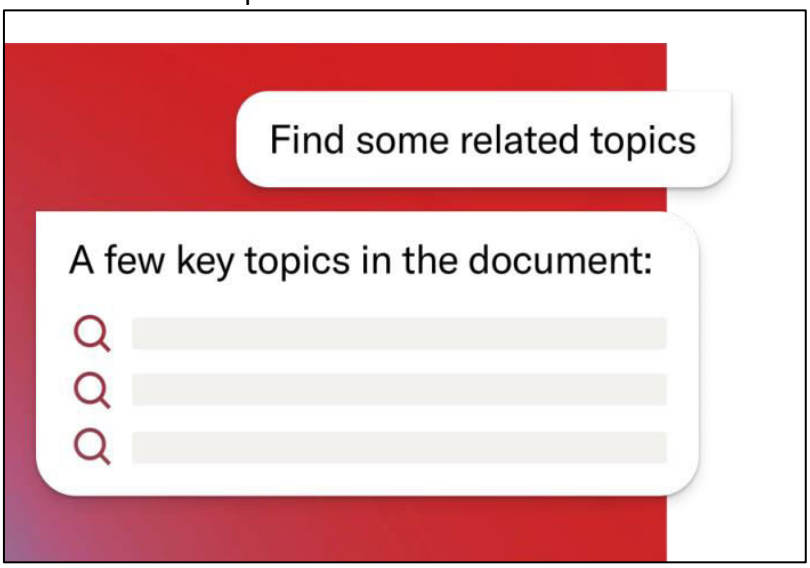

Fig. 7 JSTOR AI (collating related topics)

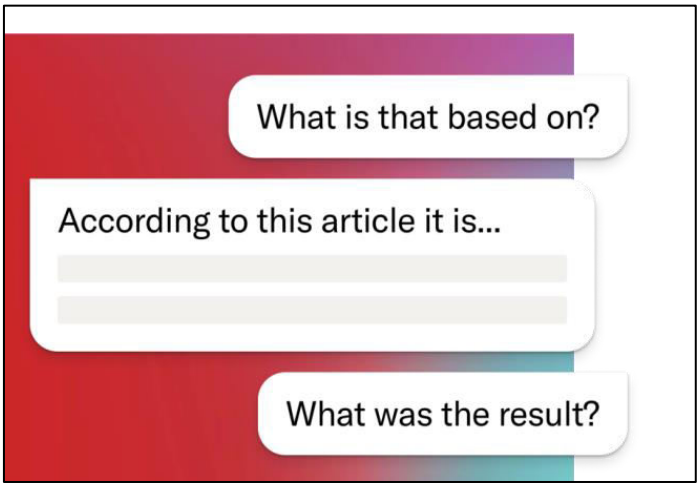

Fig. 8 JSTOR AI (conversational feature)

Be conversational

The tool enables use of natural, conversational language to ask questions and get quick answers about the concerned research area.

4.3 Web of Science

Technology can significantly reduce the amount of human effort required to collect and synthesize data for future review, but it cannot make judgments for researchers, publishers, or organizational leaders.

The Web of Science's AI-powered topic and keyword recommendations enable users to swiftly and effectively focus their searches and increase the relevancy of their findings.

This enables the researcher to pose queries and quickly get the appropriate responses from Web of Science data.

5 Changing Functions of librarian/information professionals

Librarianship has entered a phase that is defined by changing roles, immense possibilities, and varied problems as a result of the digital age. This once again reiterates that librarians need to constantly evolve and adapt themselves to the changing digital landscape. They need to be innovative, and persistently committed to their core mission of providing access to knowledge and promoting information literacy.

Librarians have a crucial role in following aspects of adopting AI in Academic activities.

1. Institutional policy making on AI assisted academic research and learning.
    i. Bringing information policy, ethical, and usage concerns to the discussion
    ii. Pre-test, build, monitor and modify carefully AI systems to prevent potential issues in data privacy, security, misinformation, bias and discrimination
    iii. Define how AI shall be leveraged to deepen and expand user's work
    iv. Bridge the digital divide by providing equal access to AI enabled services to all users
2. Developing and deploying AI integration in libraries to align with core values and principles. In order to harness full potential of AI in academic libraries, librarians have to further upgrade their IT skills in computing, networking, cyber security, database management systems. Data analytics and prompt engineering will be additional skill required as AI gets adopted.
3. Empowering users in usage of AI enabled tools
    i. Collaborate and initiate planning, developing and initiating AI literacy as part of the curriculum.

ii. Provide foundational training of AI tools for academics, to assist users in adopting AI.
iii. Leverage AI to enable lifelong learning and skill development to help adapt to changing job markets and technology advancements

6 Conclusion

AI is not just a luxury but a necessity for modern library databases. It empowers libraries to manage resources effectively, meet user needs efficiently, and stay relevant in the digital age. AI revolutionizes library services by automating repetitive tasks, enhancing user interaction, and providing advanced tools for research and accessibility. It allows libraries to stay relevant in the digital age while offering innovative and efficient services to users.

7 References

1. https://www.coursera.org/articles/what-is-artificial-intelligence
2. https://www.merriam-webster.com/dictionary/intelligence
3. https://www-scopus-com.library.somaiya.edu/pages/scopus-20 (accessed on December 9, 2024)
4. https://www.ifla.org/g/ai/generative-ai/
5. https://about.jstor.org/research-tool/#about (accessed on December 10, 2024)
6. https://clarivate.com/academia-government/blog/bringing-generative-ai-to-the-web-of-science/ (accessed on December 10, 2024)
7. Dattatraya Kalbande, Priya Suradkar, Subhash Chavan, Manoj Kumar Verma & Mayank Yuvaraj (04 Dec 2024): Artificial Intelligence Integration in Academic Libraries:Perspectives of LIS Professionals in India, The Serials Librarian, DOI: 10.1080/0361526X.2024.2433262
8. Ex Libris. (2019). *How AI can enhance the value of research libraries*. www.libraryjournal.com/?detailStory=how-ai-can-enhancethe-value-of-research-libraries
9. Lombard, E. (2024). Library Databases and Chatbots. *Internet Reference Services Quarterly*, *28*(4), 463–471. https://doi.org/10.1080/10875301.2024.2389090
10. Omame, I. M. & Alex-Nmecha, J. C. (2020). Artificial Intelligence in Libraries. In N. Osuigwe (Ed.), *Managing and Adapting Library Information Services for Future Users* (pp. 120-144). IGI Global Scientific Publishing. https://doi.org/10.4018/978-1-7998-1116-9.ch008

Bibliometric analysis of Scientific and Industrial Research Journal: a Study

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Abstract
Bibliometrics is a branch of library science that examines the scientific communication process by measuring and analyzing various aspects of written documents, using quantitative methods. It is used to monitor the growth of literature and research samples. This paper examines the authorship pattern, distribution of citations, subject-wise distribution, geographical distribution of papers and citation analysis of articles published in the Journal of Scientific and Industrial Research. The study conducted for the present paper has found that most of the papers are multi-authored. India appears to have the highest contribution in geographical distribution. The average citations per paper are 25.

Keywords
Bibliometrics, Journal of Scientific and Industrial Research ,Authorship pattern, Subject wise distribution, geographical distribution.

1.1. Introduction

Bibliometrics is a new discipline that uses quantitative methods to examine the scientific communication process by measuring and analyzing various aspects of written research documents. The term 'bibliometrics' was first used by Alan Pritchard in 1969. It is an emerging field of research in various branches of human knowledge. 'Bibliometrics' has become a standard tool in science policy and research management in the last few decades. All major collections of scientific indicators rely heavily on publication, citation statistics, and other, more sophisticated "bibliometric" techniques. Bibliometrics is a quantitative evaluation method of all macro and micro communication publication methods through mathematical and statistical calculations (Sengupta, 1985); the use of 'bibliometrics' can be applied to any discipline and to most problems related to written communication. It helps to monitor the growth of literature and research methods. This

research paper studies the 'bibliometric' analysis of literature published in the "Journal of Scientific and Industrial Research".

1.2. Sources of Journal

This oldest journal of NISCAIR, started in the year 1942, contains comprehensive reviews on various aspects of science and technology, industry, short communication, technology management, industrial development with case studies, industrial research, technology forecasting, and equipment. Analytical techniques directly relevant to industrials entrepreneurship, especially, discussion on key industrial issues, editorial or It covers all aspects of technical commentary, conference reports, book reviews, and industry-related announcements of industrial development. It published Monthly between1942; this journal is monthly published since. It continues to publish 12 issues per year. It is currently edited by Dr Narendra Kumar Sahoo, CSIR-NISCAIR, India. The journal editorial board consists of researchers from Europe, Canada, Mexico, Malaysia, and United States. Impact Factor of JSIR is 0.7 (JCR 2023).

1.3. Objectives of the Study

Following the main objectives of this study is:

- To find out volume wise contributions,
- To find out the authorship pattern,
- To determine the geographical distributions of contributions in the journal,
- To find out the distribution of contributions,

1.4. Review Literature

The paper 'Journal of Documentation' discusses the authorship pattern, geographical distribution of papers and citation analysis, degree of collaboration among published paper. The study conducted for this paper found that most of the papers are multi authored. The degree of collaboration was found to be 0.51. The geographical distribution reveals that the contribution by United Kingdom is the highest (Roy and Basak, 2013); study focuses on necessary bibliometric analysis forms, authorship pattern analysis, year wise distribution of articles, issue wise distribution of articles, single and multi authored papers. The findings of the study and the strengths of the journal indicate

weaknesses that are useful for its further development. The study revealed that the highest total number of articles 85 (21.04%) were published in the year 2018. The highest number 339 (83.91%) articles were contributed by joint authors and the rest of 65 (16.09%) articles contributed by single author (Das,2021); presents study research output performance of social scientists on social science subjects. The analysis cover mainly the number of articles, subject wise distribution of articles, authorship pattern, average number of references per articles, forms of documents cited, year wise distribution of cited journals (Thanuskodi,2010); this paper presents Bibliometric study of The Indian Journal of Economics during the period of 2012 to 2019. In this paper, there are 397 authors in the year-wise distribution of articles, subject-wise distribution, authorship pattern, 229 articles have received 3529 citations, and the highest number of published articles is by subject. After that, 64 papers have been published in the commerce branch. After author-wise analysis, it was observed that Singh D V is the most prominent author and he published 14 articles during the study period. When the geographical distribution of publications is done, there are a total of 27 articles published in New Delhi, the maximum length of the articles is 64 pages which has been analyzed during the study period (Chore, 2020).

1.5. Methodology

A total of 24 issues of the Journal of Scientific and Industrial Research (2021 to 2022) have been taken for this study. The details of each published article such as number of authors, title of the article, their institutional affiliation and addresses, number of references, number of pages, number of table and figures etc. have been recorded and analyzed. Each reference and other data are counted and filled in through a table mark system. The data has been calculated and presented in statistical table. Citation analysis is done using various statistical tools and techniques.

1.6. Data Analysis & Interpretation

Table No. 1.1. Distribution of contributions

Sr. No.	Volume Year	Number of Issues	Total	Percentage
1	2022	12	12	50
2	2021	12	12	50
Total		**24**	**24**	**100**

Table No. 1.1. Shows that a total of 24 volumes have been studied in two years (2021-2022). Out of which 2022 has the highest number of papers and 2021 has the lowest number.

Table No. 1.2. Distribution of citations (Issues wise)

Sr. No.	Number of Issues	Citations		Total	Percentage
	Month	2021	2022		
1	Jan	212	265	477	7.07
2	Feb	274	280	554	8.21
3	March	204	292	496	7.35
4	April	163	290	453	6.71
5	May	292	362	654	9.69
6	June	222	330	552	8.18
7	July	222	300	522	7.74
8	Aug	258	297	555	8.22
9	Sep	282	361	643	9.53
10	Oct	294	336	630	9.34
11	Nov	243	336	579	8.58
12	Dec	260	373	633	9.38
Total		**4947**	**3822**	**6748**	**100**

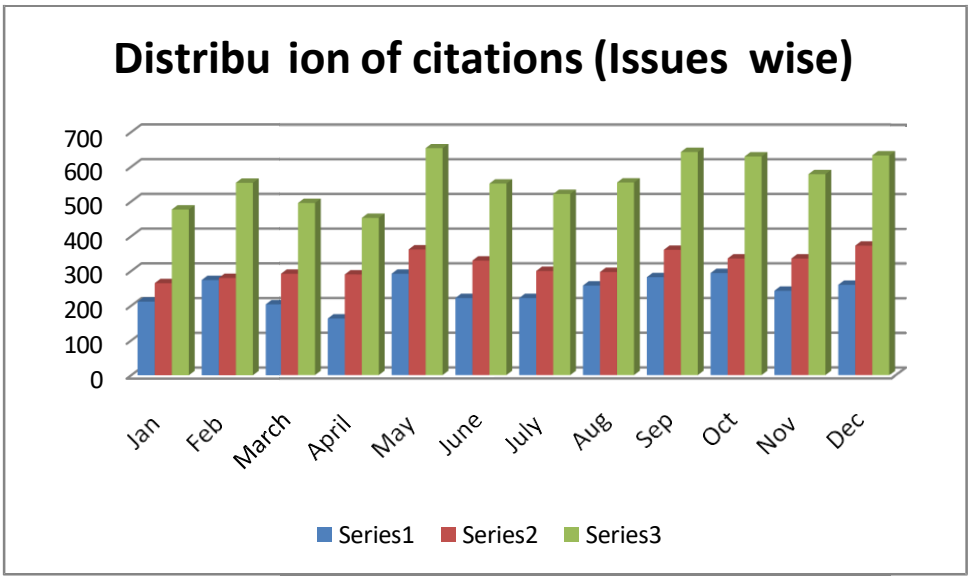

Fig. No. 1.1. Distribution of citations (Issues wise)

Table- 1.2. and the graph show that 6748 citations have been provided in two years for a total contribution of 276 articles. The above figures also show that the volume in the month of May has the highest share of 362 in total citations, out of a total number of 6748 studies.

Sr. No.	Name of Subject	Rank	Percentage %
1	Mechanical Engineering	40	14.65
2	Technology	38	13.92
3	Computer Science and Engineering	29	10.62
4	Engineering	26	9.52
5	Agricultural	20	7.33
6	Electrical and Electronics Engineering	15	5.49
7	Agricultural Engineering	14	5.13
8	Scientific and Innovative Research	12	4.40
9	Food Engineering	11	4.03
10	Engineering and Technology	10	3.66
11	Science and Technology	10	3.66
12	Computer Engineering	8	2.93
13	Electrical and Electronics Engineering	8	2.93
14	Information Technology	7	2.56
15	Physics	7	2.56
16	Industrial Engineering	6	2.20
17	Chemical Engineering	6	2.20
18	Technical Education	6	2.20
Total		**273**	**100.00**

Table No. 1.3. Subject wise distribution

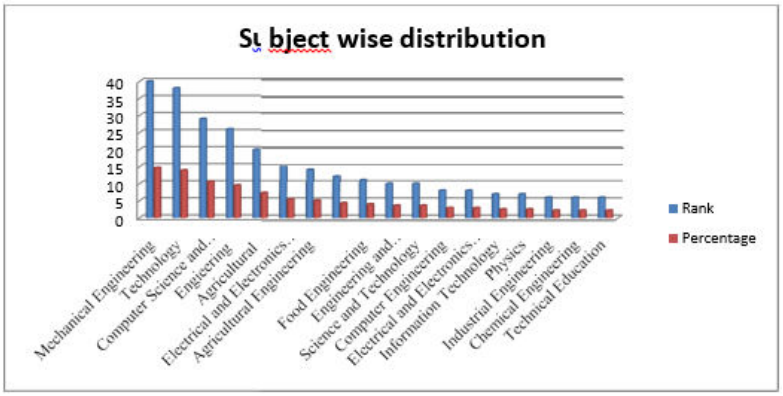

Fig. No. 1.2. - Subject wise distribution

Table-1.3. it is evident that among the various fields of scientific and industrial subjects, Mechanical Engineering is dominating the other

subjects. Figure 1.2. Shows the top five most influential subjects under this study. These are Technology 38, (13.92%) subject related papers, Computer Science and Engineering 29, (10.62%) subject related papers, Engineering 26, (9.52%) subject related papers, Agriculture 20, (7.33%) subject related papers, Electrical and Electronics Engineering 15, (5.49%) subject related papers respectively.

Table No. 1.4. Authorship Pattern

Sr. No.	Authorship	Total	Percentage
1	Single	10	4.15
2	Two	63	26.14
3	Three	72	29.88
4	Four	45	18.67
5	More than Four	51	21.16
Total		**241**	**100.00**

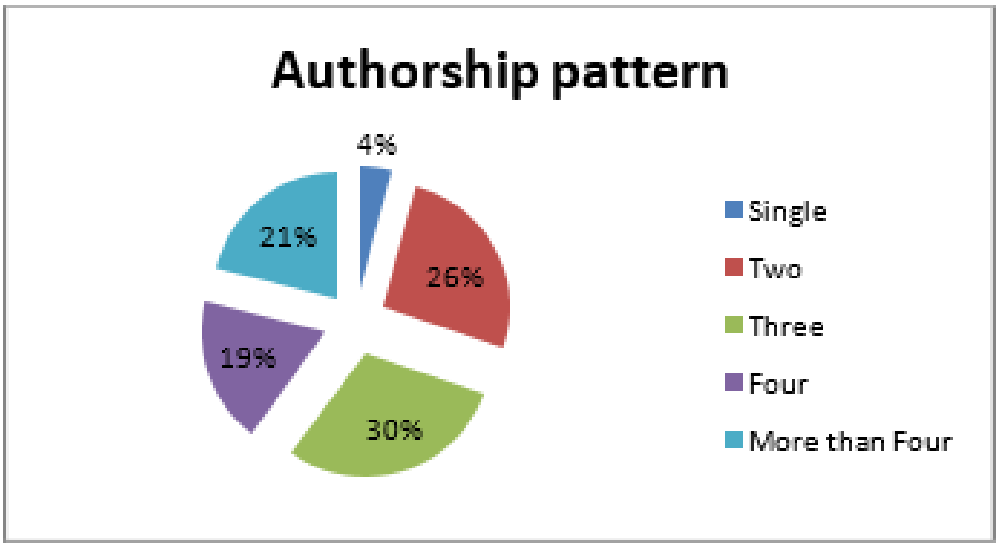

Fig No. 1.3. Authorship Pattern

Table-1.4. Graph No.-1.3. When the pattern of authorship is studied, it is shown that the highest number of publications are by one author. Out of these, there are 10 (4.15%) papers with one author, while there are 122 (49.5%) papers in single authorship pattern. There are 63 (26.14%) papers published by two authors, followed by 72 (29.88%) papers published by three authors, 45 (18.67%) papers in four authorship pattern and 51 (21.16%) papers in more than four authorship pattern. Multiple authorship patterns are analyzed to shed more light on the pattern of collaboration. 757 authors have written 241 research papers. This is an indication that researchers and scientific and industrial research are coming together to complete research projects and studies in the field of scientific and industrial research.

Table No. 1.5. Geographical distribution

Sr. No.	Name of Country	Contribution Paper	Percentage %
1	India	1085	85.16
2	Turkey	70	5.49
3	China	20	1.57
4	Nigeria	20	1.57
5	Spain	8	0.63

6	Colombia	7	0.55
7	Serbia	7	0.55
8	Iran	7	0.55
9	Bangladesh	6	0.47
10	Indonesia	5	0.39
11	Eastern Africa	5	0.39
12	Mexico	4	0.31
13	Other Country	30	2.35
Total		**1274**	**100.00**

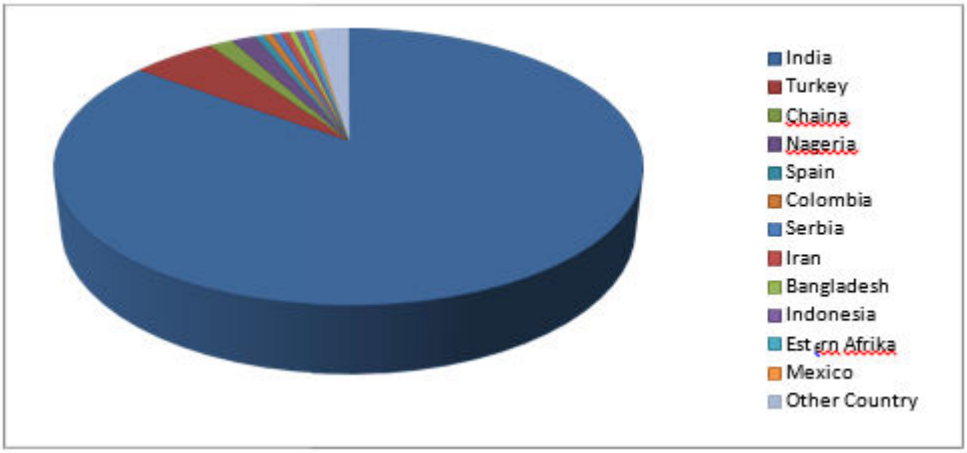

Fig. No. 1.4. Geographical distribution

Table-1.5. a study of the graph and the table shows that the journal shows a geographical distribution of contributions. Out of 1244 contributions, the highest number i.e. 1085 (85.16%) contributions are from India, followed by Turkey, China, Nigeria and Spain at

second, third, fourth and fifth positions with 70 (5.49%), 20 (1.57%) , 20 (1.57%) and 8 (0.63%) contributions respectively.

1.7. Results and findings

The followings are some interesting facts found out from the analysis of the journal 'Journal of Scientific and Industrial Research (2021-2022)' such as, Shows that a total of 24 volumes have been studied in two years (2021-2022). Out of which 2022 has the highest number of papers and 2021 has the lowest number.

- Table- 1.2. And the graph show that 6748 citations have been provided in two years for a total contribution of 276 articles. The above figures also show that the volume in the month of May has the highest share of 362 in total citations, out of a total number of 6748 studies.
- Display that among the various fields of subjects in Scientific and Industrial, Mechanical Engineering is dominating over other subjects. The top five most dominating subjects under this study. These are Technology 38, (13.92%) subject related Paper, Computer Science and Engineering 29,(10.62%)subject related Paper, Engineering 26,(9.52%) subject related Paper, Agricultural 20,(7.33%) subject related Paper ,Electrical and Electronics Engineering 15, (5.49%) subject related Paper respectively.
- Table-1.4. Graph No.-1.3. When the pattern of authorship is studied, it is shown that the highest number of publications is by one author. Out of these, there are 10 (4.15%) papers with one author, while there are 122 (49.5%) papers in single authorship pattern. There are 63 (26.14%) papers published by two authors, followed by 72 (29.88%) papers published by three authors, 45 (18.67%) papers in four authorship pattern and 51 (21.16%) papers in more than four authorship pattern. Multiple authorship patterns are analyzed to shed more light on the pattern of collaboration. 757 authors have written 241 research papers. This is an indication that researchers and scientific and industrial research are coming together to complete research projects and studies in the field of scientific and industrial research.
- Table-1.5. a study of the graph and the table shows that the journal shows a geographical distribution of contributions. Out of 1244 contributions, the highest number i.e. 1085 (85.16%) contributions are from India, followed by Turkey, China, Nigeria and Spain at second, third, fourth and fifth positions with 70 (5.49%), 20 (1.57%) , 20 (1.57%) and 8 (0.63%) contributions respectively.

1.8. Reference

1. Pitchard, A. (1969). Statistical bibliography or bibliometrics: *Journal of Documentation,* Vol-24. pp- 348-349.
2. Sengupta, I N (1985). Bibliometrics: A bird's eye view: *IASLIC Bulletin*, Vol-30,(No-4).pp- 167- 174.

3. Roy, Sanku Bilas and Basak Moutusi. (2013). Journal of Documentation : a Bibliometric Study: L*ibrary philosophy and practice,* Pp-1-11.
4. Das, Digbijoy (2021). Journal of Informetrics: a bibliometric study: *Library philosophy and practice,* Pp-1-16.
5. Thanuskodi, S. (2010). A Bibliometric study Journal of Social Science, *Journal of Social Sciences*, Vol- 24 (No-2), pp- 77-80.
6. Chore, Nitesh V. (2020). Bibliometric study of the Indian journal of economics: Journal of *Library Science and Information Technology*,Vol-2, No-1.pp -54-60.

Research Output of the Journal Advances in Integrative Medicine: A Scientometric Analysis

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Abstract
The study of the journal Elsevier Clinicalkey database "Advances in Integrative Medicine" from 2019 to 2023 focuses on numerous aspects like the year wise distribution of articles, annual rate of growth, authorship pattern, authorship productivity, degree of collaboration, most prolific authors, ranking of the institutions etc. The result shows that the maximum number of 59 (26.94%) papers were published in 2021 and the minimum of 35 (15.98%) in 2023. The study reveals that maximum 134 (61.19%) papers are original research articles out of 219 articles. The study shows that the maximum of 65 (29.68%) papers out of 219 papers are contributed by more than five authors and the single author contribution constitute the minimum number 19 (8.68%). It is analyzed that minimum AAPP as 5.38 in the year 2020 and maximum productivity per author is 0.26 in the year 2021 and 2023 and minimum productivity per author is 0.19 in the year 2020. Overall the average degree of collaboration was 0.97. The range of Average Growth Rate is between (21.62%) and (31.11%). It study indicate that Amie Steel occupies the author rank list by contributing 17 articles to his credit whereas, University of Technology, Australia hold the predominant position 35 research articles in the top ranked Institute.

Keywords
Integrative Medicine, Clinicalkey Database, Research output, Scientometric.

1. Introduction:

Scientometrics define quantitative approach that assesses scientific publication activity using a variety of tools and techniques, including

statistical methods to evaluate research productivity, the output of specific research organisations, and growth trends in specific subject areas or literature. More recently, it has been used to gauge the impact and growth of publications in particular journals.

The international, peer-reviewed journal Advances in Integrative Medicine (AIMED) places a strong emphasis on reviews and research based on evidence in the multidisciplinary fields of complementary and integrative medicine. The journal publishes a broad range of content, such as trials, surveys, editorials, case reports, systematic reviews, original research articles, and discussions. The journal seeks to enhance patient health outcomes and the practice of Integrative Medicine by encouraging excellence in research and practice in the field as well as cross-collaboration with pertinent practitioner groups and associations.

2. Review of Related Literature

Kumar (2024) conduct the scientometric analysis of the articles published in the "Journal Library & Information Science Research: An International 2015-2022. The analysis was conducted on 298 contributions from 32 issues. The study reveals that the majority of contributions (100 out of 298) were authored by two individuals. The degree of collaboration (DC) varied between 0.56 and 0.82, with an average DC of 0.71 during the selected period.

Dey (2022) studied 210 publications published in the journal Malaysian Journal of Library & Information Science (MJLIS) during 2011 to 2020 for scientometric analysis. The majority of the articles, i.e. 174 (82.86%), were co-authored, while only 36 (17.14%) were authored by a single individual. A total of 7,769 references were cited from 210 publications, published in the journal throughout the during the period. On average, each item cited 37 sources.

Mondal (2021) analysed the research output of Issues in Science and Technology Librarianship (ISTL) during 2010-2020 through the scientometric study. The paper reveals in the in 2010, maximum 30(13.4%) articles were published out of 224 articles. The authors' collaboration in ISTL publication is highest on 2020 with a mean value of 0.8 and the AAPP is highest is 2.77 ,year 2019.

Prabahar (2020) has studied 1694 research articles of the National Institute of Mental Health and Neurosciences (NIMHANS) - 2009-2018 as reflected in Web of Science database. The study found that 241(14.23%) articles were

published in the year 2017. The multi-authored publications during 2017 was also very high. The authors productivity (average author per paper) is 11.72 and the AAPP is 0.08. The academics of NIMHANS mostly preferred to publish their research in the subject area of "Neurosciences Neurology" with 735 (43.41%).

Geetha and Thilagavathy (2018) has studied 601 articles from the “Journal of Postgraduate Medicine” from 2013 to 2017 for scientometric study. The paper reveals that 153(25.5%) were published in 2017 and 98(16.3%)were published in 2013. The analysis revealed that in the year 2017, the minimum AAPP was 2.12, with the highest per authors’ productivity is 0.47. In contrast, in 2013, the maximum AAPP was 6.25, while the lowest per author’ productivity was 0.15.

Pradhan (2020) critically examined 231 research articles published in the journal Annals of Library and Information Studies between 2011 and 2017 forscientometricanalysis. According to the study, the most publications published throughout the stu dy period was 38 which was published in 2015. The single authors contributed was 82 (35.50%) of the 231 papers. According to the study, the average collaborative index was 2.37, the average DC was 0.77, and the AAPP was 1.91. Additionally, each paper received an average of 20.01 citations.

Jabeen (2015) emphasises the productivity of research and scholarly communication of LIS professionals during 2003-2012. They found a decline in single-author articles and an increase in collaborative publications after 2009. The maximum number of publications was carried out by universities rather than non-academic institutions. The study also reveals that strong citations have been received after 4-5 years, post publication of article.

3. Objectives of the Study:

The following are the objectives of the study:

- To verify various forms of articles year-wise from 2019-2023
- To findout the prolific authors during 2019-2023.
- To finout the yearwise authorship pattern of contribution per volume the article
- To calculate author productivity per paper.
- To analize the degree of collaboration.
- To analize the Growth Rate of Research Articles yearwise
- To measure the ranking of authors
- To analyze the distribution of research articles across different countries.

4. Methodology of the Study

The information gathered from the Elsevier ClinicalKey database, a scientific and medical database tool owned and operated by the Elsevier publishing company that provides access to medical libraries. There are 219 research outputs in various formats after all the required bibliographic details were gathered from the twenty volumes of Advances in Integrative Medicine published by in ClinicalKey (Elsevier) database between 2019 and 2023. The study aims to focus on the aspects like verify various forms of articles year-wise, find the most prolific authors, see the annual growth rate of article, find authors collaboration, ranking of authors etc. The information was gathered, structured, analyzed, and calculated using Microsoft MS Excel software. Furthermore, additional scientometric tools and methods were employed to generate tables for the final study.

5.Results and Analysis:

5.1 Year Wise Publication of articles

Total of 219 research publications were disseminated during the five-year study period (2019-2023). The year 2021 exhibited the highest research output with 59 articles (26.94%), followed by 2020 with 45 articles (20.55%). In contrast, 2023 demonstrated the lowest output with 35 articles (15.98%)

Year	No. of Research Outputs	Percentage (%)
2019	37	16.89
2020	45	20.55
2021	59	26.94
2022	43	19.64
2023	35	15.98
Total	219	100

Table No. 5.1 Year wise Publication of Articles

5.2 Type of Documents

Table 5.2 presents the document types published by Advances in Integrative Medicine (AIMED) between 2019 and 2023. Original research articles were most frequent, comprising 134 (61.19%) of all publications. Editorial reports (9.13%) and review articles (7.31%) followed.

Types of Documents	No. of Distributions	Percentage(%)
Original Research Article	134	61.19
Review Article	16	7.31
Case Report	15	6.85
Discussion	6	2.74
Editorial Report	20	9.13
Errata	2	0.91
Other	26	11.87
Total	**219**	**100**

Table No. 5.2 Distribution of Different Types of Documents

5.3 Most Prolific Authors:

Table 5.3 presents a list of the top 15 authors who have contributed the maximum number of articles to Advances in Integrative Medicine (AIMED). The authors are ranked according to their contributions that they have made during in the period 2019-2023. Author Amie Steel and Jon Adams Jon has contributed equally maximum number of research articles i.e 17 and has occupied the first rank. Followed by Janet Schloss who has contributed 13 articles. There were two authors Joanna E Harnett and Matthew Leach who have equally contributed 7 articles and hold third rank.

Name of the Author	No. of Research Articles	Ranking
Amie Steel	17	1
Jon Adams	17	2
Janet Schloss	13	3
Joanna E Harnett	7	4
Matthew Leach	7	4
Danielle Brown	5	5
K Maheshkumar	5	5
Mehdi Pasalar	5	5
Nicole Hannan	5	6
Holger Cramera	4	6
Jennifer Hunter	4	6
Romy Lauche	4	6
Shahin Akhondzadeh	4	6
Ali Tavakoli	3	7
Apar Avinash Saoji	3	7

Table No. 5.3 Author Ranking

5.4. Distribution of Authorship Pattern:

The Table No. 5.4 depicts the distribution of authorship pattern tabulated yearwise. It can be seen that more than five authors 65(29.68%) have made major contribution in the journal during the study period followed by three authors and five authors 39(17.81%). The Table also reveals that the single author 19(8.68%) is occupying the lowest authorship pattern.

Year	Sole	Two	Three	Four	Five	More than Five (6-10)	Total
2019	4	5	6	8	7	10	40
2020	4	4	8	9	12	17	54
2021	3	5	7	9	11	16	51
2022	5	4	10	8	5	11	43
2023	3	3	8	2	4	11	31
Total	19 (8.68%)	21 (9.59%)	39 (17.81%)	36 (16.43%)	39 (17.81%)	65 (29.68%)	219 (100.00)

Table No.5.4 Authorship Pattern

5.5 Author's productivity:

Author productivity provides an overview of the Average Authors Per Paper (AAPP) and the Productivity Per Author over a specified period. Both AAPP and Productivity Per Author are calculated using the following formula.

$$\textbf{AAPP} = \frac{\text{Number of author}}{\text{Number of papers}}$$

$$\textbf{Productivity per author} = \frac{\text{Number of papers}}{\text{Number of authors}}$$

Table 5.5 it is found that the minimum AAPP 3.77 with maximum productivity per author is 0.26 in the year 2023. In contrast, the highest AAPP was 5.38, with the lowest productivity per author being 0.19 in the year 2020.

Year	Total no of papers	Total no of authors	Average author/ paper (AAPP)	Productivity per author
2019	37	156	4.22	0.24
2020	45	242	5.38	0.19
2021	59	229	3.88	0.25
2022	43	171	3.98	0.25
2023	35	132	3.77	0.26
Total	219	930	21.23	1.2

Table No 5.5 Author's productivity

5.6 Degree of Collaboration (DC)

Degree of Collaboration (DC) represents the strong collaboration among authors in the given period. The DC of the Advances in Integrative Medicine (AIMED) publications can be measured by using Subramanyam's (1983) formula as shown below:

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

Where, DC = degree of collaboration; Nm = number of multi-authored papers, and Ns = Number of single-authored papers(Subramanyam, 1983). Table 5.6 reveals that the maximum value of DC 0.98 is found in the year 2020 and 2021 respectively and the minimum value of 0.97 found in the year 2019, 2022 and 2023 respectively. In total period, DC is found in between 0.97-0.98.

Year	Single Authored (Ns)	Multiple Authored (Nm)	Total (Ns+Nm)	Degree of Collaboration
2019	4	152	156	0.97
2020	4	238	242	0.98
2021	3	226	229	0.98
2022	5	166	171	0.97
2023	3	129	132	0.97

Table No 5.6 Degree of Collaboration

5.7. ANNUAL GROWTH RATE OF ARTICLES

The Annual Growth Rate (AGR) is used to measure annual increase or decrease in the number of publications. The formula of AGR is given below:

$$AGR = \frac{\text{End value} - \text{First value} * 100}{\text{First value}}$$

Table 5.7 presents a detailed overview of the AGR from 2019 to 2023. It shows that the highest AGR percentage (31.11%) occurred in 2021, followed by 21.62% in 2020. However there was decline in the subsequent years. Cumulative growth also increased from 2019-2024 gradually. These cumulative percentages indicate how the number of articles changed compared to 2019, both as increases and decreases over the years.

Year	**Total no of articles**	**%age of articles**	**Cumulative percentage (%)**	**AGR**
2019	37	16.89	16.87%	0
2020	45	20.56	16.87%	21.62
2021	59	26.95	64.39%	31.11
2022	43	19.63	83.97%	-27.12
2023	35	15.98	100%	-18.60
Total	219	100		

Table 5.7. ANNUAL GROWTH RATE OF ARTICLES

5.8 Top Ranked Institute

Table No. 5.8 highlights the top ranked institutes who have contributing their articles throughout the globe. It is seen that researchers of University of Technology, Australia contributed maximum articles i.e. 35 and hold first rank in the list of prolific institutes followed by Southern Cross University, Australia Endeavour College of Natural Health, Australia contributed 26 and 13 article respectivly. Here only top ten ranked institutes are being highlighted.

Name of the Institute	No. of Research Articles	Ranking
University of Technology, Australia	35	1
Southern Cross University, Australia	26	2
Endeavour College of Natural Health, Australia	13	3
Shahid Beheshit University of Medical Sciences, Iran	13	4
University of Sydney, Australia	12	5
Shiraz University of Medical Sciences, Iran	7	6
S-VYASA Yoga University, India	7	7
Government Yoga and Naturopathy Medical College & Hospital, India	6	8
Tehran University of Medical Sciences, Iran	6	9
University of Duisburg-Essen, Germany	6	10

Table No. 5.8Top Ranked Institute

5.9. Country wise Distribution of Research Articles

Table No. 5.9 reveals country wise distribution of research articles. The table depicts that the 219 research outputs are being contributed from 43 different countries across the globe. Out of these 219 research contributions, Australia contributed the maximum number of articles i.e. 67 and obtained the first rank. Followed by Iran contributing 34 articles and occupying the second position in the list; India 29 obtaining third position. The table 5.9 highlight only top ten Country along with the contribution of article.

Name of the Country	No. of Articles contibuted	Ranking
Australia	67	1
Iran	34	2
India	29	3
USA	22	4
Canada	14	5
Germany	8	6
UK	8	7
Brazil	4	8
South Africa	3	9
Nigeria	3	10

Table 5.9. Country Wise Distribution of Research Articles

6. Findings and Conclusion:

- The study reveals that 134 (61.19%) articles of the journals during the period 2019-2023 are Original Research Article followed by Editorial Report 20 (9.13%)
- Maximum number of article was published during the year 2021 i.e. 59 (26.94%) followed by 45(20.55%) in the year 2020.
- More than five author's contribution during the whole duration (2019-2023) persists at 65 (29.68%) obsess the highest position and single authors' contribution was least position with 19 (8.68%).
- The degree of collaboration in the journal Advances in Integrative Medicine is highest in the year 2020 and 2021 with DC value 0.98 and lowest value of 0.97 in the year 2019, 2022 and 2023 respectively.

- The study found that the minimum AAPP is 3.77 with maximum productivity per author is 0.26 in the year 2023. On the other hand, maximum AAPP is 5.38 with minimum productivity per author at 0.19 in the year 2020.
- The study reveals that the highest percent of The Average Growth Rate (AGR) was highest in the year 2021 with 31.11% followed by 21.62% in 2020. However there was decline in the subsequent years.
- Out of 219 research articles, highest number of contributors are from Australia i,e. 67 followed by 34 contributors from Iran and 29 contribution from India. However authors from 43 different countries across the globe have contributed during the period 2019-2023.

- The most prolific authors of Advances in Integrative Medicine journal during 2019-2023 were Amie Steel and Jon Adams Jon who contributed equally 17 articles.

Conclusion

The Journal of Advances in Integrative Medicine is a peer-reviewed scientific publication dedicated to advancing research, clinical studies, and reviews in the field of integrative medicine. It provides a vital platform for exchanging knowledge that bridges the divide between conventional medical practices and complementary, alternative, and traditional healing methods. Established in 2014, the journal has gained recognition for publishing high-quality research, including evidence-based studies, clinical evaluations, and comprehensive reviews. These contributions come from esteemed professionals and practitioners working in diverse areas of medicine and allied sciences across the globe, demonstrating its commitment to fostering interdisciplinary collaboration and excellence in integrative healthcare.

References

1. Kumar, Kamaljeet. (2024). Scientometric analysis of library & information science research: An international journal: 2015-2022. IP Indian Journal of Library Science and Information Technology, 9(2):98-102.
2. Dey, M. (2022). Mapping of Research Trends of Malaysian Journal of Library and Information Science-A Scientometric Analysis. Library Philosophy and Practice, 1-21.
3. Mondal, Arup Kumar. (2021). Mapping the Research Output of "ISTL" (2010-2020): a single Journal Scientometric study. Library Philosophy and Practice, 6115.
4. Prabahar, P., & Radhakrishnan, N. (2020). Scientometric analysis on scholarly communications of National Institute of Mental Health and Neurosciences (NIMHANS), India 3934.
5. Geetha, S., & Thilagavathy, N. (2018). A Scientometric Study of the "Journal of Postgraduate Medicine". Asian Journal of Information Science and Technology, 8(3), 41-44.
6. Pradhan, Sandeep S. (2020). Scientometric Analysis of Annals of Library and Information Studies (ALIS). International Journal of Science and Research. 2020;9(1): 361-366.

7. Jabeen, M., Yun, L., Rafiq, M., Jabeen, M., & Tahir, M. A. (2015). Scientometric analysis of library and information science journals 2003–2012 using Web of Science. International Information & Library Review, 47(3-4), 71-82.
8. Varma, Akhilesh Kumar (2018). Mapping the Journals of Librarianship and Information Science: A Scientometric Profile. International Journal of Library and Information Studies. 8(1),123-130
9. Advances in Integrative Medicine:https://www.journals.elsevier.com/advances-in-integrative-medicine (Accessed on 27.12.2024)
10. Wikipedia: https://en.wikipedia.org/wiki/ClinicalKey(Accessed on 27.12.2024)

From Text to Context: Exploring the Citation Dynamics in DAE-funded research

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Abstract
This study explores citation context in DAE-funded research publications from 2015 to 2024, analyzing patterns of scholarly engagement across various disciplines and sections of scholarly articles. Over the decade, 15,582 publications received 273,825 citations, with an average of 18 citations per paper. While publication numbers fluctuated, 2024 marked a record high of 1,930 publications, signaling a potential upward trend. Citation contexts were categorized into supporting, contrasting, and mentioning types according to Scite.ai. Results reveal a predominance of mentioning citations (95.42%), suggesting a tendency towards neutral referencing while supporting citations (4.31%) and contrasting citations (0.27%) offered insights into scholarly validation and critique. Disciplinary analysis highlighted contrasting citations' prevalence in dynamic fields like Materials Science and Physics, while supportive citations were most common in Life Sciences & Biomedicine. Sectional analysis based on the IMRaD structure underscored the "Other" category's significance, leading in all citation types and showcasing interdisciplinary engagement. These findings enhance understanding of citation intent, influence, and distribution, offering actionable insights into academic impact and the evolving nature of scholarly discourse.

Keywords
Citation Context Analysis, Scite ai, DAE-funded research, Scholarly Impact.

1. Background

Citations play a significant role by investigating both the historical roots and the novelty of new research (Iqbal et al., 2021) and remain the dominant

measurable unit of credit (Fortunato et al., 2018) in the scholarly world. Citations form the basis of widely used citation impact indicators, including the journal impact factor (Garfield, 1972) and the h-index (Hirsch, 2005), which play a key role in assessing the influence of research output, journals, and individual researchers. Apart from the citation impact indicators, citation analysis has emerged as a foundational method in research evaluations (Moed, 2005). Citation analysis provides insights into how often a particular work is referenced by other researchers, which can indicate its relevance and influence within a specific field. For researchers and policymakers, citation analysis offers guidance on potential areas for future exploration or shifts in focus, fostering strategic decision-making.

Citation indices such as Web of Science and Scopus have significantly contributed to the development of bibliometrics, scientometrics, and quantitative science studies, serving as essential tools for evaluating research productivity and impact (Nicholson et al., 2021). These indices provide comprehensive datasets that track scholarly influence, allowing researchers to assess the significance of academic contributions. However, there is a growing consensus that research evaluation cannot rely solely on publication metrics or citation data (Moretti et al., 2022).

The predominantly quantitative nature of citation analysis has drawn criticism for its focus on only numerical metrics in the assessments of research quality. This approach often neglects the complexities and contextual factors that underpin scholarly contributions. In light of these limitations, concerted efforts have been made to integrate some dimensions into citation analysis, aiming for a more holistic understanding of academic work. This transition has led to several innovative methodologies in citation analysis, including Citation Classification (Roman et al., 2021; Lyu et al., 2021; Qi et al., 2023; Ghosal et al., 2024; Istrate et al., 2024), Sentiment Analysis (Yousif et al., 2019; Aljuaid et al., 2021; Karim et al., 2022), and Citation Content Analysis (Zhang et al., 2013; Ding et al., 2014; Alvarez & Gómez, 2015; An et al., 2017). Further, researchers started categorizing citations based on function (Dong & Schäfer, 2011; Teufel et al., 2006), intent (Roman et al., 2021b), citing behavior (Bornmann & Daniel, 2008; Case & Higgins, 2000), citation polarity (Abu-Jbara et al., 2013), and location of citation (Voos & Dagaev, 1976). These advancements represent a critical evolution in citation analysis, moving beyond mere numerical counts to embrace a more nuanced perspective.

1.1 Citation Context Analysis

Citation context analysis is an advanced methodology that examines the textual context surrounding citations in academic papers (Anderson & Lemken, 2023). Unlike traditional citation analysis, which primarily focuses on the frequency of citations, citation context analysis explores the reasons and implications behind each citation. This approach allows for evaluating the relevance and significance of a cited work within the broader scholarly discourse, offering insights into how ideas are utilized and interpreted across different studies (Cui et al., 2023). Moreover, the implications of citation context analysis extend beyond mere academic curiosity; they have practical applications in evaluating the impact of scholarly articles. For instance, Doslu & Bingol, (2016) highlight that citation context can reveal the main contributions of a publication, as authors often summarize key points of cited articles within the citation context itself. This insight is crucial for understanding how scholarly works influence one another and how they are perceived within their respective fields.

The present study aims to investigate the citation context analysis of research funded by the Department of Atomic Energy, India. By focusing on DAE-funded research, the study seeks to uncover patterns in how cited works are referenced and interpreted by the authors.

1.2 The Department of Atomic Energy, India

Research in atomic energy is crucial for several reasons, primarily because it has the potential to significantly contribute to sustainable energy solutions, combat climate change, and improve energy security. Nuclear energy serves as a low-carbon alternative to fossil fuels, which is essential for reducing greenhouse gas emissions and achieving climate goals globally (*International Atomic Energy Agency*, n.d.). The research in atomic energy is integral to shaping the reality of nuclear programs. It not only informs the technical aspects of nuclear power generation but also addresses the socio-political factors that influence its acceptance and implementation.

The Department of Atomic Energy (DAE) in India was established in 1954 to make India energy-independent and to support the country’s development (*Department of Atomic Energy, India*, n.d.). The country's ambitious plans include increasing the share of nuclear power from approximately 3% to 25% of its total energy capacity by 2050, which aligns with its broader goals of achieving energy security and sustainability (Pati, 2021). The DAE has established a robust network of research institutions that significantly

advance nuclear technology and its applications. Recent data from the Nature Index (covering the period from September 1, 2023, to August 31, 2024), reveals that five DAE institutions rank among the top ten government institutions (in India) in research output, highlighting their substantial (quality) contributions to scientific knowledge and technological innovation (nature.com, 2024). Hence, we found it interesting to understand how the works from DAE-funded research have referenced other sources in their studies.

Therefore, we found it interesting to explore how research funded by the Department of Atomic Energy (DAE) references other sources within their studies. Understanding these citation practices not only sheds light on the intellectual foundations of DAE-funded research but also reveals how these works engage with and contribute to the broader academic discourse. This investigation promises to enhance our comprehension of the scholarly landscape shaped by DAE-funded research and their integration into ongoing discussions in the field.

2. Research Questions

The study aims to address the following questions:

Question 1: What are the trends in publications and citations in DAE-funded research?

Question 2: What is the purpose behind citing other sources?

Question 3: What are the Citation patterns in various Research Areas?

Question 4: How are citations distributed across the Introduction, Methods, Results, Discussion, and Other sections of scholarly articles?

3. Methodology

Our data collection approach is divided into two stages: First, we collected 15,582 records of research publications funded by the Department of Atomic Energy (DAE), India, published between 2015 and 2024, which are indexed in the Web of Science (https://www.webofscience.com/). An advanced search was conducted using the authors' country of affiliation (India) to identify publications authored by Indian researchers. The dataset was then refined to focus specifically on those publications that received funding from DAE and published between 2015 and 2024.

Second, we have collected contextual citation data from Scite.ai (https://scite.ai/) using Digital Object Identifiers (DOIs) of already retrieved publications from the Web of Science. Scite ai is a smart citation index that employs advanced natural language processing techniques to classify citation intent (Nicholson et al., 2021). Scite.ai provides insights into how often and in what context the publications are cited and categorizes

citations as supporting, contrasting, or mentioning, thereby offering a nuanced understanding of their academic impact.

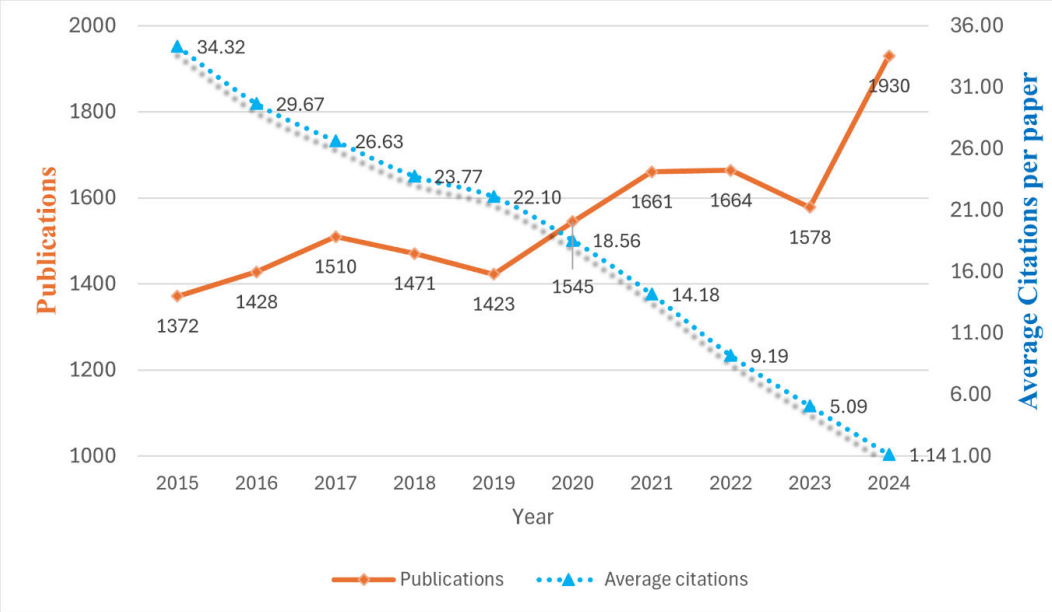
The data was retrieved on December 25, 2024. For data analysis, tabulation, and graphical visualizations, we employed Microsoft Excel and Tableau.

4. Results & Discussion

4.1 Productivity & Average Document Citation

Figure 1 shows how over the past decade (2015-2024), publications and citation average trends were observed in DAE-funded research. In total, there have been 15,582 publications (Table 2), which collectively received 273,825 citations, with an average of 18 citations per paper. The years 2019 & 2023 experienced a decline in publications, with 1423 and 1,578 publications respectively. But 2024 marked a significant rebound, achieving the highest number of publications to date at 1,930, indicating the potential for continued growth in the coming years. The data underscores that as the years progress, publications receive increasing citation averages, reflecting the research influence in their respective fields over the years.

Figure 1. Productivity & Citation Averages



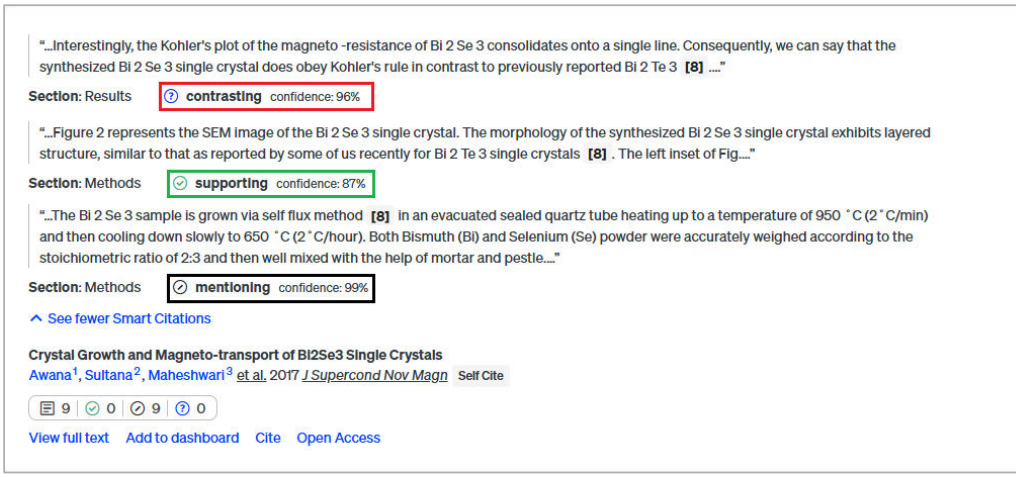
4.2 Motivation Behind Citing Other Studies

To comprehend the motivations behind citing other studies, we analyzed data collected from Scite.ai. The platform categorizes citations into: supporting citations, which provide positive evidence or agreement; contrasting citations, which indicate negative evidence or disagreement;

and mentioning citations, which acknowledge the existence of another study without evaluative context (Nicholson et al., 2021).

The example illustrated in Figure 2 demonstrates how Scite.ai categorizes citation contexts into three distinct categories: supporting, contrasting, and mentioning.

Figure 2. Citations Context Categorization in Scite ai



Further, to proceed with the analysis, Table 2 reveals that authors mostly adopt a neutral stance when citing other studies, as evidenced by the 182,513 (with 95.42%) mentioning citations. This trend suggests a preference among authors to reference prior work without supporting or contradicting it. Such a pattern may reflect a cautious approach to building on existing research, likely to maintain academic neutrality or to avoid controversy.

There were 8,235 (4.31%) supporting citations affirming the findings of other studies. The smaller proportion of supporting citations compared to neutral ones highlights a critical academic practice; while prior work is acknowledged, explicit endorsement is less common. This may reflect a competitive research culture that emphasizes originality and positions authors to highlight their unique contributions. Nevertheless, supporting citations serve as meaningful validations, enhancing the credibility of both the cited and current studies, and fostering collaborative progress in the field.

Finally, 526 (0.27%) contrasting citations indicated disagreement with cited works. Although less frequent, these citations play a vital role in advancing

academic discourse by introducing alternative perspectives and sparking constructive dialogue, driving the evolution of ideas and knowledge.

Table 2. Chronological distribution of Publications & Citations

Year	Publications	Citations	Supporting citations	Contrasting citations	Mentioning citations
2015	1372	47084	1563	123	33403
2016	1428	42366	1436	72	29338
2017	1510	40210	1216	82	27228
2018	1471	34969	1129	62	25003
2019	1423	31450	854	58	20796
2020	1545	28681	905	61	19358
2021	1661	23546	654	34	16166
2022	1664	15293	354	22	8214
2023	1578	8033	116	11	2830
2024	1930	2193	8	1	177
Total	**15582**	**273825**	**8235**	**526**	**182513**

4.3 Supporting, contrasting, and mentioning citations by discipline

We calculated the percentages of citations across various disciplines that fell into the categories of supporting, mentioning, and contrasting (Lund & Shamsi, 2023). To categorize the subjects into broader classifications, we used the WoS classifications, which are broad and allow for comparison across major disciplines, using a standard and familiar taxonomy of these disciplines (Clarivate Analytics, 2024). The results are summarized in Table 3 below, which presents the distribution of citation types across various research areas.

Table 3. Citations Context in various Research Areas

Research Areas	Supporting citations	%	Mentioning citations	%	Contrasting citations	%
Physics	4656	4.98	88527	94.70	291	0.31
Chemistry	2539	4.09	59344	95.64	162	0.26
Astronomy & Astrophysics	1173	4.81	23131	94.89	69	0.28
Materials Science	1461	4.94	28018	94.68	107	0.36
Science & Technology - Other Topics	897	4.63	18418	95.07	54	0.28
Biochemistry & Molecular Biology	349	4.21	7928	95.56	15	0.18
Oncology	112	3.86	2785	95.78	7	0.23
Life Sciences & Biomedicine - Other Topics	98	5.69	1619	93.71	5	0.27
Cell Biology	110	4.09	2573	95.61	4	0.14
Mathematics	66	1.65	3929	98.21	4	0.10

The citations that challenge or contradict the findings of previous research, were more common among Materials Science & Physics. The lack of Contrasting citations is found in Mathematics, while it has more percentage of mentioning citations. The discipline “Life Sciences & Biomedicine - Other Topics” has the highest percentage of supportive citations. On the other hand, along with Mathematics, disciplines like “Oncology”, “Chemistry” & “Biochemistry & Molecular Biology” have high percentages of mentioning citations.

The analysis reveals notable trends in citation practices across various disciplines, particularly highlighting the prevalence of contrasting citations in Materials Science and Physics. These fields demonstrate a robust engagement with existing literature, often challenging or contradicting previous findings, which may reflect the dynamic nature of research in these areas. In contrast, Mathematics shows a striking lack of contrasting citations, suggesting a more stable or established body of knowledge where new findings are less frequently positioned against prior work.

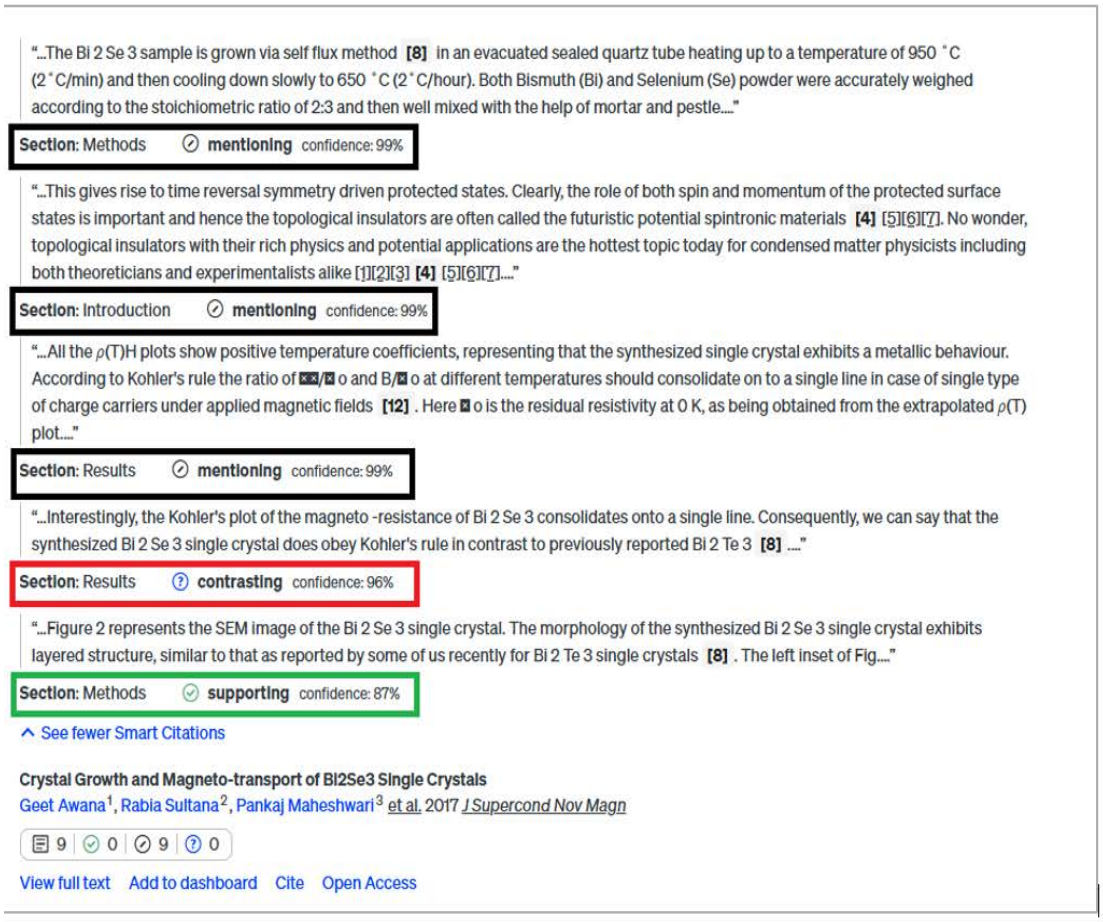
The discipline "Life Sciences & Biomedicine - Other Topics" stands out with the highest percentage of supportive citations, suggesting that research in this area tends to build upon and reinforce existing findings rather than contest them. Alongside Mathematics, fields such as Oncology, Chemistry, and Biochemistry & Molecular Biology also exhibit high percentages of mentioning citations. This pattern indicates a collaborative scholarly environment where researchers frequently reference one another's work without necessarily engaging in direct opposition.

4.4 Citations Context in Sectional Data

Citations within different sections of scholarly writing reflect the depth and maturity of a subject or topic. Analyzing these citations (with context) based on their location in the text provides valuable insights into the contextual relevance of cited works (Sandra & Rupesh, 2024). Scholarly articles typically follow the widely recognized IMRaD structure comprising the Introduction, Methods, Results, and Discussion sections (Sollaci & Pereira, 2004). Scite.ai leverages this structure to categorize citations, systematically assigning them to one of these standard headings (Sandra & Rupesh, 2024). However, some publications deviate from the IMRaD format, employing

alternative or unconventional section headings. For such cases, Scite.ai classifies citations under the category "Other". This categorization system enables Scite to organize citations into five distinct categories: Introduction, Methods, Results, Discussion, and Other, offering a comprehensive overview of citation patterns across diverse scholarly works (Sandra & Rupesh, 2024).
Figure 3 illustrates how Scite.ai categorizes citations across different sections of scholarly writing:

Figure 3. Sectional Citations in Scite ai



The citation patterns in Table 4 emphasize the significance of section-wise citation analysis in understanding scholarly influence. It provides an in-depth view of the distribution of Supporting, Contrasting, and Mentioning citations across five sections of scholarly articles: Introduction, Methods, Discussion, Results, and Other. The analysis of this citation polarity, as

indexed by Scite.ai, offers valuable insights into the intent and influence of citations within each section. A notable observation is the dominance of mentioning citations across all sections, reflecting the widespread visibility and acknowledgment of DAE-funded research. The “Other” section leads with 82,947 mentions, followed by the “Introduction” with 75,916 and the “Results” with 40,830 mentions. This highlights the recognition of these works, even in cases where they are not directly supported or challenged. The prominence of mentioning citations in the “Introduction” emphasizes its foundational role in framing research questions and providing context, while the “Results” section's significant mentions underline its importance in conveying impactful findings.

The “Other” section’s consistent dominance across all citation contexts underscores its importance in interdisciplinary and unconventional research. Its ability to accommodate diverse ideas and methodologies makes it a focal point for scholarly engagement, drawing both positive endorsements and critical evaluations.

Table 4. Citations Context in Sectional Citations

Section	Supporting citations	Contrasting citations	Mentioning citations	Total
Introduction	3227	224	72465	**75916**
Methods	1401	99	24277	**25777**
Discussion	1524	106	30270	**31900**
Results	2091	156	38583	**40830**
Other	3444	257	79246	**82947**

5. Conclusion

The insights from the study can illuminate the dynamics of how research is cited, revealing patterns of influence that may not be immediately apparent through traditional bibliometric methods. For instance, it can uncover the motivations behind citations, such as whether they are employed to support, critique, or build upon previous work, thereby offering a more comprehensive view of scholarly engagement. Furthermore, this methodology can highlight emerging trends and areas of innovation, enabling researchers and policymakers to identify fields that are burgeoning with potential or those that have reached a saturation point.

As the landscape of academia continues to evolve, understanding the intricacies of citation dynamics becomes increasingly crucial. It equips stakeholders with the knowledge necessary to make informed decisions regarding research priorities and funding allocations. By recognizing which domains are ripe for exploration and which have established foundations, researchers can strategically navigate the complexities of academic inquiry, ultimately contributing to the advancement of knowledge and the fostering of innovation. Its significance in the academic ecosystem cannot be overstated, as it provides a lens through which the interconnectedness of research can be appreciated and leveraged for the advancement of science and society at large.

References

1. Abu-Jbara, A., Ezra, J., & Radev, D. (2013). Purpose and Polarity of Citation: Towards NLP-based Bibliometrics. In L. Vanderwende, H. Daumé III, & K. Kirchhoff (Eds.), *Proceedings of the 2013 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies* (pp. 596–606). Association for Computational Linguistics. https://aclanthology.org/N13-1067
2. Aljuaid, H., Iftikhar, R., Ahmad, S., Asif, M., & Tanvir Afzal, M. (2021). Important citation identification using sentiment analysis of in-text citations. *Telematics and Informatics*, *56*, 101492. https://doi.org/10.1016/j.tele.2020.101492
3. Alvarez, M., & Gómez, J. (2015). Survey about Citation Content Analysis: Tasks, Techniques and Resources. *Natural Language Engineering*, *1*. https://doi.org/10.1017/S1351324915000388
4. An, J., Kim, N., Kan, M., Chandrasekaran, M. K., & Song, M. (2017). Exploring characteristics of highly cited authors according to citation location and content. *Journal of the Association for Information Science and Technology*, *68*(8), 1975–1988. https://doi.org/10.1002/asi.23834
5. Anderson, M. H., & Lemken, R. K. (2023). Citation Context Analysis as a Method for Conducting Rigorous and Impactful Literature Reviews. *Organizational Research Methods*, *26*(1), 77–106. https://doi.org/10.1177/1094428120969905
6. Bornmann, L., & Daniel, H.-D. (2008). What do citation counts measure? A review of studies on citing behavior. *Journal of*

Documentation, *64*(1), 45–80. https://doi.org/10.1108/00220410810844150
7. Case, D. O., & Higgins, G. M. (2000). How can we investigate citation behavior? A study of reasons for citing literature in communication. *Journal of the American Society for Information Science*, *51*(7), 635–645. https://doi.org/10.1002/(SICI)1097-4571(2000)51:7<635::AID-ASI6>3.0.CO;2-H
8. Clarivate Analytics. (2024). Web of Science Core Collection Help. *Web of Science Core Collection Help*. https://images.webofknowledge.com/images/help/WOS/hp_research_areas_easca.html
9. Cui, Y., Wang, Y., Liu, X., Wang, X., & Zhang, X. (2023). Multidimensional scholarly citations: Characterizing and understanding scholars' citation behaviors. *Journal of the Association for Information Science and Technology*, *74*(1), 115–127. https://doi.org/10.1002/asi.24709
10. *Department of Atomic Energy, India*. (n.d.). Retrieved December 25, 2024, from https://dae.gov.in/
11. Ding, Y., Zhang, G., Chambers, T., Song, M., Wang, X., & Zhai, C. (2014). Content-based citation analysis: The next generation of citation analysis. *Journal of the Association for Information Science and Technology*, *65*(9), 1820–1833. https://doi.org/10.1002/asi.23256
12. Dong, C., & Schäfer, U. (2011). Ensemble-style Self-training on Citation Classification. In H. Wang & D. Yarowsky (Eds.), *Proceedings of 5th International Joint Conference on Natural Language Processing* (pp. 623–631). Asian Federation of Natural Language Processing. https://aclanthology.org/I11-1070
13. Doslu, M., & Bingol, H. O. (2016). Context sensitive article ranking with citation context analysis. *Scientometrics*, *108*(2), 653–671. https://doi.org/10.1007/s11192-016-1982-6
14. Fortunato, S., Bergstrom, C. T., Börner, K., Evans, J. A., Helbing, D., Milojević, S., Petersen, A. M., Radicchi, F., Sinatra, R., Uzzi, B., Vespignani, A., Waltman, L., Wang, D., & Barabási, A.-L. (2018). Science of science. *Science*, *359*(6379), eaao0185. https://doi.org/10.1126/science.aao0185
15. Garfield, E. (1972). Citation Analysis as a Tool in Journal Evaluation: Journals can be ranked by frequency and impact of citations for

science policy studies. *Science*, *178*(4060), 471–479. https://doi.org/10.1126/science.178.4060.471

16. Ghosal, T., Varanasi, K. K., & Kordoni, V. (2024). A Deep Multi-Tasking Approach Leveraging on Cited-Citing Paper Relationship For Citation Intent Classification. *Scientometrics*, *129*(2), 767–783. https://doi.org/10.1007/s11192-023-04811-5
17. Hirsch, J. E. (2005). An index to quantify an individual's scientific research output. *Proceedings of the National Academy of Sciences*, *102*(46), 16569–16572. https://doi.org/10.1073/pnas.0507655102

International Atomic Energy Agency. (n.d.). Retrieved December 24, 2024, from https://www.iaea.org/

18. Iqbal, S., Hassan, S.-U., Aljohani, N. R., Alelyani, S., Nawaz, R., & Bornmann, L. (2021). A decade of in-text citation analysis based on natural language processing and machine learning techniques: An overview of empirical studies. *Scientometrics*, *126*(8), 6551–6599. https://doi.org/10.1007/s11192-021-04055-1
19. Istrate, A.-M., Fisher, J., Yang, X., Moraw, K., Li, K., Li, D., & Klein, M. (2024). Scientific Software Citation Intent Classification Using Large Language Models. In G. Rehm, S. Dietze, S. Schimmler, & F. Krüger (Eds.), *Natural Scientific Language Processing and Research Knowledge Graphs* (Vol. 14770, pp. 80–99). Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-65794-8_6
20. Karim, M., Missen, M. M. S., Umer, M., Sadiq, S., Mohamed, A., & Ashraf, I. (2022). Citation Context Analysis Using Combined Feature Embedding and Deep Convolutional Neural Network Model. *Applied Sciences*, *12*(6), 3203. https://doi.org/10.3390/app12063203
21. Lund, B., & Shamsi, A. (2023). Examining the use of supportive and contrasting citations in different disciplines: A brief study using Scite (scite.ai) data. *Scientometrics*, *128*(8), 4895–4900. https://doi.org/10.1007/s11192-023-04781-8
22. Lyu, D., Ruan, X., Xie, J., & Cheng, Y. (2021). The classification of citing motivations: A meta-synthesis. *Scientometrics*, *126*(4), 3243–3264. https://doi.org/10.1007/s11192-021-03908-z
23. Moed, H. F. (2005). *Citation Analysis in Research Evaluation* (Vol. 9). Springer-Verlag. https://doi.org/10.1007/1-4020-3714-7
24. Moretti, P. F., Moretti, L., & Guerrini, M. (2022). Europe reforms its research evaluation and management. *Nature*, *602*(7898), 578–578. https://doi.org/10.1038/d41586-022-00477-w

nature.com. (2024). *Nature Index: Institution Tables*. https://www.nature.com/nature-index/institution-outputs/generate/all/countries-India/government

25. Nicholson, J. M., Mordaunt, M., Lopez, P., Uppala, A., Rosati, D., Rodrigues, N. P., Grabitz, P., & Rife, S. C. (2021). scite: A smart citation index that displays the context of citations and classifies their intent using deep learning. *Quantitative Science Studies*, *2*(3), 882–898. https://doi.org/10.1162/qss_a_00146
26. Pati, S. (2021). India's sustainable energy future and the challenges for optimised integration of variable energy sources. *International Journal of Energy Technology and Policy*, *17*(1), 98. https://doi.org/10.1504/IJETP.2021.111927
27. Piotrowski, M. (2020). *Ain't No Way Around It: Why We Need to Be Clear About What We Mean by "Digital Humanities."* OSF. https://doi.org/10.31235/osf.io/d2kb6
28. Qi, R., Wei, J., Shao, Z., Li, Z., Chen, H., Sun, Y., & Li, S. (2023). Multi-task learning model for citation intent classification in scientific publications. *Scientometrics*, *128*(12), 6335–6355. https://doi.org/10.1007/s11192-023-04858-4
29. Roman, M., Shahid, A., Khan, S., Koubaa, A., & Yu, L. (2021a). Citation Intent Classification Using Word Embedding. *IEEE Access*, *9*, 9982–9995. https://doi.org/10.1109/ACCESS.2021.3050547
30. Roman, M., Shahid, A., Khan, S., Koubaa, A., & Yu, L. (2021b). Citation Intent Classification Using Word Embedding. *IEEE Access*, *9*, 9982–9995. IEEE Access. https://doi.org/10.1109/ACCESS.2021.3050547
31. Sandra, M. K., & Rupesh, K. A. (2024). Citation Context and Intent Analysis of Scholarly Literature on Digital Humanities. *Digital Landscape in Library 4.0*, 689–697. https://www.researchgate.net/publication/386426997_Citation_Context_and_Intent_Analysis_of_Scholarly_Literature_on_Digital_Humanities
32. Sollaci, L. B., & Pereira, M. G. (2004). The introduction, methods, results, and discussion (IMRAD) structure: A fifty-year survey. *Journal of the Medical Library Association: JMLA*, *92*(3), 364–367.
33. Teufel, S., Siddharthan, A., & Tidhar, D. (2006). An annotation scheme for citation function. *Proceedings of the 7th SIGdial Workshop on Discourse and Dialogue - SigDIAL '06*, 80. https://doi.org/10.3115/1654595.1654612

34. Voos, H., & Dagaev, K. S. (1976). ARe All Citations Equal? Or, Did We Op. Cit. Your Idem? *Journal of Academic Librarianship*, *1*(6), 19–21.
35. Yousif, A., Niu, Z., Tarus, J. K., & Ahmad, A. (2019). A survey on sentiment analysis of scientific citations. *Artificial Intelligence Review*, *52*(3), 1805–1838. https://doi.org/10.1007/s10462-017-9597-8
36. Zhang, G., Ding, Y., & Milojević, S. (2013). Citation content analysis (CCA): A framework for syntactic and semantic analysis of citation content. *Journal of the American Society for Information Science and Technology*, *64*(7), 1490–1503. https://doi.org/10.1002/asi.22850

Authorship Pattern and Collaboration Coefficient of the Applied and Environmental Microbiology Journal During 2009-2018

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Abstract
This study offers an extensive analysis of publication trends in the journal Applied and Environmental Microbiology from 2009 to 2018, focusing on productivity, authorship patterns, and collaborative dynamics. By examining annual publication data, authorship distribution, collaboration indices, and growth metrics, this research aims to provide insights into the evolving landscape of microbiological research. The data reveals a peak in publication productivity in 2011 with 1,142 articles, followed by a noticeable decline in output towards the end of the study period. Authorship patterns show a clear shift towards multi-authored papers, with a marked increase in collaborative research, as evidenced by the steady rise in the Collaboration Index and Collaborative Coefficient (CC). The Modified Collaborative Coefficient (MCC) further confirms this trend, highlighting a robust emphasis on multi-authorship. The Relative Growth Rate (RGR) and Doubling Time (Dt) metrics indicate an initial rapid growth phase in literature output, which has gradually slowed, reflecting a maturation of the field. This study underscores the growing complexity and interdisciplinary nature of microbiological research and provides critical insights for researchers and policymakers to navigate the evolving dynamics of scientific collaboration and publication.

Keywords
Collaboration Index, Collaboration Coefficient, Modified Collaboration Coefficient, Relative Growth Rate, Co-authorship Index.

Introduction

The field of Applied and Environmental Microbiology has experienced significant evolution over the past decade, driven by advances in research techniques, interdisciplinary collaborations, and growing global challenges. Understanding these changes is crucial for grasping the dynamics of scientific productivity and collaboration within this domain. This study focuses on a detailed analysis of publication trends in the Applied and Environmental Microbiology journal from 2009 to 2018.

During this period, the journal has seen a fluctuation in publication volumes, with notable peaks and troughs in annual output. These fluctuations offer a lens through which we can examine shifts in research focus, author contributions, and the nature of collaborative efforts. The analysis encompasses various metrics including year-wise productivity, authorship distribution, and collaboration indices to provide a comprehensive overview of the journal's research landscape.

In particular, the study delves into the productivity trends, illustrating a peak in 2011 followed by a gradual decline towards the end of the decade. This trend is further explored through the Collaboration Index, which reflects the extent of collaborative engagement among researchers. Additionally, the study investigates authorship patterns, highlighting a marked preference for multi-authored papers and assessing changes in collaboration levels through measures such as the Collaboration Coefficient (CC) and the Modified Collaboration Coefficient (MCC).

The Relative Growth Rate (RGR) and Doubling Time (Dt) metrics are also examined to understand the growth trajectory of literature output in the field. The RGR initially indicates a period of rapid expansion, which then slows down, suggesting a maturation phase of the field.

By offering insights into these evolving trends, this study aims to enhance our understanding of the dynamics of scientific research and collaboration in Applied and Environmental Microbiology. Such insights are essential for researchers, policymakers, and academic institutions to navigate and adapt to the shifting landscape of scientific inquiry in this crucial field.

Literature review

The Collaboration Coefficient is a measure used to quantify the degree of collaboration in research. It goes beyond simply looking at the mean number of authors per paper or the proportion of multiple-authored papers. This coefficient combines the merits of both measures and provides a more comprehensive view of collaboration within a discipline (Ajiferuke et al., 1988), (Savanur&Srikanth, 2009).

It reflects the level of collaboration by considering various aspects of research collaboration, such as the number of authors per paper and the prevalence of multiple-authored papers. By using this measure, researchers can better understand and evaluate the extent to which collaborative efforts are contributing to research within a specific field or discipline. (Ajiferuke et al., 1988), (Savanur&Srikanth, 2009).

The collaboration coefficient (CC) is a measure of collaboration in research that reflects both the mean number of authors per paper and the proportion of multi-authored papers. It ranges between 0 and 1, with 0 indicating purely single-authored papers and 1 indicating maximally authored papers. However, a modified collaboration coefficient (MCC) has been proposed to improve its performance in cases where all papers have all authors as co-authors. The MCC takes into account the number of authors per paper and the proportion of multi-authored papers, providing a more accurate measure of collaboration.(Manoj Kumar Verma et al., 2019).

The Collaborative Coefficient (CC) is a measure that combines the mean number of authors per paper with the proportion of multi-authored papers to assess the degree of collaboration in research, addressing the inadequacies of using either metric alone(Ajiferuke et al., 1988b).

A Modified Collaborative Coefficient (MCC) has been proposed to improve upon the CC by ensuring that the measure reaches 1 for collections where all papers are maximally authored, addressing a limitation of the original CC (Savanur&Srikanth, 2009).

The concept of collaborative consumption (CC), while distinct from the collaboration coefficient in research, also emphasizes the multidimensional nature of collaboration, focusing on consumer roles, collaboration intensity, and the range of stakeholders in collaborative exchanges (Ertz et al., 2018).

A triadic framework for collaborative consumption (CC) identifies motives, activities, and resources & capabilities of actors within a collaborative exchange, highlighting the complexity and dynamics of collaboration in consumption contexts (Benoit et al., 2017).

Comparative studies of various measures of research collaboration, including the CC, suggest that the degree of collaboration and the revised collaborative coefficient are superior measures for bibliometric studies, with implications for research productivity and impact (Liao & Yen, 2012).

Two new indices, the RC-Index and the CC-Index, have been developed to quantify the collaboration activities of researchers and scientific communities, taking into account the structure of collaboration networks,

the number of collaborations, and the productivity of co-authors (Abbasi et al., 2009).

Objectives

- To analysis the year-wise distribution of the publication
- To identify authorship distribution of the publication
- To analysis the Collaboration Index of the authors
- To know the Collaboration Co-efficient and Modified Collaboration Coefficient
- To analysis the Co-authorship Index
- To find out the Relative Growth Rate and Double Time of publications
-

Scope & limitations

This research paper investigates the trends in authorship and productivity within the journal Applied and Environmental Microbiology from 2009 to 2018. The study encompasses a decade of publication data to analyze shifts in the volume of research output, trends in authorship patterns, and the degree of collaboration among researchers. Key metrics such as the year-wise productivity, authorship distribution, Collaboration Index, Collaborative Coefficient (CC), Modified Collaborative Coefficient (MCC), Relative Growth Rate (RGR), and Doubling Time (Dt) are examined to provide a comprehensive overview of the journal's research dynamics. This analysis aims to offer insights into the evolving nature of scientific collaboration and the growth trajectory of research in the field of applied and environmental microbiology.

Methodology

The study employs a quantitative approach, utilizing data from the Applied and Environmental Microbiology journal spanning from 2009 to 2018. The data was collected from the journal's archives, including publication records and article metadata. Specifically, information on the number of articles published annually, authorship details, and the total number of authors per paper was extracted. website (https://journals.asm.org/journal/aem.) is used. A total of 8948 research papers were published during the period of study. To analyse the Collaboration Co-efficient and Modified Collaboration Coefficient, Co-authorship Index, Relative Growth Rate and Double Time of publications, a particular formula was used and these formulae are given

with appropriate tables in the analysis part. The data were analysed and tabulated with the use of MS-Excel application software.

Data analysis

The results of the calculations are analyzed to identify trends, patterns, and shifts in authorship and productivity. The Collaboration Index, CC, and MCC are compared across years to assess changes in collaboration levels. The RGR and Dt are analyzed to determine the growth rate and maturation of the journal's literature.

Table no. 1 year wise growth of Literature

Sr. No.	Year	Articles	Percentage
1	2009	1024	11.53
2	2010	1066	12.01
3	2011	1142	12.86
4	2012	1134	12.77
5	2013	972	10.95
6	2014	826	9.30
7	2015	1029	11.59
8	2016	591	6.66
9	2017	563	6.34
10	2018	532	5.99
Total		**8879**	100

Table no. 1 presents the year-wise productivity of the journal Applied and Environmental Microbiology from 2009 to 2018, detailing the number of articles published each year along with their respective percentages of the total output. Over this decade, the journal published a cumulative total of 8,879 articles.The data reveals fluctuations in annual publication numbers, with a notable peak in 2011 when 1,142 articles were published, representing 12.86% of the total output for the decade. This peak was followed by a slight decline in subsequent years, but the publication numbers remained relatively high until 2016. From 2016 onwards, there was a pronounced decline in productivity, with the number of articles dropping to 591 in 2016 (6.66%), 563 in 2017 (6.34%), and 532 in 2018 (5.99%). The overall trend indicates a significant decrease in publication volumes towards the end of the period, contrasting with the earlier years where productivity

was higher. This decline suggests a potential shift in research focus, publication practices, or external factors affecting the journal's output in its later years.

Year-Wise Authorship Distribution of the Publication

Table no. 2 Authorship pattern year wise

Sr.No.	Year	Single Author	Two Author	Three Author	Four Author	More Than Four Author	Total
1	2009	141	73	50	45	715	1024
2	2010	129	70	63	45	759	1066
3	2011	156	97	65	36	788	1142
4	2012	122	86	57	55	814	1134
5	2013	131	74	68	75	624	972
6	2014	110	96	85	57	478	826
7	2015	117	101	83	75	653	1029
8	2016	138	107	67	67	212	591
9	2017	113	107	90	75	178	563
10	2018	109	133	85	71	134	532
Total		**1266**	**944**	**713**	**601**	**5355**	**8879**

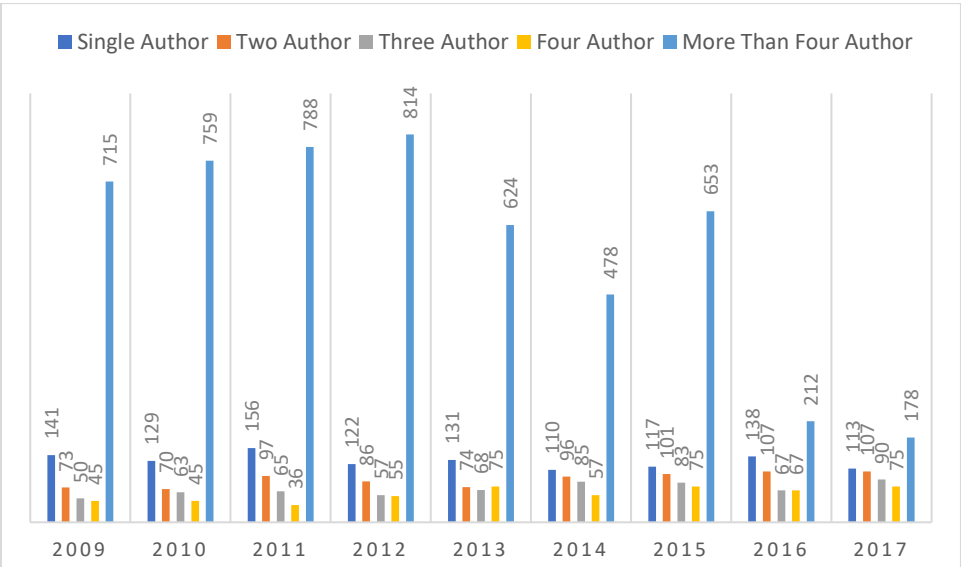

Figure no. 1 Authorship pattern year wise

The table 2 and figure no. 1 presents of the year-wise authorship distribution for publications in the journal Applied and Environmental Microbiology from 2009 to 2018. The table categorizes the number of articles based on the number of authors involved, ranging from single-author papers to those with more than four authors.

The data indicates a clear trend towards multi-authored publications throughout the decade. Single-author papers were the least common, contributing a mere 1.4% of the total articles (1,266 out of 8,879). In contrast, articles with more than four authors dominated the output, accounting for 60.3% of the total publications (5,355 out of 8,879). This trend underscores a strong preference for collaborative research in the field. The peak in multi-author papers occurred in 2011, with 788 articles involving more than four authors. In contrast, the proportion of single-author contributions and two-author papers remained relatively low and consistent across the years. Notably, there was a significant drop in multi-author papers in 2016, reflecting a shift in authorship patterns, possibly due to changes in research focus or publication practices. Overall, the table highlights the evolving nature of authorship in the journal, with a clear and sustained emphasis on collaborative research efforts.

Collaboration Index

Collaboration Index is a mean number of authors per joint paper. For this analysis, the single authored papers which are equal to one always are omitted. The mean number of authors per joint authored paper means collaboration index is shown in table no. 4.30.

Table no. 3 Collaboration Index

Sr. No.	Year	No of paper y	No. of Author x	Collaboration Index=NA/NP
1	2009	1024	5363	0.19
2	2010	1066	5814	0.18
3	2011	1142	6385	0.18
4	2012	1134	6300	0.18
5	2013	972	5579	0.17
6	2014	826	4881	0.17
7	2015	1029	6274	0.16
8	2016	591	3680	0.16
9	2017	563	3635	0.15
10	2018	532	6606	0.08
Total		**8879**	**54517**	**1.64**

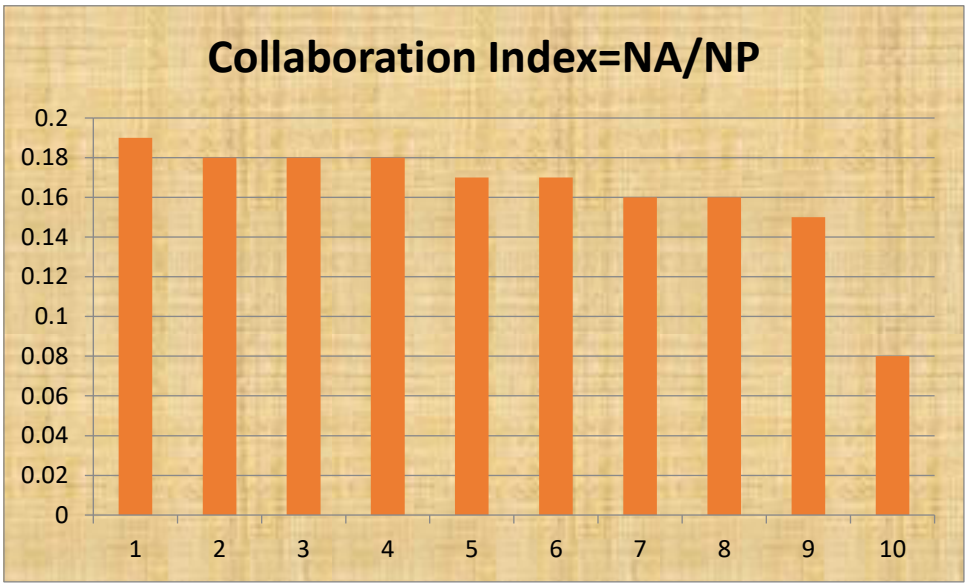

Figure no. 2 Collaboration Index

The table no.3 and figure no2 illustrates the Collaboration Index for publications in the Applied and Environmental Microbiology journal from 2009 to 2018. The Collaboration Index is calculated as the mean number of authors per joint-authored paper, excluding single-authored papers. Over the ten-year period, the journal published a total of 8,879 papers with 54,517 authors, resulting in a cumulative Collaboration Index of 1.64. Yearly analysis shows a relatively consistent Collaboration Index from 2009 to 2017, ranging between 0.15 and 0.19, indicating a stable level of co-authorship. Notably, the year 2018 exhibits a significant drop in the Collaboration Index to 0.08, despite a high number of authors (6,606) relative to the number of papers (532). This suggests an unusual year where a small number of papers had a very high author count, possibly reflecting large collaborative projects or special issues. Overall, the data suggests a steady trend of co-authorship in the journal, with slight variations across the years.

Collaboration Coefficient and Modified Collaboration Coefficient

According to Ajiferuke et al. (1988) who have shown the mean number of author per paper, the proportion of multiple authorship as a measure of degree of collaboration in a discipline, is inadequate. There for, they have

proposed an measure combining some of the merits of both measure into what is known as collaborative coefficient.

Suppose if a paper has a single author, the author receives one credit; if two each receives ½ credits. In ferneral, if we have 'n' author each receive 1/n credits. Hence, the average credit awarded to each author of a random paper is E[1/n], a value which lies between 0 and 1, if '0' is to correspond to single authorship, than the CC is defined as:

CC = 1-E [1/n]

= 1- (1/j) p (N=j)

And its sum ∑ rate = 1-f1+(1/2)f2+(1/2)f3+…(1/k)fk N

Table No. 4The Collaborative co-efficient of publications

Sr.No.	Year	Single Author	Two Author	Three Author	Four Author	More Than Four Author	Total	CC
1	2009	141	73	50	45	715	1024	0.54
2	2010	129	70	63	45	759	1066	0.56
3	2011	156	97	65	36	788	1142	0.54
4	2012	122	86	57	55	814	1134	0.59
5	2013	131	74	68	75	624	972	0.62
6	2014	110	96	85	57	478	826	0.64
7	2015	117	101	83	75	653	1029	0.63
8	2016	138	107	67	67	212	591	0.95
9	2017	113	107	90	75	178	563	0.65
10	2018	109	133	85	71	134	532	0.66
Total		**1266**	**944**	**713**	**601**	**5355**	**8879**	**0.85**

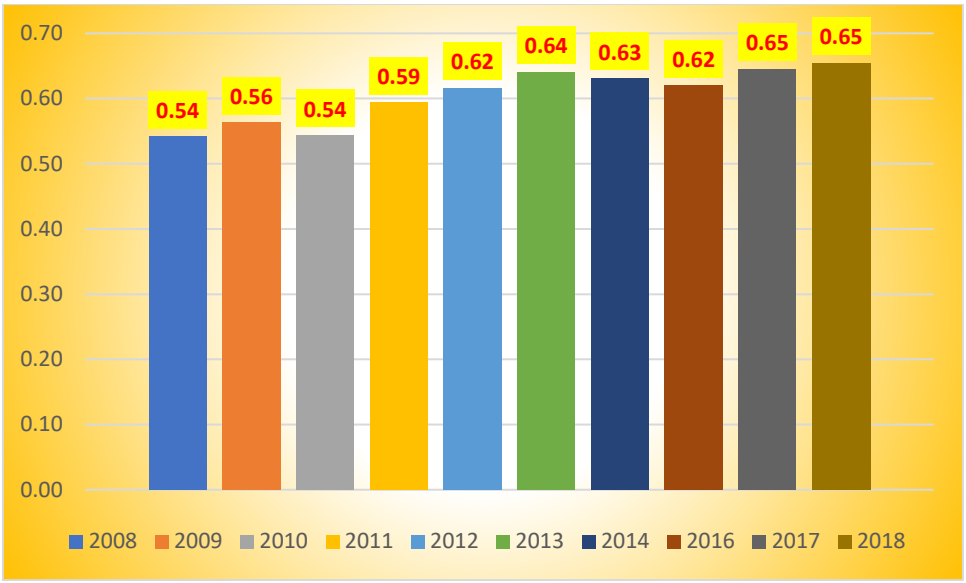

Figure No. 3 The Collaborative co-efficient of publications

The table 4 and figure no 3presents the Collaborative Coefficient (CC) of publications in the Applied and Environmental Microbiology journal from 2009 to 2018, reflecting the extent of collaboration among authors. The CC is calculated based on the distribution of articles across different authorship patterns, ranging from single-author papers to those with more than four authors. Over the ten-year period, a total of 8,879 articles were published, with the CC showing an overall trend toward increasing collaboration.

In 2009, the CC was 0.54, with 141 single-author papers and the majority of articles (715) involving more than four authors. The CC remained relatively stable between 0.54 and 0.64 from 2009 to 2015, indicating moderate collaboration levels. However, in 2016, there was a significant increase in the CC to 0.95, suggesting a sharp rise in collaborative efforts, even though the total number of publications dropped to 591. This spike in the CC was driven by a reduction in single-author papers and a concentration of articles with higher author counts.

The following years, 2017 and 2018, saw the CC stabilize around 0.65 and 0.66, respectively, reflecting continued strong collaboration, with a notable number of articles involving two to four authors. The overall CC for the entire period is 0.85, highlighting the journal's trend towards multi-authored publications and indicating a high level of collaboration among researchers in the field of applied and environmental microbiology.

The Modified Collaborative co-efficient of publication

The modified collaboration coefficient (MCC) counted by the formula which is suggested by Savanur and Srikanth (2010) as given below:

$$MCC = \left(\frac{N}{N-1}\right)\left\{1-\frac{\sum_{j=1}^{A}\left(\frac{1}{j}\right)fj\ A\ j=1}{N}\right\}$$

$$MCC = \left(\frac{557}{557-1}\right)\left\{1-\frac{\left(\frac{1}{1}x141\right)+\left(\frac{1}{2}73\right)+\left(\frac{1}{3}x50\right)+\left(\frac{1}{4}x45\right)+\left(\frac{1}{5}x248\right)}{557}\right\}$$

$$=(1.002)\left\{1-\frac{255.02}{557}\right\}$$

$$=(1.002)\{1-0.46\}$$

$$=(1.002)\{0.54\}$$

$$=1.002 * 0.54$$

$$=0.54$$

Table No.- 5 Modified Collaboration Coefficient

Sr.No.	Year	Single Author	Two Author	Three Author	Four Author	More Than Four Author	Total	MCC
1	2009	141	73	50	45	715	1024	0.54
2	2010	129	70	63	45	759	1066	0.56
3	2011	156	97	65	36	788	1142	0.54
4	2012	122	86	57	55	814	1134	0.59
5	2013	131	74	68	75	624	972	0.62
6	2014	110	96	85	57	478	826	0.64
7	2015	117	101	83	75	653	1029	0.63
8	2016	138	107	67	67	212	591	0.95
9	2017	113	107	90	75	178	563	0.65
10	2018	109	133	85	71	134	532	0.66
Total		**1266**	**944**	**713**	**601**	**5355**	**8879**	**0.85**

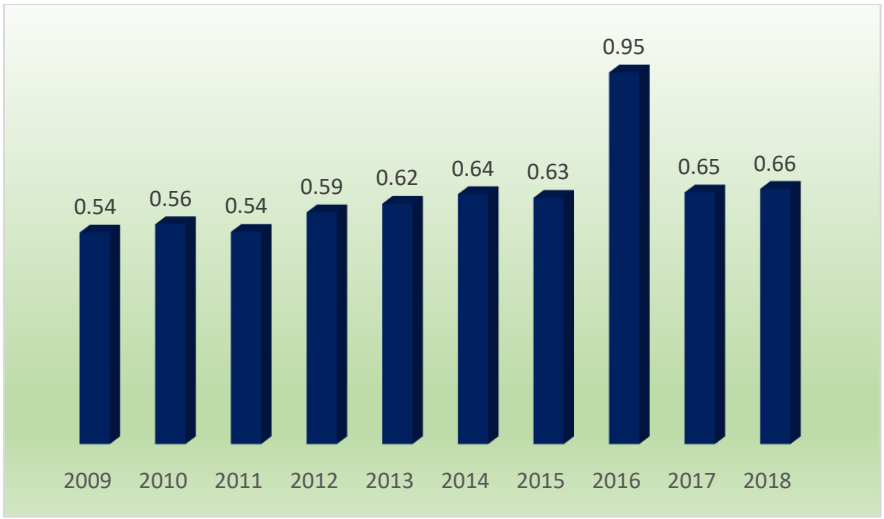

Figure no. **4. Modified Collaboration Coefficient**

The table no.5 and figure no. 4 present the Modified Collaboration Coefficient (MCC) of publications in the Applied and Environmental Microbiology journal from 2009 to 2018. The MCC, calculated using the formula proposed by Savanur and Srikanth (2010), provides a refined measure of collaboration by accounting for the distribution of authorship across different categories.

Over this ten-year period, the MCC values reflect the degree of collaborative authorship within the journal. In 2009, the MCC was 0.54, indicating a moderate level of collaboration, with 141 single-author papers and 715 papers authored by more than four authors. The MCC remained relatively consistent through 2011, fluctuating between 0.54 and 0.56, reflecting steady collaboration levels.

In 2012, the MCC increased to 0.59 and continued to rise, reaching 0.64 in 2014 and 0.63 in 2015. This upward trend suggests a growing emphasis on collaborative research during these years. A notable spike in the MCC occurred in 2016, where it jumped to 0.95, despite a lower total publication count (591). This dramatic increase suggests a strong shift towards multi-authored papers, particularly those with more than four authors.

The MCC slightly decreased in 2017 and 2018, with values of 0.65 and 0.66, respectively, indicating sustained high levels of collaboration. The overall MCC for the entire period is 0.85, highlighting a consistent trend towards collaboration in research within the field of applied and environmental microbiology. This data underscores the importance of teamwork and multi-authorship in advancing scientific knowledge in this domain.

Relative Growth Rate and Double Time of publication

The growth of literature of Applied and Environmental Microbiology journal research is being measured with the Scientometric indicators Relative Growth Rate (RGR) and Doubling Time (Dt). The RGR is obtained with the following formula used by Karpagam R, et.al. (2011);

$$R(P) = \frac{Loge2p - Loge1p}{2T - 1T}$$

Here R (P) = Relative Growth Rate of articles over the specific period of time.

Log_e 1P = Log of initial number of articles.

Log_e 2P = log of final number of articles

2T – 1T = the unit difference between the initial time and final times.

The Dt. is obtained with the following formula;

$$Dt = \frac{0.693}{R}$$

Table no.6 Relative Growth Rate & Doubling Time for Publication

Sr.No.	Year	TP	Cumulative Paper	Loge 1p	Loge 2p	[R (P)]	Mean [R (P)]	[Dt(p)]	Mean [Dt (p)]
1	2009	1024	1024		1.11		1.4128		2.0782
2	2010	1066	2j090	6.93	7.64	0.71		0.97	
3	2011	1142	3232	7.64	8.08	0.44		1.59	
4	2012	1134	4366	8.08	8.38	0.30		2.30	
5	2013	972	5338	8.38	8.58	0.20		3.45	
6	2014	826	6164	8.58	8.73	0.14	0.1018	4.82	7.8443
7	2015	1029	7193	8.73	8.88	0.15		4.49	
8	2016	591	7784	8.88	8.96	0.08		8.78	
9	2017	563	8347	8.96	9.03	0.07		9.92	
10	2018	532	8879	9.03	9.09	0.06		11.22	

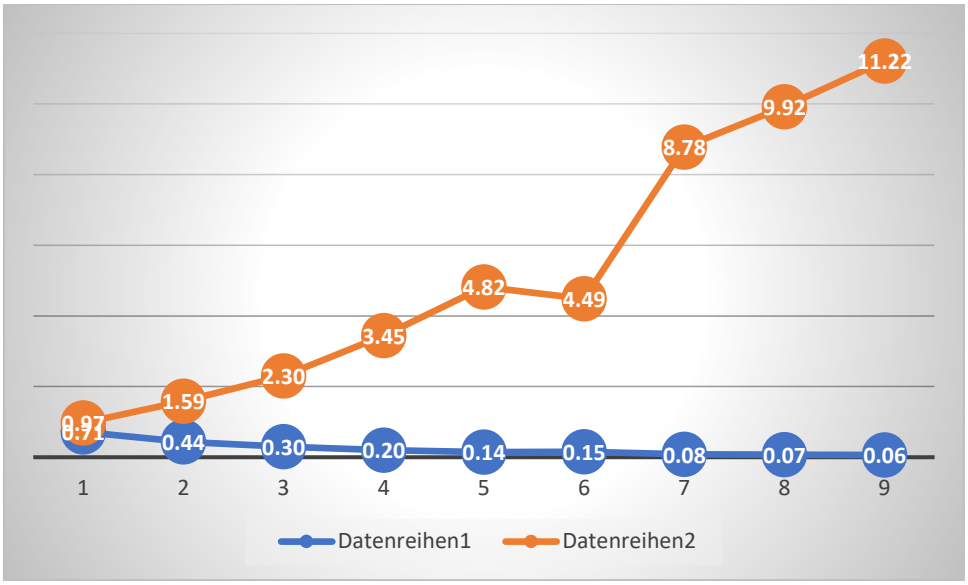

Figure No. 5 Relative Growth Rate and Doubling Time for publication

The analysis of the growth of literature in Applied and Environmental Microbiology journal research from 2009 to 2018 reveals significant trends through the Scientometric indicators of Relative Growth Rate (RGR) and Doubling Time (Dt). Initially, there was a period of rapid expansion, particularly noticeable in 2010, where the RGR peaked at 0.71, indicating a substantial increase in publications compared to the previous year. However, this rapid growth did not sustain, as the RGR gradually declined over the years, reaching its lowest point of 0.06 in 2018. This declining RGR suggests a slowing pace in the expansion of research output within the field. As the RGR decreased, the Doubling Time (Dt) correspondingly increased, reflecting the growing time required for the publication count to double. In 2010, with a high RGR, the Dt was just 0.97 years, meaning the literature output was doubling in less than a year. By 2018, the Dt had stretched to 11.22 years, signalling a significant slowdown in new publications. These trends indicate that the field of Applied and Environmental Microbiology journal research may be reaching a maturation phase, with a decreasing rate of new contributions. This data is crucial for researchers and policymakers, offering insights into the field's developmental trajectory and highlighting the need for strategic focus on sustaining research innovation and addressing potential saturation.

Conclusion

The comprehensive analysis of the Applied and Environmental Microbiology journal from 2009 to 2018 reveals a notable evolution in research

productivity, authorship patterns, and collaborative efforts. The year-wise productivity data shows a peak in publication output around 2011, followed by a gradual decline in subsequent years. This trend is further underscored by the Relative Growth Rate (RGR) and Doubling Time (Dt) metrics, which indicate an initial period of rapid expansion in research output that has slowed considerably over the decade. The decreasing RGR and increasing Dt suggest that the field is approaching a stage of maturity, with a slower rate of new publications emerging annually.

The analysis of authorship patterns and collaboration indices highlights a strong trend towards multi-authorship and collaborative research. The high Collaborative Coefficient (CC) and Modified Collaboration Coefficient (MCC) reflect a consistent emphasis on teamwork and co-authored papers, with a notable increase in collaborative efforts, especially around 2016. Despite a decline in overall publication numbers in recent years, the sustained high levels of collaboration demonstrate the importance of collective research endeavours in advancing scientific knowledge in this domain. Overall, these findings provide valuable insights for future research strategies, emphasizing the need for continued innovation and collaboration to navigate the evolving landscape of applied and environmental microbiology.

References

1. Abbasi, A., Altmann, J., & Hwang, J. (2009). Evaluating scholars based on their academic collaboration activities: Two indices, the rc-index and the cc-index, for quantifying collaboration activities of researchers and scientific communities. Scientometrics, 83(1), 1–13. https://doi.org/10.1007/s11192-009-0139-2
2. Ajiferuke, I., Burell, Q., & Tague, J. (1988a). Collaborative coefficient: A single measure of the degree of collaboration in research. Scientometrics, 14(5-6), 421–433. https://doi.org/10.1007/bf02017100
3. Ajiferuke, I., Burell, Q., & Tague, J. (1988b). Collaborative coefficient: A single measure of the degree of collaboration in research. Scientometrics, 14(5-6), 421–433. https://doi.org/10.1007/bf02017100
4. Benoit, S., Baker, T. L., Bolton, R. N., Gruber, T., &Kandampully, J. (2017). A triadic framework for collaborative consumption (CC): Motives, activities and resources & capabilities of actors. Journal of Business Research, 79, 219–227. https://doi.org/10.1016/j.jbusres.2017.05.004

5. Ertz, M., Durif, F., & Arcand, M. (2018). A conceptual perspective on collaborative consumption. AMS Review, 9(1-2), 27–41. https://doi.org/10.1007/s13162-018-0121-3
6. Liao, C. H., & Yen, H. R. (2012). Quantifying the degree of research collaboration: A comparative study of collaborative measures. Journal of Informetrics, 6(1), 27–33. https://doi.org/10.1016/j.joi.2011.09.003
7. Manoj Kumar Verma, Shukla, R., & Yadav, S. (2019). Authorship Pattern and Collaboration Coefficient of the Researchers World: Journal of Arts, Science and Commerce (RW-JASC) During 2010–2017. International Journal of Information Dissemination and Technology. https://doi.org/10.5958/2249-5576.2019.00012.8
8. Savanur, K., & Srikanth, R. (2009). Modified collaborative coefficient: A new measure for quantifying the degree of research collaboration. Scientometrics, 84(2), 365–371. https://doi.org/10.1007/s11192-009-0100-4

Trends and Patterns in HIV Vaccine Research: A Comprehensive Analysis of Author Productivity, Collaboration, and Linguistic Diversity (2001-2020)

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Abstract

This paper has cover a bibliometrics analysis of HIV Vaccine literature research. The data for the study has been downloaded form national Centre for Biotechnology (NCBI) Pub Med. The study analysis literature growth trends. It also examines research activities in different countries worldwide This research paper provides a comprehensive analysis of the evolution and trends in HIV vaccine literature from 2001 to 2020, with a focus on publication productivity, collaboration dynamics, and key thematic areas. An examination of author productivity reveals significant contributions from leading researchers, with Montefiori DC emerging as the most prolific author. The study of collaboration patterns indicates a marked increase in multi-author papers, reflecting a shift towards larger, more interdisciplinary research teams. The degree of collaboration (DC) has consistently risen, particularly among papers with more than four authors, highlighting the complexity and collaborative nature of HIV vaccine research. This study provides valuable insights into the progression of HIV vaccine research, emphasizing the importance of collaborative efforts and a multi-faceted approach to understanding and combating HIV.

Keywords

HIV Vaccine Research, Authorship Patterns, Collaboration Index, Publication Trends, Regional Contributions, Literature Analysis

Introduction

HIV/AIDS continues to pose a significant global health challenge, underscoring the critical need for ongoing research and development of effective vaccines. Over the past two decades, the field of HIV vaccine research has seen substantial progress, driven by a concerted effort from researchers worldwide. This research paper explores the trends and dynamics within HIV vaccine literature from 2001 to 2020, providing a detailed analysis of publication productivity, collaboration patterns, and thematic focus.

The primary objective of this study is to elucidate the evolution of research output and collaboration in the HIV vaccine field. By examining the productivity of leading researchers, the paper identifies key contributors and highlights shifts in research focus and output over the years. Additionally, the study investigates the degree of collaboration among researchers, revealing how collaborative efforts have evolved in response to the increasing complexity of vaccine development, this paper employs a word frequency analysis of articles indexed in PubMed to uncover predominant themes and areas of focus within HIV vaccine research. By analyzing terms related to human and animal studies, demographic factors, and immunological and preventive strategies, this research provides insights into the central priorities and challenges in the field.

This research aims to contribute to a deeper understanding of the progress and trends in HIV vaccine research, highlighting the importance of collaborative efforts and thematic focus in advancing our knowledge and development of effective vaccines.

The data for the study was downloaded from the National Center for Biotechnology Information (NCBI).Pub Med (Published Medical Literature) is an online version of Medline, available free to anyone with internet access. MEDLINE is the National Library of Medicine's bibliographic database covering the fields of medicine, nursing, dentistry, veterinary medicine, health care system and the preclinical sciences. MEDLINE contains approximately 12 million records.

Objective

- To assess the annual publication output of top authors in HIV vaccine research.
- To examine collaboration patterns in HIV vaccine literature.
- To identify predominant research themes in HIV vaccine studies.
- To measure the impact and influence of leading researchers through publication output.
- To Access and determine trends in collaboration levels and their correlation with research productivity.

Scope And Limitation

This research paper focuses on analyzing the trends and patterns in HIV vaccine research from 2001 to 2020, including publication productivity, degree of collaboration, and key research themes based on a comprehensive review of PubMed-indexed articles. It aims to provide insights into the evolving nature of research contributions, collaboration dynamics, and thematic focus in the field of HIV vaccine development.

The study is limited to articles indexed in PubMed, which may exclude relevant research published in other databases or non-English language sources. Additionally, the analysis is based on citation and publication data, which may not fully capture the quality or impact of the research. The focus on specific metrics such as author productivity and word frequency might not encompass all aspects of research quality and innovation.

Methodology

This study employs a quantitative analysis of HIV vaccine research literature published from 2001 to 2020. The methodology includes a comprehensive data collection from PubMed, focusing on articles indexed within this timeframe. The analysis involves examining publication productivity by top authors, evaluating the degree of collaboration through co-authorship trends, and performing a word frequency analysis to identify key research themes. Data on author contributions and collaboration patterns are quantified and analyzed using statistical measures such as the Degree of Collaboration (DC) and Collaboration Index. The study also incorporates a review of citation data to assess the impact of research outputs. The results are presented through descriptive statistics, trend analysis, and thematic insights to provide a detailed overview of research dynamics in HIV vaccine development.

Data Analysis & Interpretation

Table no. 1: Document Types in HIV Vaccine Literature (2001-2020)

Sr.No	Document Type	Total	Percentage
1	Journal Article	9136	88.98
2	Clinical Reports	279	2.72
3	Editorial	237	2.31
4	Case Reports	237	2.31
5	Review	193	1.88
6	Letter	147	1.43
7	Abstract	20	0.19
8	Comment	11	0.11
9	Clinical Trail	7	0.07
10	Congresses	1	0.01
	Total	**10268**	**100**

Table 1 provides an overview of document types in HIV vaccine literature from 2001 to 2020, revealing that out of 10,268 analyzed documents, journal articles are the most prevalent, comprising 88.98% of the total. Clinical reports, editorial pieces, and case reports follow, contributing 2.72%, 2.31%, and 2.31% respectively, indicating their relevance in clinical and specific case discussions. Reviews make up 1.88%, reflecting their role in summarizing existing knowledge. Other formats, including letters, abstracts, comments, clinical trials, and congress reports, are less common, highlighting that while journal articles dominate the field, there is a diverse range of publication types contributing to the HIV vaccine research discourse.

Table no. 2 Country wise distribution of Author in HIV Vaccine Literature (2001-2020)

Sr.no.	region	Freq.	percentage
1	USA	20412	55.17
2	China	2556	6.91
3	South Africa	2162	5.84
4	France	1280	3.46
5	Canada	1220	3.30
6	Spain	1204	3.25
7	Thailand	981	2.65
8	Italy	787	2.13

9	UK	784	2.12
10	India	640	1.73
11	Germany	618	1.67
12	Netherlands	604	1.63
13	Australia	597	1.61
14	Iran	535	1.45
15	Uganda	528	1.43
16	Japan	477	1.29
17	Kenya	419	1.13
18	Switzerland	417	1.13
19	Brazil	416	1.12
20	Sweden	362	0.98
Total		**36999**	**100**

Table 2 details the regional distribution of authors in HIV vaccine literature from 2001 to 2020, based on author affiliations by country. The data, covering 36,999 authors, reveals that the United States is the predominant contributor, with 20,412 authors (55.17%), reflecting its leading role in HIV research due to significant investment and prominent research institutions. China is the second-largest contributor with 2,556 authors (6.91%), highlighting its expanding influence in the field. South Africa, with 2,162 authors (5.84%), ranks third, underscoring its pivotal role due to high HIV prevalence. European countries, including France, Canada, and Spain, contribute notably as well, with each country adding between 3% and 3.5% to the total authorship. Other countries such as Thailand, Italy, the United Kingdom, and India also contribute significantly, demonstrating widespread international engagement in HIV vaccine research. Overall, while the United States dominates, the data underscores a broad, global collaboration in advancing HIV vaccine research.

Table no. 3 most cited word in HIV Vaccine Literature (2001-2020)

Sr. No.	Words	Occurrences
1	Humans	8265
2	Animals	3543
3	Female	3253
4	Male	2542
5	Adult	1955

6	Hiv-1/Immunology	1743
7	Aids Vaccines/Immunology	1617
8	Mice	1231
9	Middle Aged	1109
10	Aids Vaccines	937
11	Adolescent	933
12	Hiv Infections/Prevention & Control	810
13	Young Adult	805
14	Mice Inbred Balb C	717
15	Macaca Mulatta	679
16	Hiv Infections/Immunology/Prevention & Control	674
17	Molecular Sequence Data	627
18	Viral Load	625
19	Cd8-Positive T-Lymphocytes/Immunology	624
20	Hiv Antibodies/Immunology	624

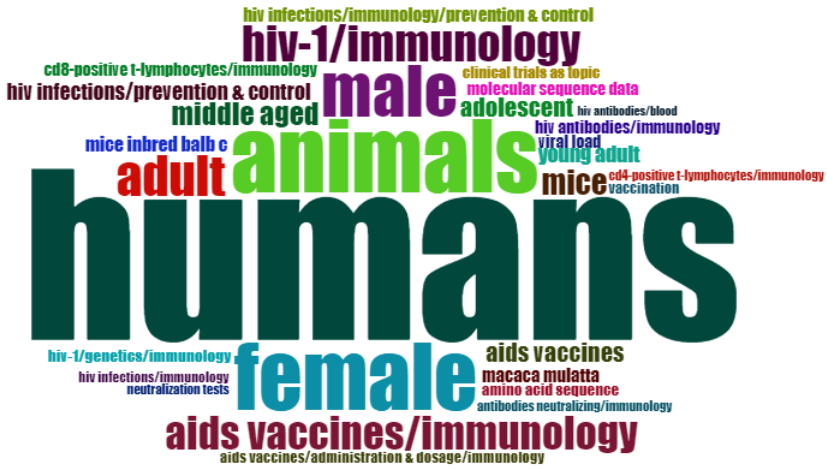

Figure no. 1 Word cloud of HIV Vaccine Literature (2001-2020)

Table no.3 and Figure 1 highlight the top 20 most cited terms in HIV vaccine literature from 2001 to 2020, based on an analysis of 10,268 PubMed articles. The frequency analysis reveals a strong focus on human and animal studies,

with "humans" being the most cited term (8,265 occurrences), reflecting the primary goal of developing vaccines for human use. Animal models are also crucial, as evidenced by frequent mentions of terms like "animals" and "mice." The analysis also shows an emphasis on demographic diversity with terms related to gender and age, and a significant focus on immunological aspects of HIV and AIDS, including "HIV-1/immunology" and "AIDS vaccines/immunology." Technical terms such as "molecular sequence data" and "viral load" further indicate the importance of genetic and virological research. Overall, the study underscores key themes in HIV vaccine research, including human and animal research, demographic considerations, and a strong emphasis on immunological and preventive strategies.

Table no. 4 Language wise distribution of HIV Vaccine Literature (2001-2020)

Sr.No.	Language	Citation	Percentage
1	English	10268	97.51
2	Chinese	58	0.55
3	French	50	0.47
4	German	35	0.33
5	Japanese	29	0.28
6	Russian	22	0.21
7	French	12	0.11
8	Polish	9	0.09
9	Spanish	15	0.14
10	Portuguese	10	0.09
11	Italian	6	0.06
12	Dutch	4	0.04
13	Norwegian	3	0.03
14	Hebrew	3	0.03
15	Czech	3	0.03
16	Swedish	2	0.02
17	Lithuanian	1	0.01
Total		**10530**	**100**

Table 4 outlines the language distribution of HIV vaccine literature published from 2001 to 2020, revealing a predominant use of English, which accounts

for 97.45% (10,006 articles) of the total 10,268 articles analyzed. This high percentage underscores English as the primary medium for disseminating HIV vaccine research, facilitating global access and communication. Although English is overwhelmingly dominant, other languages also contribute, albeit in much smaller proportions. Chinese ranks second with 58 articles (0.56%), followed by French with 50 articles (0.49%). German and Japanese contribute 35 (0.34%) and 29 articles (0.28%), respectively. Additional contributions come from Russian (22 articles, 0.21%), Spanish (15 articles, 0.15%), and Portuguese (10 articles, 0.10%), with other languages collectively representing less than 1% of the total. This distribution highlights the global nature of HIV vaccine research while emphasizing the central role of English in scholarly communication within the field.

Table no 5 Year-Wise Productivity of Top Authors in HIV Vaccine Literature (2001-2020)

Row Labels	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Grand Total
BAROUCH DH	3	7	1	2	4		1	3	5	7	4	6	7	6	6	13	7	7	9	7	105
BURTON DR	4	2	4	4	3	4	6	7	6	8	6	5	10	15	18	29	19	13	16	23	202
FERRARI G	1	1	1	2	4	2	3	1	2	2	3	8	5	10	9	13	19	10	13	14	123
GILBERT PB	1		4	2	4	6	5	3	6	2	4	7	11	8	7	9	11	7	11	7	115
HANKE T	2	7	6	5	3	7	8	3	4	4	4	4	3	10	4	7	5	3	6	8	103
HAYNES BF	1	3	1	4	4	6	5	6	10	14	12	11	20	20	16	17	23	16	11	11	211
HUANG Y	1	2	3	2	4	4	1	5	3	4	12	11	6	2	4	9	9	2	7	9	101
KIM JH			2	1	1	1	2		1	3	3	12	9	22	18	13	11	8	5	7	119
LIFSON JD	4	2	4	2	3	5	3	1	4	2	3	6	4	5	10	16	6	9	10	11	110
MASCOLA JR	2	3	3	3	13	5	6	1	10	8	5	10	10	12	21	21	20	15	13	12	193
MCELRATH MJ	3	2	3	5	1	2	5	5	2	8	14	11	7	10	12	8	7	6	10	9	130
MICHAEL NL		1		1			1	3	5	6	5	12	11	16	14	11	16	12	12	11	137
MONTEFIORI DC	9	14	5	11	21	11	10	8	12	8	13	16	14	22	22	24	27	19	24	16	307
ROBB ML		4	3	2		2	1	3	3	6	4	6	4	13	16	13	19	16	15	16	146
SANDERS RW							1		1	2	2	4	7	10	17	13	10	12	11	12	102
SEAMAN MS				2	4		1		3	6	5	6	11	10	13	10	10	6	6	11	104
TOMARAS GD					2	1	3	1	4	7	14	6	12	15	16	23	22	15	18	22	181
WANG Y				1	2	1	1	2	5	4	6	6	2	8	7	19	16	11	12	20	124
WARD AB											2	1	6	8	19	15	23	15	17	25	131
WILSON IA	1		2	1	2		2	1	1	2	5	3	7	10	15	15	14	11	10	14	117
Grand Total	**32**	**48**	**42**	**50**	**75**	**57**	**65**	**53**	**87**	**103**	**126**	**151**	**166**	**232**	**264**	**298**	**294**	**213**	**236**	**265**	**2861**

Table 5 provides an in-depth analysis of the productivity of leading authors in HIV vaccine research from 2001 to 2020, highlighting their significant contributions over the two decades. The top authors collectively produced 2,861 articles, with Montefiori DC being the most prolific, publishing 307 papers and demonstrating a notable increase in productivity from 2010, peaking at 27 publications in 2017. Haynes BF follows with 211 publications, showing a marked rise in output starting from 2010 and maintaining high productivity through 2017. Other prominent researchers include Burton DR, with 202 publications, and Tomaras GD and Mascola JR, with 181 and 193 publications, respectively, both showing upward trends in the latter part of the study period. Michael NL and Ward AB also contributed significantly, with 137 and 131 publications, respectively, with Ward AB notably increasing his productivity from 2015. Overall, the data underscores a heightened focus

and substantial progress in HIV vaccine research, particularly evident from 2010 onwards.

Table no. 6 Degree of Collaboration in HIV Vaccine Literature (2001-2020)

Sr.No.	Year	DC Two authored papers	DC in three authored papers	DC in four authored papers	DC in more than four authors
1	2001	0.13	0.09	0.08	0.45
2	2002	0.12	0.11	0.08	0.46
3	2003	0.15	0.10	0.06	0.45
4	2004	0.13	0.09	0.08	0.51
5	2005	0.10	0.09	0.10	0.54
6	2006	0.12	0.10	0.07	0.58
7	2007	0.12	0.10	0.09	0.54
8	2008	0.12	0.08	0.08	0.56
9	2009	0.12	0.10	0.08	0.57
10	2010	0.14	0.09	0.07	0.59
11	2011	0.10	0.09	0.09	0.62
12	2012	0.12	0.09	0.09	0.61
13	2013	0.11	0.10	0.07	0.64
14	2014	0.10	0.09	0.08	0.67
15	2015	0.09	0.09	0.08	0.69
16	2016	0.08	0.09	0.07	0.71
17	2017	0.09	0.08	0.08	0.69
18	2018	0.06	0.09	0.08	0.74
19	2019	0.06	0.08	0.08	0.75
20	2020	0.07	0.08	0.09	0.74

Table no 6 degree of collaboration (DC) in HIV vaccine literature from 2001 to 2020 demonstrates a marked shift towards extensive research partnerships. The data reveals a notable increase in the proportion of papers authored by large teams of more than four researchers. Starting at a DC of 0.45 in 2001, this figure steadily rose to 0.75 in 2019 and 0.74 in 2020. This trend highlights a growing reliance on broad collaborative networks, reflecting the complex, multidisciplinary nature of HIV vaccine research,

which often requires diverse expertise and resources & smaller collaborations involving two, three, or four authors have shown relatively stable DC values over the same period. The DC for two-authored papers fluctuated between 0.06 and 0.15, while the DC for three-authored and four-authored papers remained consistent, ranging from 0.08 to 0.11 and 0.06 to 0.10, respectively. This stability in smaller group collaborations contrasts with the increasing dominance of larger teams, underscoring the evolving dynamics in research collaboration within the field. The shift towards larger teams underscores the importance of pooling a wide range of expertise to tackle the multifaceted challenges of HIV vaccine development.

Table no. 7 Year wise authorship pattern HIV vaccine literature

Year	articles	Single Author	Two Author	Three Author	Four Author	More Than Four Author	Total	Percentage
2001	390	141	73	50	45	190	499	4.86
2002	409	129	70	63	45	121	428	4.17
2003	448	156	97	65	36	103	457	4.45
2004	453	122	86	57	55	178	498	4.85
2005	500	131	74	68	75	176	524	5.10
2006	473	110	96	85	57	235	583	5.68
2007	481	117	101	83	75	147	523	5.09
2008	509	138	107	67	67	135	514	5.01
2009	506	113	107	90	75	153	538	5.24
2010	532	109	133	85	71	178	576	5.61
2011	493	113	97	86	87	145	528	5.14
2012	508	84	125	94	87	128	518	5.04
2013	530	81	115	107	77	188	568	5.53
2014	605	71	125	110	94	153	553	5.39
2015	569	70	112	107	95	110	494	4.81
2016	636	66	103	112	93	123	497	4.84
2017	560	61	104	96	93	187	541	5.27
2018	569	37	72	96	90	126	421	4.10
2019	520	41	73	88	90	235	527	5.13
2020	577	40	84	102	113	142	481	4.68

The table no. 7 provides an analysis of the authorship patterns in HIV vaccine literature from 2001 to 2020, highlighting the distribution of articles based on the number of authors involved—ranging from single authorship to collaborations involving more than four authors. The data offers insights into the trends and shifts in collaborative research over the years. There is a noticeable decline in the number of single-author articles. In 2001, 141 articles were authored by a single individual, accounting for a significant portion of the research. By 2020, this number dropped to just 40, reflecting a broader trend away from single-author works in favor of more collaborative efforts. There is a clear increase in multi-author collaborations, particularly in articles authored by more than four individuals. The number of such articles started at 190 in 2001 and peaked at 235 in 2006 and again in 2019. This trend suggests that as the complexity and scope of HIV vaccine research have grown, so has the need for collaboration among multiple experts from different fields. The authorship patterns in HIV vaccine literature from 2001 to 2020 reveal a clear trend toward increased collaboration, with a marked decline in single-author articles and a corresponding rise in multi-author works. This shift reflects the evolving nature of research in the field, emphasizing the importance of teamwork and interdisciplinary collaboration.

Table no. 8 Analysis of Price's Fundamental Law in HIV Vaccine Research (2001-2020)

Sr.NO.	Year	Time	Number of Authors	Exponential Growth $b=y_t/yt_o$
1	2001	0	2842	
2	2002	1	3097	1.09
3	2003	2	3292	1.06
4	2004	3	3847	1.17
5	2005	4	4730	1.23
6	2006	5	5281	1.12
7	2007	6	4969	0.94
8	2008	7	5433	1.09
9	2009	8	5845	1.08
10	2010	9	6606	1.13
11	2011	10	7486	1.13
12	2012	11	7538	1.01

13	2013	12	8301	1.10
14	2014	13	10061	1.21
15	2015	14	11186	1.11
16	2016	15	11769	1.05
17	2017	16	10451	0.89
18	2018	17	10676	1.02
19	2019	18	11536	1.08
20	2020	19	13416	1.16

The table no.8 presents an analysis based on Price's Fundamental Law of exponential growth in the context of HIV vaccine research, focusing on the number of authors contributing to the literature from 2001 to 2020. This analysis helps in understanding the growth dynamics of scientific collaboration in this field over the two decades. Applying Price's Fundamental Law, the number of authors in HIV vaccine research has shown a general upward trend, with some fluctuations in growth rates. The exponential growth rate reached its peak at 1.23 in 2005 and saw moderate declines in subsequent years, with a resurgence towards the end of the period. The overall increase in the number of authors reflects the expanding interest and effort in this field, with a cumulative total of 148,362 authors by 2020. The application of Price's Fundamental Law to the HIV vaccine research field reveals a complex pattern of growth characterized by initial rapid expansion, followed by fluctuations and subsequent stabilization. The overall trend underscores the increasing importance of collaboration in advancing HIV vaccine research, with a growing number of researchers contributing to the field over time.

Table no. 9 Collaboration Index HIV vaccine research

Sr.NO.	Year	No of paper y	No .of Author x	Collaboration Index=NA/NP
1	2001	390	2842	0.14
2	2002	409	3097	0.13
3	2003	448	3292	0.14
4	2004	453	3847	0.12
5	2005	500	4730	0.11
6	2006	473	5281	0.09

7	2007	481	4969	0.10
8	2008	509	5433	0.09
9	2009	506	5845	0.09
10	2010	532	6606	0.08
11	2011	493	7486	0.07
12	2012	508	7538	0.07
13	2013	530	8301	0.06
14	2014	605	10061	0.06
15	2015	569	11186	0.05
16	2016	636	11769	0.05
17	2017	560	10451	0.05
18	2018	569	10676	0.05
19	2019	520	11536	0.05
20	2020	577	13416	0.04

Table 9 on the Collaboration Index provides insights into the evolving collaborative dynamics in HIV vaccine research from 2001 to 2020. Initially, the index was 0.14 in 2001, indicating a moderate level of collaboration. Over time, however, it exhibited a general decline, falling to 0.04 by 2020. This decrease suggests a trend towards fewer authors per paper on average. While the index showed some fluctuations and a peak of 0.11 in 2005, it steadily declined from around 2010, dropping below 0.10 by 2015 and continuing to decrease. This trend reflects a shift towards more specialized or smaller research groups, despite the overall growth in research output. The decline in the Collaboration Index indicates potential changes in collaborative practices and publication strategies within the field.

Table no. 10 Correlation between Contributions and Contributors HIV vaccine research.

Sr.NO.	Year	No. of author x	No of paper y	xy	x2	y2
1	2001	2842	390	1108380	8076964	152100
2	2002	3097	409	1266673	9591409	167281
3	2003	3292	448	1474816	10837264	200704
4	2004	3847	453	1742691	14799409	205209
5	2005	4730	500	2365000	22372900	250000
6	2006	5281	473	2497913	27888961	223729
7	2007	4969	481	2390089	24690961	231361
8	2008	5433	509	2765397	29517489	259081

9	2009	5845	506	2957570	34164025	256036
10	2010	6606	532	3514392	43639236	283024
11	2011	7486	493	3690598	56040196	243049
12	2012	7538	508	3829304	56821444	258064
13	2013	8301	530	4399530	68906601	280900
14	2014	10061	605	6086905	101223721	366025
15	2015	11186	569	6364834	125126596	323761
16	2016	11769	636	7485084	138509361	404496
17	2017	10451	560	5852560	109223401	313600
18	2018	10676	569	6074644	113976976	323761
19	2019	11536	520	5998720	133079296	270400
20	2020	13416	577	7741032	179989056	332929

The table no 10 illustrates the correlation between the number of authors (contributors) and the number of papers published (contributions) in HIV vaccine research from 2001 to 2020. By examining the relationship between these variables, we can gain insights into how changes in the number of authors impact the volume of research output over the years.

In 2001, there were 2,842 authors contributing to 390 papers, with a corresponding product of 1,108,380 for the variables of authors and papers. As the years progressed, both the number of authors and papers increased significantly. For instance, in 2010, there were 6,606 authors and 532 papers, resulting in a product of 3,514,392. This upward trend continued, with the number of authors reaching 13,416 and the number of papers increasing to 577 by 2020, leading to a product of 7,741,032. This data reflects a strong positive relationship between the number of contributors and the volume of research output.

The table also provides squared values of both the number of authors and papers, indicating the growing complexity of the research landscape. For example, in 2005, the squared values were 22,372,900 for authors and 250,000 for papers, while in 2020, these values had increased to 179,989,056 for authors and 332,929 for papers. These figures demonstrate that as the number of authors and papers increases, the impact on research output grows significantly. Overall, the correlation between contributions and contributors shows a robust positive relationship, suggesting that an increase in the number of authors tends to be associated with a higher number of published papers, reflecting the growing collaborative nature of HIV vaccine research.

Table no. 11 Single Author Time Series analysis HIV vaccine research

Sr.NO.	Year	Single author Paper	X	X2	xy
1	2001	141	10	100	1410
2	2002	129	9	81	1161
3	2003	156	8	64	1248
4	2004	122	7	49	854
5	2005	131	6	36	786
6	2006	110	5	25	550
7	2007	117	4	16	468
8	2008	138	3	9	414
9	2009	113	2	4	226
10	2010	109	1	1	109
11	2011	113	0	0	0
12	2012	84	1	1	84
13	2013	81	2	4	162
14	2014	71	3	9	213
15	2015	70	4	16	280
16	2016	66	5	25	330
17	2017	61	6	36	366
18	2018	37	7	49	259
19	2019	41	8	64	328
20	2020	40	9	81	360

The table no 11 Single Author Time Series Analysis examines the trend in the number of single-author papers published annually in HIV vaccine research from 2001 to 2020. This analysis provides insights into the dynamics of solo-authored contributions over two decades, highlighting changes in individual research output and its implications, in 2001, there were 141 single-author papers, and the analysis used a series of calculations to capture the trend. For instance, the squared values of the number of papers and the product of the number of papers and time period (years) are provided. By 2010, the number of single-author papers had decreased to 109, reflecting a gradual decline over the years. The squared values and the product calculations demonstrate how the volume of single-author research output has changed relative to the passage of time. Particularly from 2011 onward, the number of single-author papers showed a continued decline. By 2020, the number

had further decreased to 40 papers. The squared values and the products reveal a noticeable downward trend in solo-authored contributions. This trend may indicate a shift towards more collaborative research or a reduction in individual contributions to the field. The single-author time series analysis thus underscores a transition in research practices, highlighting the increasing trend of multi-authored papers and a potential reduction in the prominence of single-authored studies in HIV vaccine research.

Table no. 12 Degree of Collaboration in HIV Vaccine Research (2001-2020)

Sr.No.	Years	Single Author Papers	Multi Author Papers	TA	TP	DC
1	2001	141	358	2842	390	0.92
2	2002	129	299	3097	409	0.73
3	2003	156	301	3292	448	0.67
4	2004	122	376	3847	453	0.83
5	2005	131	393	4730	500	0.79
6	2006	110	473	5281	473	1.00
7	2007	117	406	4969	481	0.84
8	2008	138	376	5433	509	0.74
9	2009	113	425	5845	506	0.84
10	2010	109	467	6606	532	0.88
11	2011	113	415	7486	493	0.84
12	2012	84	434	7538	508	0.85
13	2013	81	487	8301	530	0.92
14	2014	71	482	10061	605	0.80
15	2015	70	424	11186	569	0.75
16	2016	66	431	11769	636	0.68
17	2017	61	480	10451	560	0.86
18	2018	37	384	10676	569	0.67
19	2019	41	486	11536	520	0.93
20	2020	40	441	13416	577	0.76

The table no. 12 degree of collaboration in HIV vaccine research from 2001 to 2020 reveals a notable trend in the nature of authorship over the years. In

the early 2000s, single-author papers were relatively common, with a high degree of collaboration indicated by a lower DC (Degree of Collaboration) score. For example, in 2001, the DC score was 0.92, reflecting a predominance of single-author contributions in the field. This trend continued through the early years, with fluctuations in the DC score that illustrate the dynamic nature of collaborative efforts. By 2006, the DC score reached 1.00, indicating a shift towards equal representation of single and multi-author papers.

As the years progressed, a clear trend emerged showing an increasing emphasis on multi-author papers. The DC scores varied over the years, with some years showing higher collaboration indices, such as 2013 and 2019, with DC scores of 0.92 and 0.93, respectively. This shift highlights the growing complexity of HIV vaccine research, where collaborative efforts have become more pronounced. Despite some variability, the overall trend towards higher collaboration is evident, as reflected in the lower DC scores in the later years, suggesting a more collaborative research environment. The data indicates that while single-author contributions have decreased, multi-author publications have become more central to advancing HIV vaccine research.

Table no. 13 Author Productivity in HIV Vaccine Literature (2001-2020)

Sr.No.	Year	Total Paper	Total Author	AAPP	PPA
1	2001	390	2842	7.29	0.14
2	2002	409	3097	7.57	0.13
3	2003	448	3292	7.35	0.14
4	2004	453	3847	8.49	0.12
5	2005	500	4730	9.46	0.11
6	2006	473	5281	11.16	0.09
7	2007	481	4969	10.33	0.10
8	2008	509	5433	10.67	0.09
9	2009	506	5845	11.55	0.09
10	2010	532	6606	12.42	0.08
11	2011	493	7486	15.18	0.07
12	2012	508	7538	14.84	0.07
13	2013	530	8301	15.66	0.06
14	2014	605	10061	16.63	0.06
15	2015	569	11186	19.66	0.05
16	2016	636	11769	18.50	0.05

17	2017	560	10451	18.66	0.05
18	2018	569	10676	18.76	0.05
19	2019	520	11536	22.18	0.05
20	2020	577	13416	23.25	0.04

The table no 13 provides insights into author productivity in HIV vaccine literature from 2001 to 2020, highlighting the relationship between the total number of papers published, the total number of authors involved, the average authors per paper (AAPP), and the productivity per author (PPA). The data shows a consistent increase in the average number of authors per paper (AAPP) over the two decades. In 2001, the AAPP was 7.29, which steadily increased to 23.25 by 2020. This indicates a growing trend toward collaborative research, with more authors contributing to each paper as time progresses. The total number of authors involved in HIV vaccine literature has grown significantly over the years, from 2,842 authors in 2001 to 13,416 authors in 2020. This increase reflects the expanding research community engaged in HIV vaccine development, driven by the global importance of this area of study.The data reveals a clear trend towards increased collaboration in HIV vaccine research, with more authors contributing to each paper over time, while the individual productivity per author has decreased. This shift highlights the importance of collective efforts and interdisciplinary collaboration in advancing HIV vaccine research.

Conclusion

The research paper provides a comprehensive analysis of HIV vaccine literature from 2001 to 2020, emphasizing trends in authorship, collaboration, and productivity. The study highlights a marked increase in multi-author papers over the years, reflecting a significant shift towards collaborative research efforts. This trend underscores the growing complexity and interdisciplinary nature of HIV vaccine research, where collective expertise and joint efforts are crucial for advancing scientific knowledge and innovation. The analysis of publication metrics, including the Degree of Collaboration and authorship patterns, reveals a dynamic landscape where collaborative networks have become increasingly important. The findings indicate that while single-author contributions were more prevalent in the early 2000s, there has been a clear shift towards multi-author collaborations, especially in recent years. This shift is corroborated by the increasing number of publications and authors, as well as the rising Degree of Collaboration (DC) scores, which highlight the essential role of

collaborative research in addressing complex challenges in HIV vaccine development. The research underscores the importance of fostering collaborative environments and multi-disciplinary approaches in scientific research. As HIV vaccine research continues to evolve, understanding these trends will be crucial for stakeholders aiming to enhance research productivity, collaboration, and ultimately, the development of effective HIV vaccines. The study provides valuable insights into the evolving nature of research collaboration and productivity, offering a foundation for future research and policy development in the field.

References

1. Adhe, G., Sonvane, S., & Vaishnav, A. A. ROLE MODEL SCIENTIST, PROF. GK KULKARNI: A SCIENTOMETRIC PORTRAIT.
2. Adhe, G., Sonwane, S., & Vaishnav, A. A. (2011). Science Indicators of Scientists in Dr. Babasaheb Ambedkar Marathwada Univeristy, Aurangabad.
3. Alsharif, A. H., Salleh, N. O. R. Z. M. D., & Baharun, R. O. H. A. I. Z. A. T. (2020). Bibliometric analysis. *Journal of Theoretical and Applied Information Technology*, *98*(15), 2948-2962.
4. Bansode, S. Y. (2019). Library and information science MOOCs: An Indian scenario. *Annals of Library and Information Studies (ALIS)*, *66*(1), 39-45.
5. Dhakne, B. D., & Golwal, M. D. (2022). CONTENT ANALYSIS OF RAYAT SHIKSHAN SANSTHA'S AUTONOMOUS COLLEGES LIBRARY WEBSITE. *Methodology*.
6. Ding, Y., Foo, S., & Chowdhury, G. (1998). A bibliometric analysis of collaboration in the field of information retrieval. *The International Information & Library Review*, *30*(4), 367-376.
7. Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of business research*, *133*, 285-296.
8. Gajbe, S. S., & Sonawane, S. S. (2015). AUTHORSHIP PATTERN AND DEGREE OF COLLABORATION IN THE LEPROSY RESEARCH: A SCIENTOMETRICS STUDY. *Knowledge librarian*, *2*(6).
9. Golwal, M. D. (2018). Bibliometric study on research growth of information literacy. *Knowledge Librarian*, 451-460.
10. Kumbhar, K. N. (2019). A Bibliometric study of Ph. D. Awarded Theses in Department of Library and Information Science. *Pearl: A Journal of Library and Information Science*, *13*(1), 80-85.

11. Nehra, S. S., & Bansode, S. Y. (2023). Knowledge Production Through Open Data for Digital Humanities: A Study of the Indian Landscape. *DESIDOC Journal of Library & Information Technology*, *43*(4).
12. Pandit, M. P. J., & Sonawane, S. S. Collaboration Trend in Library and Information Science Abstracts (LISA) during 2010-2014.
13. Subramanyam, K. (1983). Bibliometric studies of research collaboration: A review. *Journal of information Science*, *6*(1), 33-38.
14. Van Nunen, K., Li, J., Reniers, G., & Ponnet, K. (2018). Bibliometric analysis of safety culture research. *Safety science*, *108*, 248-258.

Bibliometric Analysis of Journal of Reference & User Services Quarterly

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Abstract
This study presents a bibliometric analysis of articles published in Reference & User Services Quarterly (RUSQ) from 2006 to 2020. Utilizing data from the subject of Library and Information Science and the analysis examines publication trends year wise and language wise, the findings reveal an overall increase in publications, highlight document types, and identify keyword in reference and user services research. This analysis provides insights into the evolving landscape of library and information science.

Keywords
Bibliometric study, Citation analysis, Periodicals

Introduction

The field of Library and Information Science (LIS) has undergone significant transformations over the past few decades, particularly in response to rapid technological advancements and shifting user needs. Within this evolving landscape, Reference & User Services Quarterly (RUSQ) has emerged as a pivotal journal, providing a platform for scholarly discourse on reference services, user engagement, and information literacy. This study conductsa bibliometric analysis of articles published in RUSQ from 2006 to 2020, aiming to capture the trends and developments in reference and user services research over this 15-year period.

Utilizing data from a comprehensive review of published articles, this analysis examines various dimensions, including publication trends by year, the distribution of articles by language,document types, and the frequency of keywords. By systematically categorizing and analyzing these aspects, the study seeks to identify patterns that reflect the priorities and interests of the LIS community during this timeframe.

The findings reveal a notable increase in the volume of publications, underscoring a growing commitment to research in reference and user services. Additionally, the analysis highlights the types of documents published, ranging from original research articles to practical guides, thus illustrating the diverse contributions to the field. The identification of recurring keywords serves to pinpoint emerging themes and areas of focus within reference and user services, offering insights into the ongoing evolution of the discipline.

Ultimately, this bibliometric analysis contributes to a deeper understanding of the scholarly landscape in LIS, particularly in the context of reference and user services. By mappingpublication trends and thematic shifts, the study provides valuable information for researchers, practitioners, and educators seeking to navigate the complexities of modern library services.

The Reference & User Services Quarterly is a prominent journal in the field of library and information science (LIS), focusing on research related to reference services, user experience, and information literacy. Understanding publication trends and citation patterns within this journal can offer valuable insights into the development of these areas. This study aims to conduct a bibliometric analysis of RUSQ from 2006 to 2020, exploring how the landscape of reference and user services has changed over the years.

1. About Journals:

Reference & User Services Quarterly (RUSQ) is a distinguished journal published by the American Library Association (ALA) under the Reference and User Services Association (RUSA). It focuses on research, case studies, and articles related to reference services, user experience, and information literacy within libraries. RUSQ aims to foster discussions on trends, challenges, and innovative practices in these areas, often covering topics such as user engagement and assessment, emerging technologies in reference services, best practices for information literacy instruction, and successful program case studies. The journal is published quarterly, making it a valuable resource for librarians, information professionals, educators, and researchers interested in library and information science. RUSQ accepts a variety of article types,including research studies, practical guides, and theoretical discussions, encouraging authors to contribute original insights relevant to its focus. Accessible through the ALA's website and various academic databases, recent issues of RUSQ have delved into the impact of digital tools
on user engagement, strategies for remote reference services during and after the COVID-19pandemic, and the role of libraries in supporting digital literacy.

2. Bibliometric Analysis:

A bibliometric analysis is a research method used to quantitatively assess the academic impact, productivity, and trends of journals, articles, or authors. It employs statistical tools to evaluate publications based on metrics like citation counts, publication frequency, authorship patterns, and collaboration networks. Bibliometric analyses can reveal key insights, such as identifying highly cited papers, leading researchers, or top-performing institutions within a field.

Common tools used include citation databases like Web of Science, Scopus, and Google Scholar, which allow researchers to track citations, co-authorship networks, and keyword frequency. Key indicators include the h-index (which measures both productivity and citation impact), journal impact factors (which measure the average number of citations per article), and citation maps, which visualize how ideas and knowledge spread through the literature.

Bibliometric studies are essential for assessing the performance and influence of journals, identifying emerging research trends, and guiding researchers in selecting high-impact venues for publication. They are widely used in academic, corporate, and governmental settings to evaluate research output, allocate funding, and strategize research priorities. However, over-reliance on metrics alone can overlook qualitative factors like innovation and social relevance.

3. Publication Trends in RUSQ (2006-2020)

Sr.No	Year	Publications	%
1	2006	91	4.35
2	2007	185	8.84
3	2008	189	9.03
4	2009	166	7.93
5	2010	155	7.41
6	2011	167	7.98
7	2012	149	7.12

8	2013	160	7.65
9	2014	166	7.93
10	2015	157	7.50
11	2016	129	6.17
12	2017	128	6.12
13	2018	133	6.36
14	2019	117	5.59
15	2020	NA	0.00
Total		**2092**	**100.00**

The analysis of publication trends in Reference & User Services Quarterly (RUSQ) from 2006 to 2019 reveals significant fluctuations in the number of articles published annually. The total number of publications during this period amounted to 2,092 articles, reflecting a growing interest in reference and user services research.

- **2006:** The analysis begins in 2006, with 91 publications, accounting for 4.35% of the total articles. This year marked the starting point for understanding the growth trajectory of the journal.
- **2007-2009:** A notable increase occurred in 2007, with 185 publications (8.84%), followed by 189 in 2008 (9.03%). However, in 2009, there was a slight decline to 166 articles (7.93%), indicating some variability in research output.
- **2010-2014:** The years 2010 to 2014 exhibited relatively stable publication numbers, ranging from 155 to 166 articles per year. The highest percentage was seen in 2014, with 166 articles (7.93%), suggesting a steady interest in the field.
- **2015-2017:** A decline in publications was noted starting in 2016, with only 129 articles (6.17%) published, followed by a marginal decrease to 128 articles (6.12%) in 2017. Thistrend raises questions about the factors influencing these reductions in output.
- **2018-2019:** The publication count slightly increased to 133 articles (6.36%) in 2018, but fell again to 117 articles (5.59%) in 2019.
- **2020:** No data was available for 2020, which may indicate disruptions in publication processes or other external factors.

4. Overview of Publication Trends with documents types (2006-2020)

Year	Articles	Columns	Features	From Committees of RUSA	Sources: Professional Materials	Sources: Reference Books	Total	%
2006	91	0	0	0	0	0	91	4.35
2007	185	0	0	0	0	0	185	8.84
2008	189	0	0	0	0	0	189	9.03
2009	163	0	0	0	0	0	163	7.79
2010	155	0	0	0	0	0	155	7.41
2011	167	0	0	0	0	0	167	7.98
2012	149	0	0	0	0	0	149	7.12
2013	160	0	0	0	0	0	160	7.65
2014	130	9	2	3	12	13	169	8.08
2015	0	28	12	10	42	65	157	7.50
2016	0	26	9	10	30	54	129	6.17
2017	0	29	13	3	35	48	128	6.12
2018	0	26	14	16	28	49	133	6.36
2019	0	23	9	5	27	53	117	5.59
2020	0	0	0	0	0	0	0	0.00
Total	1389	141	59	47	174	282	2092	100.00

5.1. Total Publications:

Over the period from 2006 to 2020, a total of 2,092 publications were recorded. The yearly breakdown shows fluctuations in the number of articles published, with a peak in 2008 (189 articles) and a decline in 2020, where no articles were published.

5.2. Yearly Breakdown:

- **2006-2013:** The first eight years show a consistent number of articles, primarily consisting of traditional research articles, with no entries for columns or features. The total number of articles varied between 91 and 189, indicating a growing interest in the field.

- **2014-2019:** A significant shift occurs starting in 2014. This year saw an increase in diversified content, with the introduction of 9 columns, 2 features, and contributions from RUSA committees. This diversification suggests an effort to enhance the journal's appeal and relevance by incorporating various perspectives and formats.
- **2015-2019:** The years 2015 through 2019 show a consistent number of columns, features,and professional materials, suggesting a more structured approach to content. Notably, the number of articles dropped to zero in 2015-2017, indicating a potential editorial shift or external factors affecting publication.

5.3. Types of Contributions:

- **Articles:** The primary contribution type throughout the years, totaling 1,389 articles (66.4% of the total), reflects the journal's commitment to research and scholarship in reference and user services.
- **Columns:** The introduction of columns starting in 2014 indicates a growing interest in more informal, opinion-based pieces, with a total of 141 columns published.
- **Features and RUSA Committee Contributions:** These elements added valuable insights and perspectives to the journal, particularly in 2014 and later years. The total of 59 features and 47 contributions from committees indicates a move toward inclusivity and a broader range of topics.
- **Sources:** Professional materials and reference books comprised a substantial portion of the contributions, totaling 282. This inclusion enhances the journal's practical applications for librarians and practitioners.

5. 4. Decline in Publications:

The absence of publications in 2020 raises questions about the impact of external factors, such as the COVID-19 pandemic, on the journal's operation. This gap underscores the challengesfaced by academic publishing during significant global events.

6. Keyword wise Analysis:

Sr.No.	Keyword	Total
1	Academic	46
2	Cataloging	36
3	Information	35

4	Library	33
5	Technical	32
6	Research	22
7	Access	18
8	Management	17
9	Resources	17
10	Impact	15
11	University	15
12	Acquisitions	13
13	Leadership	13
14	Librarian	12
15	User	12
16	Web	12
17	Authority	11
18	Business	11
19	Change masters	11
20	Citation	11
21	Developing	11
22	Survey	11
23	Bibliographic	10
24	Collection	10
25	Diversity	10
26	Analysis	9
27	Challenges	9
28	Classification	9
29	Collections	9
30	Perspectives	9
31	Social	9
32	About	8
33	Adult	8

34	Association	8
35	Book	8
36	Digital	8
37	Evaluating	8
38	Sources	8
39	Teaching	8
40	Value	8
41	Workplace	8
42	Beyond	7
43	Books	7
44	Collaboration	7
45	Control	7
46	Discovery	7
47	Getting	7
48	Identifying	7
49	Internet	7
50	Breaking	6

The keyword list highlights key themes in research papers, with "Academic" (46) as the most frequent, suggesting a strong focus on academic topics. Keywords like "Cataloging" (36), "Information" (35), and "Library" (33) indicate a major focus on library sciences, technical processes, and information management. Terms like "Research" (22), "Access" (18), and "Resources" (17) reflect concerns around research access and resource management. Emerging themes include leadership ("Leadership" 13), diversity ("Diversity" 10), and digital trends ("Web" 12, "Digital" 8), indicating interest in evolving library management, user experience, and technology integration.

Conclusion

Overall, the data illustrate a general increase in publications from 2006 to 2014, followed by a decline in the latter years of the study period. This trend highlights the evolving nature of reference and user services research and underscores the importance of continual adaptation

Within the library and information science community. Understanding these publication patterns can provide valuable insights into the current and future landscape of research in this vital area.

The analysis of publication trends in RUSQ from 2006 to 2020 reveals a dynamic landscape in the field of reference and user services. While traditional articles remained the backbone of the journal, the increasing variety of content types, particularly starting in 2014, demonstrates an effort to adapt to changing reader needs and enhance engagement. The decline in publications in 2020 serves as a reminder of the vulnerabilities in academic publishing, particularly in unprecedented circumstances. Overall, the findings indicate a journal that has evolved significantly while maintaining its core focus on reference and user services.

The keyword analysis reveals a strong focus on academic topics, library sciences, and technical processes. Key themes include research access, resource management, leadership, and diversity. Emerging trends highlight the growing importance of digital integration and user experience in library management and information systems.

References:

1. Baker, R. S., & Smith, L. R. (2020). Impact of distance learning services on student success: Abibliometric analysis. Journal of Library & Information Services in Distance Learning, 14(1), 1- 16.
2. Bornmann, L., & Haunschild, R. (2018). Citation score normalized by cited references (CSNCR): The introduction of a new citation impact indicator. Journal of the Association for Information Science and Technology, 69(6), 859-872.
3. Clarivate Analytics. (2024). Web of Science Core Collection. Retrieved from https://clarivate.com/webofsciencegroup/solutions/web-of-science/
4. CrossRef. (2024). Metadata for Research Outputs. Retrieved from https://www.crossref.org/
5. Clarivate Analytics. (2024). Journal Citation Reports: Impact Factor. Retrieved from https://clarivate.com/webofsciencegroup/solutions/journal-citation-reports/
6. Digital Science. (2024). Dimensions: A Comprehensive Research Database. Retrieved from https://www.dimensions.ai/
7. https://www.ala.org/rusa/rusq

8. Garfield, E. (2009). From citation indexes to informetrics: Is the tail now wagging the dog?. Information Processing & Management, 45(3), 362-367. doi:10.1016/j.ipm.2008.09.006
9. Hirsch, J. E. (2005). An index to quantify an individual's scientific research output. Proceedings of the National Academy of Sciences, 102(46), 16569-16572. doi:10.1073/pnas.0507655102
10. Hosseini, S. J. F., & Zamani, N. (2018). Scientific collaboration in the field of "bioinformatics" based on a scientometric approach. Scientia Iranica, 25(6), 3503-3513.
11. Kostoff, R. N. (2007). The difference between highly and poorly cited medical articles in the journal literature. Information Processing & Management, 43(3), 501-518.
12. Li, J., & Halevi, G. (2021). A systematic review of co-citation analysis: Theory, methodology, and applications. Journal of Informetrics, 15(2), 101017.
13. Moed, H. F. (2005). Citation analysis in research evaluation. Research Evaluation, 14(1), 57- 66.
14. Proceedings of the National Academy of Sciences, 102(46), 16569-16572.doi:10.1073/pnas.0507655102
15. Pritchard, A. (1969). Statistical bibliography or bibliometrics?. Journal of Documentation, 25(4), 348-349.
16. Thelwall, M., & Wilson, P. (2016). Mendeley readership altmetrics for medical articles: An analysis of 45 fields. Journal of Documentation, 72(2), 254-271.
17. van Eck, N. J., & Waltman, L. (2020). Visualizing bibliometric networks. Scientometrics, 114(3), 823-842.

A Bibliometric Analysis of Open Access Research Publications of Tata Memorial Hospital in India from 2015-2024

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Abstract
This study analyzes the research outputs of Tata Memorial Hospital (TMH) in India from 2015 to 2024, highlighting both the steady productivity and varying impact of its publications. While the highest number of publications occurred in 2020 (540) and the lowest in 2015 (227), citation trends peaked in 2015 with 29,072 citations but declined in 2023 and 2024 due to the limited time for recent publications to accumulate citations. Despite the decline in citation impact, TMH maintained consistent productivity, with 3,586 open-access documents and a total of 116,727 citations by 2024. Most of TMH's research was in journal articles, with Kumar P. Prabhash being the most prolific author. Collaborative research is a key feature, with large author teams contributing significantly to TMH's output. The most frequently published journal was Cancer Research, Statistics, and Treatment, and the most cited paper was Ferlay et al.'s 2015 study on global cancer incidence. Collaborative organizations, including the Homi Bhabha National Institute and the Advanced Centre for Treatment, Research & Education in Cancer, played a key role in boosting research productivity. TMH's research primarily focuses on Medicine, Biochemistry, Genetics, and Molecular Biology, with international collaborations enhancing its global impact. The most common keywords, such as "Cancer," "COVID-19," and "India," underscore the institution's focus on cancer and global health. This study provides a comprehensive overview of TMH's open-access research output and collaborative efforts over the last decade.

Key Words
Bibliometric Analysis, Open Access Publications, Tata Memorial Hospital (TMH), Research Productivity, Publication Trends, Medical Research

Introduction

Bibliometrics has become a crucial statistical evaluators of research productivity in many academic disciplines. The term 'Bibliometric' was first

used by Alan Pritchard in 1969 to denote a new approach where quantitative methods were employed to demonstrate the scientific communication process by measuring and analyzing various aspects of written material (Pritchard, 1969). Bibliometrics is an emerging area of research from different branches of human knowledge. It has been frequently used by academicians, policymakers, and researchers to evaluate the performance of individuals and organizations. Furthermore, the researcher can apply Bibliometrics to any subject area to address many problems related to research productivity (Marisha, Banshal & Singh, 2017). Bibliometrics data can be used to evaluate the relative performance of individual research units. This study presents a bibliometric analysis of the open-access research publications from Tata Memorial Hospital from 2015 to 2024. This analysis aims to assess the patterns, trends, and impact of these publications and highlight the significance of OA in advancing cancer research.

Tata Memorial Hospital (TMH) in Mumbai, India, is a premier institution dedicated to treating, researching, and preventing cancer; with a rich history of clinical excellence and pioneering cancer care, TMH is not only a leader in oncology but also plays a critical role in advancing cancer research both in India and globally. In recent years, the importance of disseminating research findings through open access (OA) platforms has gained considerable momentum. OA publishing makes scientific knowledge freely accessible, enabling researchers, clinicians, and policymakers worldwide to benefit from the latest research without financial barriers.

About TMH

Tata Memorial Hospital (TMH) is one of India's foremost cancer care institutions, renowned for its comprehensive approach to cancer treatment, research, and education. In Mumbai, TMH is a part of the Tata Trusts, which has a long history of contributing to social causes, particularly in healthcare. Established in 1941, TMH has consistently been at the forefront of cancer care and is recognized globally for its expertise in treating various forms of cancer.

The hospital offers many services, including early detection, diagnosis, surgery, chemotherapy, radiation therapy, and palliative care. It also specialises in pediatric oncology, haematological malignancies, and rare cancers. With a team of highly skilled professionals and state-of-the-art infrastructure, TMH serves as a leading referral centre for cancer patients

from India, neighbouring countries, and beyond. In addition to its clinical services, TMH is deeply committed to cancer research. The hospital has established itself as a hub for innovative research, particularly in oncology treatments, molecular genetics, cancer epidemiology, and public health. It conducts basic and applied research to improve cancer outcomes and understand the complexities of cancer biology. The institution collaborates with several national and international research bodies, contributing to the global effort to combat cancer.

Education and training are integral parts of TMH's mission. The hospital offers advanced education programs for medical professionals, including oncologists, researchers, and nurses, and has developed a robust academic framework to train the next generation of cancer specialists. The hospital is also involved in various community outreach programs to raise awareness about cancer prevention, early detection, and treatment. (https://en.wikipedia.org/wiki/Tata_Memorial_Centre)

Literature Review:

Previous research has explored both universities' and institutions' qualitative and quantitative research productivity. A comprehensive literature review is crucial for helping researchers define and understand their research questions. Relevant studies have been extensively reviewed to address the objectives of the current research (Baby & Kumaravel, 2012).

Parabhoi, Sahu, and Kumari (2017) conducted a bibliometric analysis to examine the scholarly research trends at Dr Yashwant Singh Parmar University of Horticulture and Forestry, Solan (Nauni) during the period from 2006 to 2015, based on publications indexed in the Scopus database. A total of 560 documents were published over the ten years. The study analyzed various aspects of the research output, including types of publications, year-wise distribution of articles, authorship patterns, collaboration trends, average citations per article, preferred journals, subject-wise distribution, and author productivity. The findings revealed that 88.21% of the publications were journal articles, with the primary research focus being Agricultural and Biological Sciences. The Indian Journal of Agricultural Sciences was identified as the most preferred journal for publication. Regarding authorship, "Sharma, N." was the most prolific author, holding the highest rank with an H-index of 8, a G-index of 10, and an M-index of 0.6667. The study also highlighted that the most highly cited paper during this period

was "Synthesis of ZnO nanoparticles and study of their antibacterial and antifungal properties."

Parabhoi & Sahu (2018) conducted a bibliometric analysis of the research publications from Himachal Pradesh University (HPU) from 1972 to 2015, using the Scopus database as the data source. The study examined various aspects of the university's research output, including publication types, authorship trends, collaboration patterns, the most prolific authors, and preferred journals. This study provides valuable insights into the research trends at HPU, highlighting the growth in scholarly output, increasing collaboration, and the prominence of specific research areas and authors.

Mishra, Rout, and Sahu (2022) conducted a bibliometric analysis to assess the quantitative growth and development of research productivity at Jadavpur University over ten years, from 2011 to 2020, using data from the Scopus database. The study evaluated the university's intellectual output, focusing on publication types, disciplinary trends, document growth, citation counts, impact factors, source journals, and collaboration patterns with institutions and countries. The analysis revealed that from 2011 to 2020, Jadavpur University researchers published 17,060 documents, many in collaboration with renowned institutions. The peak year for publications was 2018, with 1,954 documents published. The study also highlighted that multi-author papers were more prevalent than single-author papers, suggesting a collaborative research culture at the university.

A similar study on publications from Gujarat University, Ahmedabad (Kumar, Dora, & Desai, 2015), analyzed 760 research publications contributed between 2004 and 2013 and revealed that 83% of papers were journal articles. In an analysis of 1,041 bibliographic records from Scholarly Research Trend of Banaras Hindu University (Gautam & Mishra, 2015), analyzed during 2004-2013, using the Indian Citation Index, it was found that joint authors contributing most to research outputs, with 404 (39 %) articles published in Science Citation Index Expanded (SCIE) indexed journals and 637 (61 %) articles published in non-SCIE-indexed journals.

Objectives

The primary objectives of the present study are as follows:

- To analyze the types of publications and the annual distribution of documents of Open-access publications from Tata Memorial Hospital between 2015 and 2024.
- To study the authorship patterns in research publications.
- To identify the top 10 preferred journals for publication.
- To track the ten most cited papers.
- To highlight the top ten collaborative organizations contributing to the publications.
- To visualize co-authorship networks, global research distribution, and keyword analysis.

Methodology and Scope

The Scopus database was used to collect bibliographic data on the Tata Memorial Hospital (TMH) publications from 2015 to 2024. Scopus is a prominent database that indexes the most extensive collection of research publications and web resources, including journal articles, conference papers, reviews, and editorials published in journals and books. The search process involved entering Tata Memorial Hospital's affiliation ID, limiting the publication years to 2015–2024 and selecting the open access on 12 December 2024. The search query was: AF-ID ("Tata Memorial Hospital" 60018517)) AND (LIMIT-TO (PUBYEAR , 2024) OR LIMIT-TO (PUBYEAR , 2023) OR LIMIT-TO (PUBYEAR , 2022) OR LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2018) OR LIMIT-TO (PUBYEAR , 2017) OR LIMIT-TO (PUBYEAR , 2016) OR LIMIT-TO (PUBYEAR , 2015)) AND (LIMIT-TO (OA , "all")). A total of 3,586 open-access documents, including journal articles, conference papers, book chapters, and other publications, were retrieved from Scopus. The data were exported in CSV format and converted into Excel for analysis. Various bibliometric techniques were applied to evaluate TMH's research productivity. Additionally, R software was used for data analysis, and VOSviewer was utilized to visualize collaborative country network maps to gain insights into collaboration patterns.

Data Analysis and Interpretation

Relevant parameters were selected for analysis and interpretation. The results are briefly described as follows:

Data Analysis

1) Types of Documents:

Types of Documents	Documents (Open Access)	Percentage %	All Documents
Journal Articles	2347	65.44	7916
Review	495	13.80	1119
Latter	371	10.34	1104
Editorial	155	4.32	322
Note	101	2.84	209
Others (Erratum, conference paper, Short Survey, Data Paper, Book chapter)	117	3.26	624
Total	**3586**	**100**	**11294**

Table 1: Types of Documents

Table 1 shows that out of a total of 11,294 documents published by Tata Memorial Hospital (TMH) from 2015 to 2024, a total of 3,586 were made available on open-access platforms. Most of these publications were journal articles, with 2,347 documents and 65.44% of the total. Reviews followed, comprising 13.80% of the publications, with 495 papers. Letters contributed 10.34%, totaling 371 documents. Editorials made up 4.32%, with 155 publications. Notes represented 2.84%, totaling 101 documents. Other types of documents, such as errata, conference papers, short surveys, data papers, and book chapters, accounted for 3.26%, with 117 documents.

2) Year-wise Publications and Citations in Open Access:

Year	Publications	Percentage	Citations	Avg. Citation Per Paper
2015	227	6.33	29072	128.07
2016	250	6.97	5880	23.52
2017	257	7.16	11860	46.14
2018	218	6.07	26841	123.12
2019	298	8.31	6576	22.06
2020	540	15.05	16784	31.08
2021	489	13.63	8323	17.02

2022	532	14.83	8655	16.26
2023	459	12.79	2282	4.92
2024	316	8.86	454	1.43
Grand Total	3586	100	1,16,727	

Table 2: Year-wise Publications and Citations

Table 2 provides a comprehensive overview of the publication and citation trends at Tata Memorial Hospital (TMH) from 2015 to 2024. The number of publications fluctuated over the years, with the highest number in 2020 (540 publications), with 15.05% of the total. The lowest number of publications was in 2015 (227), representing 6.33%. Citation trends also varied significantly, with 2015 showing the highest citation count of 29,072, which resulted in an average of 128.07 citations per paper. The average citations per paper were notably high in 2018 (123.12). Still, they began to decline after that, especially in 2023 and 2024, where the citation counts dropped dramatically, leading to an average of just 4.92 and 1.43 per paper, respectively. Publications in recent years (2023 and 2024) may have needed more time to accumulate citations. Academic articles typically take time to gain visibility and be referenced by other researchers, especially in fields with longer research cycles. This delay could explain the lower citation counts in these years. Despite the fluctuations in citations, the total number of publications remained steady, contributing to 3,586 open-access documents by 2024. The total citations across all years amounted to 116,727. These trends highlight both the productivity and the varying impact of the hospital's research output over the period, with peak citation years in the earlier part of the study period, followed by a noticeable decline in recent years.

3) Top 10 Most Prolific Authors:

SL	Author	No. of Documents	Citations	ACPP	H-Index
1	Prabhash, Kumar P.	338	2979	8.83	41
2	Noronha,Vanita Maria	295	2314	7.79	35
3	Joshi, A.	213	1889	8.82	31
4	Gupta, S.	177	3469	19.16	37
5	Patil, V.	175	2104	7.67	30

6	Mahajan, A.	170	1379	8.11	30
7	Menon, N.	158	897	5.40	17
8	Chaturvedi, P.	142	26689	186.63	53
9	Ramaswamy, A.	102	764	7.41	17
10	Rekhi, B.	99	575	5.75	26
ACPP= Average Citation Per Paper					

Table 3: Most Prolific Authors

Table 3 describes the most prolific author at Tata Memorial Hospital (TMH), Kumar P. Prabhash, who published 338 documents. These publications have received 2,979 citations, resulting in an average citation per paper (ACPP) of 8.83. His H-index is 41, indicating significant scholarly impact, as this metric reflects the number of his publications that have been cited at least 41 times each. Other notable authors include Vanita Maria Noronha (295 publications, 2,314 citations, ACPP of 7.79, H-index of 35) and A. Joshi (213 publications, 1,889 citations, ACPP of 8.82, H-index of 31). Both authors have made substantial contributions to the research output at TMH, and their work has been widely cited.

Additionally, S. Gupta has an impressive ACPP of 19.16, 177 publications, 3,469 citations, and an H-index of 37. Another highly productive author is P. Chaturvedi, who has an extraordinary ACPP of 186.63, with 142 publications and 26,689 citations. She is one of the highest-impact authors at TMH, with an H-index of 53. These authors have significantly contributed to TMH's research output, with Kumar P. Prabhash leading in both volume and scholarly impact based on citations and H-index.

4) Authorship pattern:

Authorship Pattern	No. of Contribution 2015-2024	Percentage
Single Author	211	5.88
Two Authors	332	9.25
Multi Authors (3,4 &5 authors)	1057	29.47
Mega Authors	1986	55.38

(More than six authors)		
Total	3586	100

Table 4: Authorship pattern

The authorship pattern of research publications at Tata Memorial Hospital (TMH) from 2015 to 2024 reveals a distinct trend in collaboration, as shown in Table 4. A relatively small percentage of publications (5.88%) were authored by a single author with 211 contributions. In contrast, publications with two authors accounted for 9.25%, with 332 contributions. Small to medium-sized teams produced a notable portion of the research, as publications with three, four, or five authors comprised 29.47% of the total, representing 1,057 contributions. However, the most significant proportion of publications came from mega-author teams, with more than six authors, which accounted for 55.38% of the total publications, totalling 1,986 contributions. This suggests a strong tendency toward collaborative research at TMH, with many publications involving large teams, possibly reflecting the institution's multidisciplinary and collaborative nature of medical and clinical research.

5) Top 10 Preferred Journals for Publishing:

SL	Journal Title	Publishers	No. of Publications	Journal Impact Factor (2023)	SJR (2023)
1	Cancer Research, Statistics, and Treatment	Wolters Kluwer Medknow	348	0.666	0.254
2	Indian Journal of Medical and Paediatric Oncology	Georg Thieme Verlag	181	0.197	0.123
3	Indian Journal of Anaesthesia	Wolters Kluwer Medknow	119	1.122	0.494
4	Indian Journal of Critical Care Medicine	Jaypee Brothers Medical	119	1.062	0.511

5	South Asian Journal of Cancer	Georg Thieme Verlag	111	0.548	0.222
6	Indian Journal of Surgical Oncology	Springer	105	0.588	0.25
7	Indian Journal of Palliative Care	Scientific Scholar LLC	74	0.981	0.404
8	Indian Journal of Pathology and Microbiology	Wolters Kluwer Medknow	72	0.487	0.224
9	EcancerMedical science	Cancer Intellilgence	67	1.17	0.515
10	Journal of Cancer Research and Therapeutics	Wolters Kluwer Medknow	66	1.313	0.427

Table 5: Top 10 Preferred Journals for Publishing

Table 5 presents the top ten preferred journals for publishing research from Tata Memorial Hospital (TMH) that focus on oncology, anaesthesia, and critical care, with a combination of national and international journals. The most frequently published journal is Cancer Research, Statistics, and Treatment (Wolters Kluwer Medknow), with 348 publications. This journal has a 2023 Impact Factor of 0.666 and an SJR of 0.254, indicating moderate recognition in the field. Other significant journals include the Indian Journal of Medical and Paediatric Oncology (Georg Thieme Verlag), with 181 publications, and the Indian Journal of Anaesthesia (Wolters Kluwer Medknow) and the Indian Journal of Critical Care Medicine (Jaypee Brothers Medical), each with 119 publications. These journals have Impact Factors ranging from 0.197 to 1.122 and SJR scores between 0.123 and 0.511, indicating a mix of regional and more established international journals with moderate to high recognition.

The publishing pattern highlights a strong preference for journals within the medical and oncology fields, particularly those focusing on regional issues and clinical research, while also showing an inclination toward journals with higher visibility and impact.

6) Top 10 most-highly cited papers:

Authors	Title	Year	Source Title	Cited by	Rank
Ferlay J.; Soerjomataram I.; Dikshit R.; etall	Cancer incidence and mortality worldwide: Sources, methods and major patterns in GLOBOCAN 2012	2015	International Journal of Cancer	23592	1
James S.L.; Abate D.; Abate K.H.; et all	Global, regional, and national incidence, prevalence, and years lived with disability for 354 Diseases and Injuries for 195 countries and territories, 1990-2017: A systematic analysis for the Global Burden of Disease Study 2017	2018	The Lancet	9557	2
Roth G.A.; Abate D.; Abate K.H. etall	Global, regional, and national age-sex-specific mortality for 282 causes of death in 195 countries and territories, 1980–2017: a systematic analysis for the Global Burden of Disease Study 2017	2018	The Lancet	5488	3
Agha R.A.; Franchi T.; Sohrabi C.; etall	The SCARE 2020 Guideline: Updating Consensus Surgical Case Report (SCARE) Guidelines	2020	International Journal of Surgery	4664	4
Bassi C.; Marchegiani G.; Dervenis C.; etall	The 2016 update of the International Study Group (ISGPS) definition and grading of postoperative pancreatic fistula: 11 Years After	2017	Surgery (United States)	2999	5

Griswold M.G.; Fullman N.; Hawley C. etall	Alcohol use and burden for 195 countries and territories, 1990-2016: A systematic analysis for the Global Burden of Disease Study 2016	2018	The Lancet	2296	6
Agha R.A.; Borrelli M.R.; Farwana R.; etall	The SCARE 20182018 statement: Updating consensus Surgical Case Report (SCARE) guidelines		International Journal of Surgery	2045	7
Fitzmaurice C.; Abate D.; Abbasi N.; etall	Global, regional, and national cancer incidence, mortality, years of life lost, years lived with disability, and disability-adjusted life-years for 29 cancer groups, 1990 to 2017: A systematic analysis for the global burden of disease study	2019	JAMA Oncology	1886	8
Khoury J.D.; Solary E.; Abla O.; etall	The 5th edition of the World Health Organization Classification of Haematolymphoid Tumours: Myeloid and Histiocytic/Dendritic Neo plasms	2020	Leukaemia	1829	9
Campbell P.J.; Getz G.; Korbel J.O.; etall	Pan-cancer analysis of whole genomes	2020	Nature	1769	10

Table 5: Top 10 most-highly cited papers

Table 5 reveals the productivity of the top ten highly cited papers of Tata Memorial Hospital (TMH). Its collaborations span many significant research topics, particularly global health, cancer, and surgery. Out of ten papers, the

most highly-cited paper was published by Ferlay et al. (2015), titled Cancer Incidence and mortality worldwide: Sources, methods, and major patterns in GLOBOCAN 2012, published in the International Journal of Cancer, with an impressive 23,592 citations. This paper offers a comprehensive overview of global cancer incidence and mortality, playing a key role in global cancer epidemiology.

7) Top Ten Collaborative Organizations:

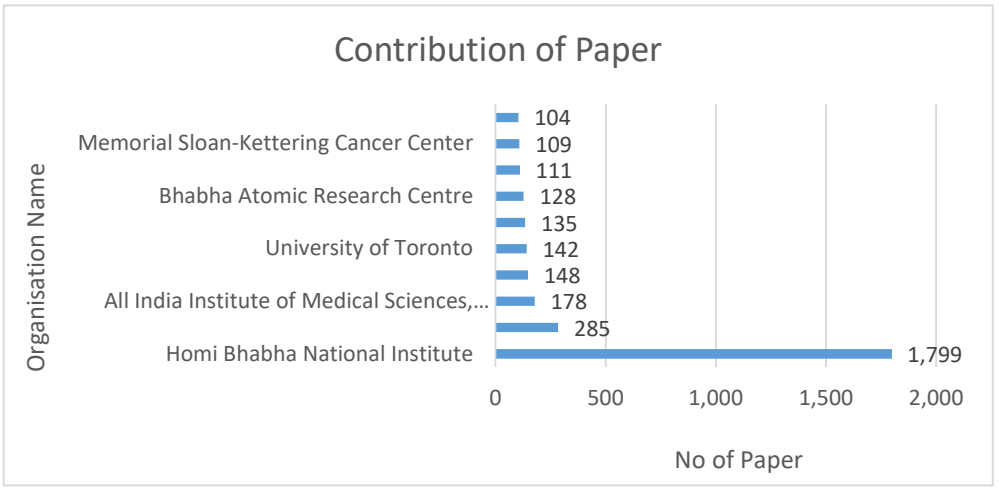

Figure:1 Top Ten Collaborative Organizations

Figure 1 reveals that the top ten collaborative organizations with Tata Memorial Hospital (TMH) show that the Homi Bhabha National Institute contributed 1799 papers, followed by the Advanced Centre for Treatment, Research & Education in Cancer, which takes the lead with 285 and All India Institute of Medical Sciences, New Delhi 178. It is deduced that organizational/institutional collaboration is essential for the productivity of multidimensional research.

8) Subject wise Publications:

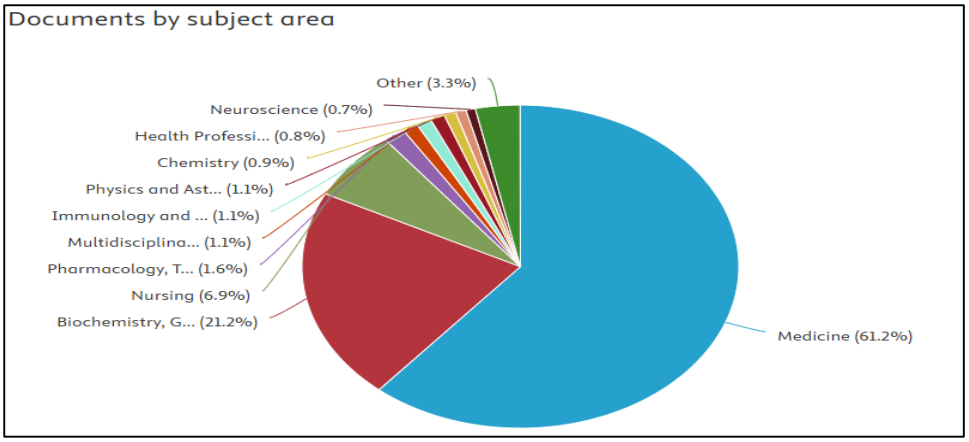

Figure 2: Subject-wise Publications

This study represents the different subject-wise research productivity. Figure 2 depicts that Medicine is the most potential publication area with 3278 (61.2%), highlighting TMH's strong focus on clinical and medical research. Biochemistry, Genetics, and Molecular Biology follow with 1,138 publications, underscoring the institution's contributions to molecular and genetic research, particularly in cancer biology and related areas. Smaller numbers of publications appear in Materials Science, Social Sciences, Mathematics, Decision Sciences, etc. These indicate interdisciplinary efforts and a holistic approach to research at TMH, addressing issues beyond traditional medical science.

9) Visualizations of Collaboration of Co-authorship Network: -

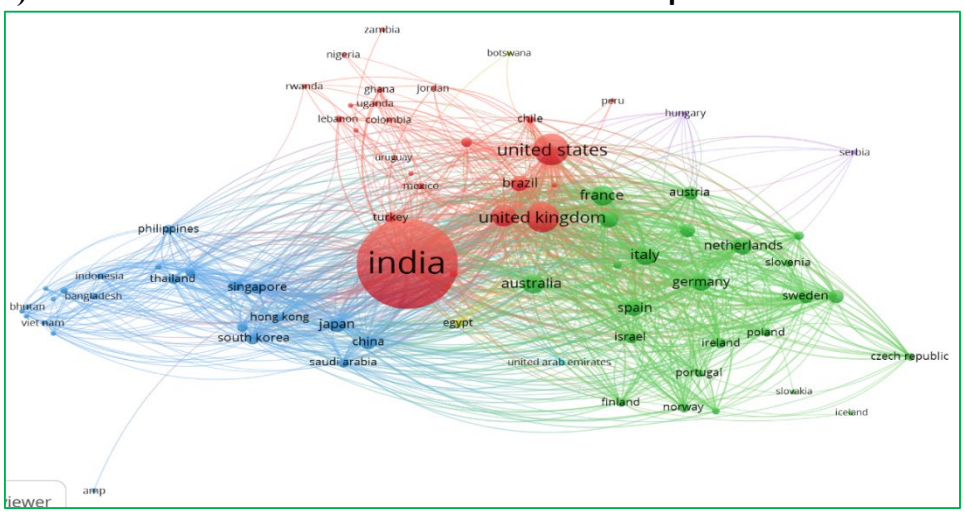

Figure 3: Collaboration of Co-authorship network

10) Co-authorship Network analysis:

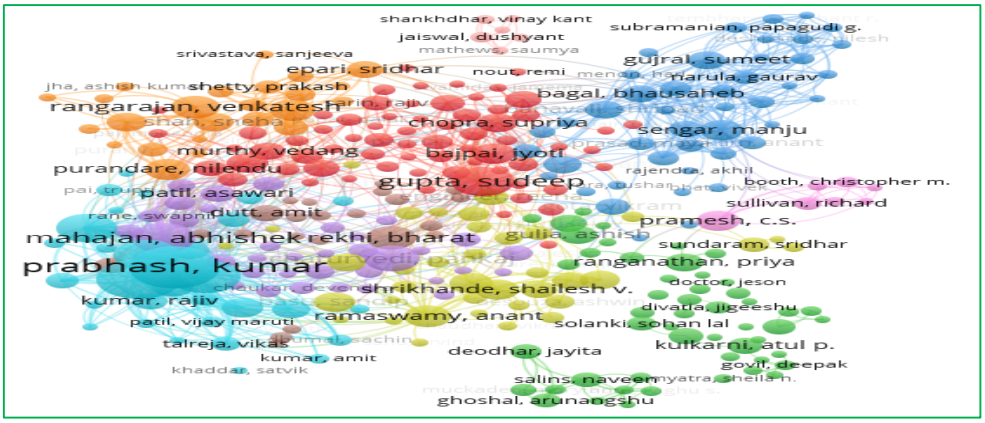

Figure 4: Co-authorship Network analysis

Figures 3 & 4 show represent the contributions of authors in Indian as well as other countries and the co-authorship network analysis of Tata Memorial Hospital (TMH). The authors of the TMH have collaboratively produced their research articles in other countries, such as the United States, the United Kingdom, France, Canada, and others. In this network visualization, items are coloured differently and represent the item's score. The total strength of the co-authorship links with other authors and the authors' total link strength will be highlighted. Lines also represent the strongest co-authorship link between authors. In this figure, Prabhas Kumar has 338 documents with 2979 citations, and the link strength is 1922. The font size represents the number of publications, and the curved line represents the strength of collaboration between the authors or researchers, where the colour represents the cluster.

11) Author Keywords Analysis vs Index Keywords:

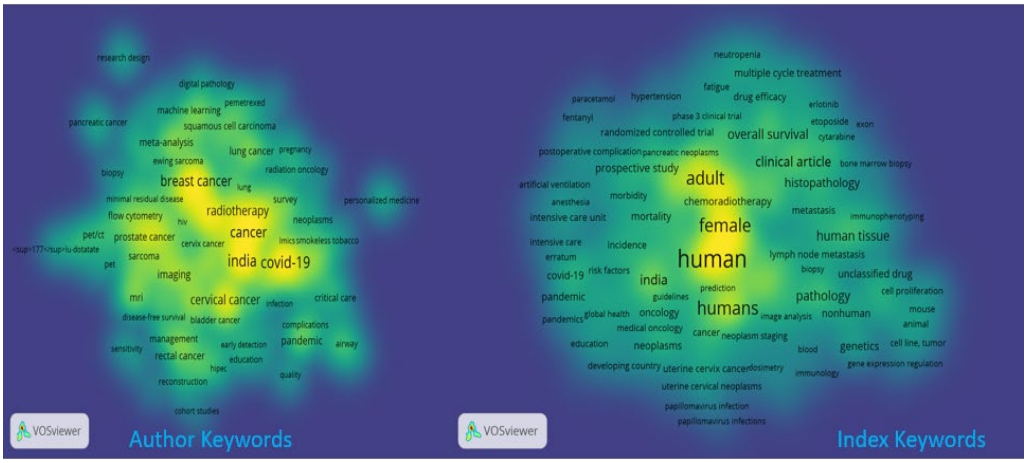

Figure 5: Keywords Analysis

Figure 5 indicates the analysis of frequently used author and index keywords from 2015-2024. The study found 6795 author keywords and 14979 index keywords were used in the clustering map during the study period. It shows the highest number of cluster occurrences with the font size and background colour (yellow). The most commonly used author keywords were "Cancer," "COVID-19," and "India," which appeared most frequently. Among the index keywords, the clusters with the highest occurrences were "human," "humans," and "female."

Summary, discussion and conclusion:

The present study analysed the research outputs of Tata Memorial Hospital (TMH) in India from 2015 to 2024. These trends reflect both the steady productivity of TMH's research and the varying impact of its publications, with peak citation years in the earlier part of the study period, followed by a noticeable decline in recent years. The most publications occurred in 2020 (540), while the lowest was in 2015 (227). Citation trends peaked in 2015 with 29,072 citations, averaging 128.07 citations per paper, but declined significantly in 2023 and 2024, with averages of just 4.92 and 1.43 citations, respectively. This decline is likely due to recent publications not having enough time to accumulate citations. Despite the fluctuation in citation counts, TMH's total publications remained steady, reaching 3,586 open-access documents by 2024 and collecting 116,727 citations overall. These trends reflect the hospital's consistent productivity, with a noticeable drop in citation impact in recent years. Most of all, the research contributions were in the form of journal articles and significant contributions to open-access research. Kumar P. Prabhash is the most prolific author at Tata Memorial Hospital (TMH), with 338 publications, 2,979 citations, and an H-index of 41, reflecting a strong scholarly impact. The authorship pattern shows a clear preference for collaborative research. The most significant proportion of publications came from mega-authors, with more than six authors highlighting the TMH's emphasis on multidisciplinary and collaborative medical research. The most frequently published journal is Cancer Research, Statistics, and Treatment (Wolters Kluwer Medknow), with 348 publications. Ferlay et al. (2015) published the most highly-cited paper, titled Cancer incidence and mortality worldwide: Sources, methods, and Major Patterns in GLOBOCAN 2012, published in the International Journal of Cancer, with an impressive 23,592 citations.

This study also reveals that the top collaborative organizations with Tata Memorial Hospital (TMH) include the Homi Bhabha National Institute, with 1,799 papers, and the Advanced Centre for Treatment, Research & Education in Cancer, contributing 285 papers. This highlights the importance of institutional collaboration for enhanced research productivity. Medicine is the primary publication area at TMH, followed by significant contributions in Biochemistry, Genetics, and Molecular Biology, indicating a strong focus on clinical and molecular research. TMH's international collaborations include authors working closely with researchers from countries like the United States, United Kingdom, and Canada. The frequently used author and index keywords, with "Cancer," "COVID-19," and "India" being the most common, emphasize TMH's focus on cancer research and global health issues. The findings of this study highlight the strengths and weaknesses of the open-access research output of Tata Memorial Hospital (TMH) in India over ten years.

References:

1. Baby, & Kumaravel. (2012). Research productivity of Periyar University: A bibliometric analysis. International Research Journal of Library, Information and Archival Studies, 1(1).
2. Gautam, V. K., & Mishra, R. (2015). Scholarly research trend of Banaras Hindu University during 2004-2013: A scientometric study based on Indian Citation Index. DESIDOC Journal of Library & Information Technology, 35(2).
3. Kumar, H. A., Dora, M., & Desai, A. (2015). A bibliometrics profile of Gujarat University, Ahmedabad during 2004-2013. DESIDOC Journal of Library and Information Technology, 35(1), 9–16. https://doi.org/10.14429/djlit.35.1.7699
4. Marisha, Banshal, S. K., & Singh, V. K. (2017). Research performance of central universities in India. Current Science, 112(11), 2198-2207.
5. Marisha, B. S., & Singh, V. K. (2017). Research performance of central universities in India. Current Science, 112(11), 2198-2207.
6. Mishra, P., Rout, S. K., & Sahu, R. R. (2022). Mapping the research productivity of Jadavpur University a period from 2011–2020: A bibliometric analysis. KIIT Journal of Library and Information Management, 9(1), 1-12.
7. Parabhoi, L., & Sahu, R. R. (2019). Research publications of Himachal Pradesh University during 1972-2015: A bibliometric study. In S. Singh, B. K. Singh, & N. Thapa (Eds.), Emerging trends for SMART libraries: A

festschrift volume in honor of Professor V.P. Khare (pp. 345–359). Shree Publishers and Distributors.
8. Parabhoi, L., Sahu, R. R., & Kumari, N. (2017). Research productivity of Dr Yashwant Singh Parmar University of Horticulture and Forestry, Solan, Nauni indexed in Scopus during the year 2006-2015: A bibliometric study. International Journal of Library and Information Studies, 7(4), 421–430.
9. Pritchard, A. (1969). Statistical bibliography or bibliometrics. Journal of Documentation, 25(4), 348–349.
10. Roy, S. B., & Basak, M. (2013). Journal of Documentation: a bibliometric study. Library Philosophy and Practice (e-Journal). Paper, 945.
11. Sa, M. K., & Parabhoi, L. (2017). Research Productivity of Global Facebook Research during 2012-2015: A Bibliometric Appraisal. International Research: Journal of Library and Information Science, 7(2)
12. Tata Memorial Centre. (n.d.). Retrieved December 12, 2024, from https://en.wikipedia.org/wiki/Tata_Memorial_Centre
13. Tata Memorial Centre. (n.d.). Retrieved December 12, 2024, from https://tmc.gov.in/

Bibliometric Analysis of Journals of Online Information Review

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Abstract In this research paper, a bibliometric study of the journals of "Online Information Review" is being conducted. These journals are published in six issues every year. For this research article, data has been downloaded from the website of the journal. For this research, a bibliographic analysis has been done with 249 articles published in the journal during the five years 2006-2010. This study focuses on bibliographic analysis form, authorship analysis, year-wise distribution of articles and issue-wise distribution, as well as single and multi-author papers. The findings of the study have shown the strengths and weaknesses of the journal, which are useful for its further development. It has been revealed from this study that in 2009, maximum 55 (22.09%) articles were published. Maximum 98 (39.35%) articles have been contributed by single authors.

Key Word
Bibliometric, Scientrometric, Informetric, Citation Analysis

Introduction

Citation analysis is a branch of Bibliometrics. It is a crucial research tool for intellect science analysis and the structure and direction of science. The development of Citation Analysis has been marked by the mention of new techniques and measures. It is the new Bibliometric technique, which was citation count, determining given documents has received how many citations. The main objective of Citation Analysis is to evaluate and interpret citations received by articles, the author's institution, and other aggregates of scientific activities.Citation analysis is a method that involves gathering, tabulating, analyzing, and interpreting citations from diverse forms of literature in order to identify important sources of data, as well as relevant people, places, and other groups of scientific activity. Citation analysis

establishes linkages by using citations from academic publications. It is possible to identify a wide range of connections, including those between authors, academic publications, journals, sectors, or even nations. It is possible to research citations both to and from a certain document. One especially popular application of citation analysis is to evaluate the impact of a single author on a certain subject by calculating the number of times the author has been cited by others.

About Online Information Review journal

Online information Review is a peer-reviewed publication devoted to the broad topic of online information in academic, business, scientific, and commercial contexts. Focusing primarily on the development, storage, retrieval, and application of online and digital information, it addresses a problem involving online source systems and services. With contributions from both developed and content, coverage is global.

Review of Literature

Gross and Gross (1927) discovered that they cited frequently very few journals in the Journal of the American Chemical Society, while someone only cited once many journals. Their finding concurs with Zipf's Law, which states that while few items occur often, many items occur rarely. (National Institute of Standards and Technology, 2002); libraries should be able to supply most of the users' needs with a few journals.

Nasir U. and Khan (2010) in their study titled "A Citation analysis of doctorate dissertations submitted in the Department of History, Aligarh Muslim University, Aligarh," the authors examined 4500 citations from 41 Ph.D. theses produced between 1990 and 2010. Their research findings show books received the most citations, making up 72.5% of all citations. The majority of the texts were written in English (45.52%), next in Persian (32.46%), and finally in Urdu (13.6%). It was discovered that single authors were responsible for 77.341 percent of the publications. The publication with the most citations, "Journal of Bihar Research Society," was ranked first (6.44%).

Sengar (2014) In his article, "Authorship pattern, degree of collaboration and research publishing trend among scientists/researchers of CSIR-IMTECH, India 1991-2010: a bibliometric analysis," the author looked at 902 research publications to determine the degree of authorship cooperation

and the pattern of authorship among the CSIR-IMTECH scientists/researchers throughout the years 1991 to 2010. His research findings showed that most scientists and researchers prefer to publish their work as joint authors. It was determined that 0.83 percent of the writing was collaborative. In 2007 and 2010, more research publications were produced. They also observed that the CSIR-IMTECH research was increasingly shifting toward multi-authorship and collaborative projects.

Alhamdi, Khaparde & Kanekar (2014) This work tried a bibliometric analysis of 10 volumes (57–66) in the area of the journal of documentation. It is based on the references included in the "Journal of Documentation," an international journal, 2001 and 2010. The authors' contributions to 364 publications in the Journal of Documentation, which total 15150 references, served as the foundation for the current study. The number of journal citations was shown to be higher than those of other citation types. Additionally, it was shown that solitary researchers predominate over collaborative ones. The Journal of Documentation did not particularly like the breadth of the partnership.

Buffardi and Nichols (1981) Studies like the evaluation of journals in the fields of embryology, anatomy, and morphology show what journals rank best within these fields using ranked lists in Journal Citation Reports, but there is no additional information such as a citation or a circulation study to examine what is being used locally. Nanoscience is difficult to evaluate according to ranked lists as very few journals are dedicated to this interdisciplinary field, thus a local citation study is essential. (Dombrowski's, 198l).

Definitional Analysis

Bibliometric

The application of the mathematical method to books and other media of communication"(Pritchard 1969); potter defines bibliometric as the study and measurement of the publication pattern of all forms of written communication and their author"(Kumar.,2004).

Scientometrics

In the 1960s, particularly in Eastern Europe, the term “Scientometrics” was used to denote “Measurement of Informetrics

Process" (Rao, 2013); Scientometrics is branch of the 'science of science'.

Informetric

Informetric is a term synonymous with and analogous to bibliometrics. The term "informatics" was suggested by German scientists Blackert and Zygel in 1982 as a newly formed branch of science, using mathematical and statistical methods to investigate Scientific and Technical Information on a theoretical level and practical information activities (Blackert and Stegel, 1979).

Citation

"Citation is the bibliographical reference that is usually appended with every research communication (Talwarkanungo, 1993); according to Martin, a citation implies a relationship between a part or the whole of the citing document (Ijary and Kannappanavar 1990).

Citation Analysis

Analyzes of the references or citation which forms part of the scholarly setup of primary communication true citation analysis is one that deals with works cited as having actually been used in the preparation or having otherwise contributed to the source paper.

Objective of the study.

To make an analysis of articles published in Journal of online information review from 2006 and 2010.

- Identify two-dimensional examination of data with respect to authorship patterns of articles,
- Determine the distribution of articles by issue,
- Study the authorship pattern by period and volume,
- Scrutinize single and joint author papers,
- Know the average citations per contribution in each volume of the journal,
- Know the page-wise distribution of journal articles,

Scope and Limitation of the Study

The present study includes articles published in the 'Journal of Online Information Review' from the period 2006 to 2010. The data has been downloaded from the journal's website for this study. The results have been

tabulated and analyzed to fulfill the above-mentioned objectives of the research. A total of 249 articles have been retrieved from 30 issues of the journal in 5 volumes during the period 2006-2010. This data has been organized, calculated, tabulated, analyzed and its results have been presented in this paper using simple arithmetic and statistical methods.

Methods of the Study

The articles on "Online Information Review" were chosen at random from the web up until November 28th, 2010. It was discovered that the majority of the articles published in the top international LIS journals of online information review were among those that were readily available on the internet. Comparable to Online Information Review Emerald, which is based on evidence. Furthermore, no references are left out of the article's investigation.

Data Collection

The collected data from Journals of “Online Information Review,” the LIS journal is available on the UGC Infonet on the Dr. Babasaheb Ambedkar Marathwada University, Aurangabad website.The analysis and interpretation of data are below in the subsequent paragraph Online Information review list of the journal along with publishers and country of origin. Journals consulted with percentage total no of published and consulted publication of articles.

Data Analysis

Citation Analysis is a branch of Bibliometrics. It is an important research tool for understanding science which analysis the structure and directions of sciences. It aims at measuring the utility of documents and the relationships between documents and fields. The analysis is information is one of the important parts of an “Online Information Review” study. The present study of a total of 5478 citations appended to 249 articles was done in the journal during 2006-2010. The data or information was presented in the form of tables and graphs to show the result prominently.

a. Year wise Distribution of Articles

Table No. 1 shows that the maximum number of articles published in the year 2009 (55) and minimum in the year 2008 (46) articles. The journal published average of 49 articles per year.

Table No. 1Year wise Distribution of Articles

S. N.	Year	Vol. No.	No. of Issue	No. of Article	%
1	2006	30	6	49	19.68%
2	2007	31	6	48	19.28%
3	2008	32	6	46	18.47%
4	2009	33	6	55	22.09%
5	2010	34	6	51	20.48%
Total			**30**	**249**	**100%**

b. Month Wise Distribution of Articles

Table No. 2 shows that highest articles were published in the month of October 27 (10.84%) and the lowest no. of the articles were published in the month of February 16 (6.43%).

Table No. 2 Distribution of contribution (Issue wise)

S. N.	Month	No. of Articles	%
1	January	23	9.24%
2	February	16	6.43%
3	March	22	8.84%
4	April	18	7.23%
5	May	19	7.63%
6	June	20	8.03%
7	July	21	8.43%
8	August	19	7.63%
9	September	24	9.64%
10	October	27	10.84%
11	November	18	7.23%
12	December	22	8.84%
Total		**249**	**100%**

c. Authorship Pattern

Table No. 3 covers the authorship pattern of the articles published during the period-2006-2010 of study. Maximum number of articles was contributed by single authors articles 98, (39.36%). This is followed by Double authors 78, (31.33%) articles, three authors 49, (19.68%), four author 15, (6.02%)articles, Five Author 5, (2.01%) articles, more than six author 3, (1.20%) article and Seven Author 1, (0.40%) article.

Table No-3 Authorship Pattern

S.N.	Authorship Pattern	Issue					Total	%
1	Single Author	14	27	30	15	12	**98**	**39.35**
2	Double Author	9	16	15	21	17	**78**	**31.32**
3	Three Author	8	11	7	13	10	**49**	**19.67**
4	Four Author	2	3	7	2	1	**15**	**6.024**
5	Five Author	1	2	0	2	0	**5**	**2.00**
6	More than six Author	0	3	0	1	0	**4**	**1.60**
Totals		**34**	**62**	**59**	**54**	**40**	**249**	**100.00**

9.4 Average citation per article in each volume

Table No. 4 reveals the average citation per article in each volume during the period of study.

Maximum number of citations 1288 (23.51) appearedin volume no.34 followed by1144 (20.88%) citationsappearedin volume no. 33, 1078 (19.67%) citationsappearedin volume no. 31, 1056 (19.27%)citationsappearedin volume no. 32 and 912 (16.64%) citationsappearedin volume no.30.

Table No.4average citations per article in each volume

S. N.	Vol. No.	No. of Articles	No. of Citation	%
1	30	49	912	16.64
2	31	48	1078	19.67
3	32	46	1056	19.27
4	33	55	1144	20.88
5	34	51	1288	23.51
Total		**249**	**5478**	**100**

d. Ranking of author

It was interesting to know, who has been the famous author among professionals. Taking into consideration of citations only thirteen ranks have been given in Table No. 5. It can be observed from the table that Jacso, P. ranked first, while Nielen, J. second, Saety R. W. third, Thelwall, M.I. fourth and Kim, L.M. and Delone, W. H. fifth and so on.

Table No. 5 Ranking of author

S. N.	Name of Author	Time Cited	Rank
1	Jacso, P.	37	1
2	Nielen, J.	32	2
3	Saety R. W.	28	3
4	Thelwall, M.I.	26	4
5	Kim, L.M.	23	5
6	Delone, W. H.	23	5
7	Cimiano, P.	22	6
8	Voled M.	22	6
9	Cullen, R.	21	7
10	Hsu, C.L.	20	8
11	Tomi, I.	12	9
12	Lave, J.	9	10
13	De Pedret	9	10
Total		**284**	

e. Geographical distribution

Table no. 6 shows that USAhas the first rank with 907 citations forming (24.98%) of the total citation, second rank goes toUK with 812 citations forming (22.36%) of the total citation, third rank goes to Chinawith 612 citations forming (16.99%) of the total citation, fourth rank goes to Singapore with 402 citations forming (11.07%) of the total citation, fifth rank goes to Cananda with 378 citations forming (10.41%) of the total citation,sixth rank goes to New Zeeland with 221 citations forming (6.09%) of the total citation and so on.

Table No. 6 Geographical distribution

S. N.	Country	Citation	Percentage
1	USA	907	24.98
2	UK	812	22.36
3	China	617	16.99
4	Singapore	402	11.07
5	Canada	378	10.41
6	New Zeeland	221	6.09
7	Spain	102	2.81
8	South Africa	52	1.43
9	Sweden	48	1.32
10	Nigeria	46	1.27
11	Nether land	46	1.27
Total		**3631**	**100**

f. Average pages per volume

Table No. 7 reveals that the Maximum number of citations 1844 (28.70) pagesappeared in volume no. 30followed by1529 (23.80%) pagesappeared in volume no. 31, 1232 (19.17%) pagesappeared in volume no. 34, 927 (14.43%) pagesappeared in volume no. 33 and 892 (13.88%) pagesappeared in volume no. 32.

Table No. 7 Average pages per volume

S. N.	Vol. No.	No. of Articles	Total Pages	%
1	30	49	1844	28.70
2	31	48	1529	23.80
3	32	46	892	13.88

4	33	55	927	14.43
5	34	51	1232	19.17
Totals		**249**	**6424**	**100**

Findings and Conclusion

In this study, an attempt was made to conduct a bibliometric study of the Online Information Review journal of research in a wide range of fields including digital information and communication and related technologies to achieve the predefined objectives, such as examining the growth of publication, most cited articles, most prolific authors, authorship pattern, Geographical distribution etc. A total of 249 articles were analyzed in this study. This study discovered that the majority of articles were contributed in the year 2009, while a negative trend was shown from 2008 onwards. It was also found that many articles were published under single authorship, while out of 249 articles, 98 were published under single authorship. The highest number of citations were received by Mr. Jacso, P. He received more than 37 citations.

Reference

1. Alhamdi, F. A., Khaparde, V., & Kanekar, B. V. (2014). Journal of Documentation: A Bibliometric Study (2001-2010). Excel's International Journal of Social Science & Humanities, 1(2). 57-70.
2. Buffardi, L. C. & Nichols, J.A. (1981). Citation Impact, Acceptance rate, and AP A journals. American Psychologist 36,1453-1456.
3. Bulletin, 34 (4) 175-1791.
4. Dombrowski. (1990). Journals evaluation using journals Citation reports as a Collection Development tool. Collection management 10(2/4),175-180.
5. Gross, P. L. K. & Gross E. M. (1927). College Library and chemical Education. Sciences 66,385-389.
6. https://digitalcommons.unl.edu/libphilprac/5495
7. Ijay, S. R. and Kannappanavar, B. U. (1990). Information Pattern of Indian Clinical Psychological: A Citation study Journals of Library and Information science.15(2), December.
8. Kumar, P.S.G. (2000). Research Methods and Statistical Technique B. R. Publication Corruption.
9. Nasir, J., Umar, S., & Khan, S. (2010). A citation analysis of doctoral dissertations submitted in the department of History, Aligarh

Muslim, University, Aligarh. Gyankosh: The Journal of Library & Information Management, 1(1), 75-80.
10. National Institutes of Standard and Technology. (2002). Zifs law [Online]. available {http://www.itl.nist.gov/div897/sqg/dads /HTMAL/zifs law}.
11. Ona Voveriene and ayelre, Trumpiene (1994). Bibliometric scintometric and information. Iaslic
12. Paul M. and Roy R. (1983) Developing horizons in library and information science P.226) Print wed Publication C.T., Jaipur.
13. Rao, Ravichandra I.K. (2013). From Librametry to Webometric Research in India with emphasis on the work done since 2001. SRELS Journal of Information Management. 50(5), 479-520.
14. Sengar, K. P. S. (2014). Authorship pattern, degree of collaboration and research publication trend among scientists/researchers of CSIR-IMTECH, India 1991-2010: a bibliometric study. PEARL-A Journal of Library and Information Science, 8(1), 26-31.
15. Smith, L. (1981). Citation analysis Library trends 30,83-106.
16. Varma, Maya (1994). Citation analysis of same selected Indian Journals in Economics Annals of Library Sciences and Documentation 41(1),33-39.
17. White, H. S. (1981). Strategies and alternatives in dealing with the serial Management Budgeting serial Collection Development: Choices and Strategies.31-32.

The Emerging Global Reference Destination for Scientometrics Literature in the Open Access International Nuclear Information System

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Abstract

The International Nuclear Information System (INIS) is an open repository of science and technology it covers all allied subjects on peaceful applications of atoms, was evaluated for its significance in the evolving fields of scientometrics and bibliometrics. A targeted search produced 361 records, highlighting a new and valuable resource within the INIS scope. This scientometric study examined a collection of publication records to identify key patterns, trends, and characteristics within the research domain. The study aimed to assess publication productivity, evaluate the contributions of leading institutions and countries, analyze evolving keyword and subject trends, and explore the distribution of publications across over the periods. By using quantitative analysis methods, this study provided valuable insights into the patterns of scientific output and highlighted the most significant contributors to the field, providing a comprehensive understanding of publication productivity trends and emerging topics. The findings proved to be a useful resource for researchers, policymakers, and institutions in guiding future research priorities and collaborations. The findings highlight INIS's value as a significant resource for nuclear information and its contribution to research with societal benefits. The INIS database encompasses a wide range of socially beneficial subjects, including nuclear power generation, radiation therapy, radiation protection of the public and environment, nuclear agriculture, and food preservation. Furthermore, the database incorporates valuable knowledge management information, such as subject bibliographic standardization, classification systems, indexing and publication analysis techniques. This makes the INIS database an invaluable resource for library and information professionals worldwide.

Keywords
scientometrics, bibliometrics, publication analysis, IAEA, databases, descriptors, INIS thesaurus, nuclear information, journals, Non-conventional literature, scientific reports

Introduction

INIS, a key repository for literature on the peaceful applications of nuclear science and technology (Verlini 2010), INIS containing Non-conventional literature (NCL) which is not easily available commercially distribution channels, such as a technical and scientific reports, patent documentation, conference proceedings and doctoral thesis (Hendley 1993) and Highlighted in a repot are the functional requirements for a digital NCL system at INIS and its members (INIS-GB--617). United Kingdom. It also includes books and magazines which is available in commercially through publishers. This study aims to promote INIS among library professionals and analyze its scientometrics and bibliometrics records archived in the database. *INIS database* is classified in 49 standard subject categories. It includes conventional and Non-conventional literature (NCL). The categories listed by the INIS database in 2001 mark a milestone for the diversification of multidiscipline of nuclear science and technology. The categories include in figure 1:

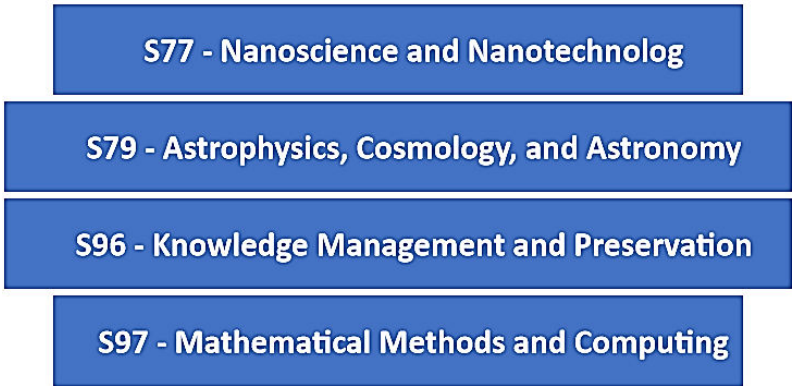

Figure 1: Newly added subject category with subject code in INIS repository

These categories highlight the expanding scope of research areas within nuclear science, emphasizing interdisciplinary fields and the integration of advanced technologies for peaceful purposes. The subject of knowledge management, including its classification and information systems, is highly valuable for library and information professionals worldwide. In INIS repositories, indexing is crucial for highlighting significant topics and emerging trends (Buckland 1991; IAEA 2024). Standardized vocabulary, consisting of controlled descriptors, is essential for maintaining consistency

and accuracy in the indexing process (Broughton 2006). Indexers select these terms from a designated thesaurus that aligns with the database's focus to ensure clarity and uniformity across the records (Bates 1998).

It provides a structured framework to manage, organize, and disseminate information effectively within organizations. Knowledge management systems enable the capture, storage, retrieval, and sharing of valuable knowledge and expertise, which is crucial for improving decision-making, innovation, and overall efficiency in various fields, including nuclear science and technology. These systems are essential tools for librarians and information professionals in managing vast collections, enhancing user experience, and facilitating access to information.

This study is aimed to present the trend of publications; observing countries output globally; analysing the content through the classification and keywords; and finding out publication forms of the literature during the study period.

This study presents a scientometric and bibliometric analysis of retrieved records from the INIS repository. The analysis aims to provide insights into the publication patterns, trends, and characteristics of nuclear science and technology literature. The indicators were author productivity, collaboration patterns, institutional and country-wise contributions, and subject trends to the study. The findings highlight the repository's strengths, areas for improvement, and emerging research areas. This research promotes INIS as a valuable resource for nuclear information and encourages library professionals to leverage its potential for research and information dissemination. Many scientometric and bibliometric techniques were used to analyze scientific publications, employing these valuable methods to filter information and create a specific database focused on the pin-pointed needs of researchers. There has been significant advancement in scientometric techniques since the 1970s decade to the present day, with a substantial number of key publications contributing to the field (Barboni 1977; Braun 1979; Lyon 1979; Chen 2024;

Materials and methods

Number of publications for the study were collected from INIS repository (1977-2024), a total of 396 records were collected for analysis. The search strategy utilized keywords such as "scientometric" OR "bibliometric" in the Title and Abstract fields to identify relevant publications. This selection criterion ensured the inclusion of publications specifically related to scientometric studies within the INIS database, aligning with the objectives

of the research. The analysis in the present study is limited to 396 publications records in the field of scientometric study in INIS database as per objectives of the study.

Results and discussion

➢ Growth of scientometrics literature in INIS

Figure 2 shows, the analysis of the growth of scientometric literature within the INIS repository reveals a clear trend over the years. Between 1977 and 1988, there were only 17 publications related to scientometric studies. The following decade, from 1989 to 2000, saw a one increase with 18 publications. However, from 2002 to 2013, the number of publications tripled, totaling 64 papers. Most notably, the period from 2014 to 2024 witnessed a significant surge in scientometrics research, with 262 publications recorded. This growth reflects the increasing interest and recognition of scientometric studies as a valuable tool for analyzing scientific research and knowledge dissemination in the world. The upward trend during the recent decade highlights a growing academic interest in scientometric techniques within the field of nuclear science and technology. This reflects a heightened recognition of the need for improved understanding and management of scientific productivity and collaboration.

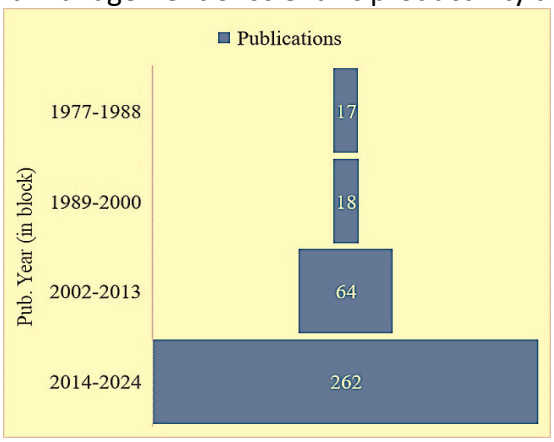

Figure 2: Growth of publication in INIS repository related to Scientometrics and bibliometrics during 1977-2024

➢ Type of Documents

The INIS serves as a valuable resource for library professionals, offering a diverse range of information types crucial for research and academic purposes. As shown in Figure 3, the data indicates the distribution of various formats available within the INIS repository: The illustrate the variety and richness of content available, with 256 (71%) journal articles, 47

(13%) books, 32 (9%) miscellaneous items, 25 reports (7%), and 1 multimedia resource. This variety not only highlights the breadth of information accessible through INIS but also emphasizes its importance in supporting research and knowledge dissemination across different formats and topics within the field of nuclear science and technology

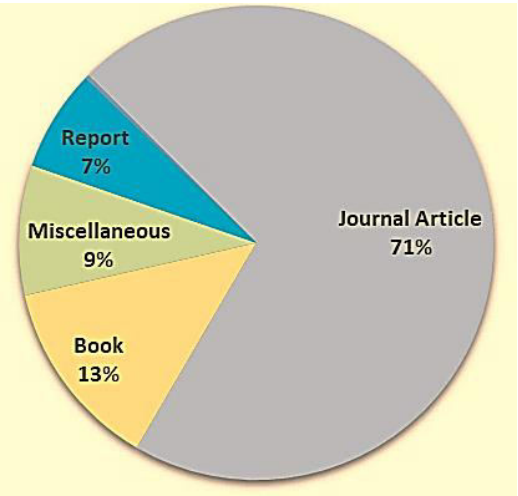

Figure 3: Type of documents in INIS repository related to Scientometrics and bibliometrics during 1977-2024

- **Country of publications:**

Table 1 shows that a total of 34 countries contributed significantly to scientometric research in the country publication field of the database. Leading contributors include the Netherlands (65 records), the United Kingdom (49 records), Germany (44 records), Spain (36 records), and the United States (23 records). Other notable contributors are Brazil (16 records), France (15 records), India (14 records), the International Atomic Energy Agency (IAEA) (13 records), Ukraine (12 records), and China (11 records). This highlights the global distribution of scientific research outputs, with these countries serving as prominent players in the field of scientometric research.

Table 1: More than 10 publication contributors in INIS repository related to Scientometrics and bibliometrics in during 1977-2024

S.No.	Country of publication	No. or records	%
1	Netherlands	65	18
2	United Kingdom	49	13.6
3	Germany	44	12.2

4	Spain	36	9.97
5	United States	23	6.37
6	Brazil	16	4.43
7	France	15	4.16
8	India	14	3.88
9	International Atomic Energy Agency (IAEA)	13	3.6
10	Ukraine	12	3.32
11	China	11	3.05

- **Country of Authorship**

Table 1 shows, the country authorship pattern indicates the distribution of authorship across articles in scientometric research. A majority of articles (244 out of 361) are authored by a single author, suggesting a significant contribution from individual researchers. Articles with two authors (42 articles) and three authors (19 articles) also contribute to the overall count, reflecting collaborative efforts in the field. Articles with four or more authors are less common, with only a few articles having up to seven authors. This distribution highlights the varying levels of collaboration in scientometric research, with most publications being the work of individual researchers, but also a noticeable presence of collaborative efforts.

Table 2: Country authorship

Authorship	**No. of publications**	**Total Authorship**
No authors	46	0
1	244	244
2	42	84
3	19	57
4	5	20
5	2	10
6	2	12
7	1	7
total	**361**	**434**

A total of 65 countries significantly appeared in the author field in INIS repository. The China leads with the highest number of authors, totaling 87, indicating a strong presence and significant contribution in this field. The United States follows with 44 Institutional authors, demonstrating its substantial involvement in scientometric research as well. Brazil, France, and India each have 25, 23, and 19 authors respectively, showing a notable contribution from these countries. Spain, United Kingdom, Japan, Canada, and Ukraine also have a strong representation with 17, 16, 14, 13, and 13 authors respectively. Australia, Austria, and Italy round out the list with 12 authors each are listed in table 3, reflecting their growing interest and involvement in scientometric research. These figures highlight the global reach and collaborative nature of scientometric research across various countries. India's contribution to scientometric research is significant, with 19 publications listed in the top five author rankings. This reflects the country's growing involvement and increasing influence in the field, demonstrating a strong academic and research presence. The participation of Indian authors indicates a vibrant scientometric research community within the country, contributing to both national and international scholarly discussions.

Table 3: Top country appeared in the author field in INIS repository

S.N0.	Country name	Number of publications
1	China	87
2	United State	44
3	Brazil	25
4	France	23
5	India	19
6	Spain	17
7	United Kingdom	16
8	Japan	14
9	Canada	13
10	Ukraine	13
11	Australia	12
12	Austria	12
13	Italy	12

- **INIS Subject categorization and scientometrics related publications**

INIS encompasses standard 49 subject categories (INIS 2021), the scientometric research publications are classified within 31 of these subjects listed in table 3, reflecting a diverse range of scientific fields. Leading the list is Environmental Sciences with 96 publications, reflecting a strong focus on sustainability and environmental research. General and Miscellaneous follows with 54 publications, indicating a broad coverage across various topics not confined to specific scientific disciplines. Other significant fields include Radiology and Nuclear Medicine with 37 publications, and Energy Planning, Policy, and Economy, along with Inorganic, Organic, Physical, and Analytical Chemistry, each contributing 21 publications.

Table 3: Subjects in scientometric publications and subject code as per INIS categorization scheme

SR	Subject (standard category code)	No. of publications
1	Environmental Sciences (S54)	96
2	General and Miscellaneous (S99)	54
3	Radiology and Nuclear Medicine (S62)	37
4	Energy Planning, Policy and Economy (S29)	21
5	Inorganic, Organic, Physical and Analytical Chemistry (S37)	21
6	Knowledge Management and Preservation (S96)	20
7	Engineering (S42)	14
8	Materials Science (S36)	13
9	Radiation Protection and Dosimetry (S61)	9
10	Mathematical Methods and Computing (S97)	8
11	Nanoscience and Nanotechnology (S77)	8
12	Applied Life Sciences (S60)	7
13	Instrumentation Related to Nuclear Science and Technology (S46)	7
14	Biomass Fuels (S09)	6
15	General Studies of Nuclear Reactors (S22)	5
16	Radiation, Thermal, and Other Environmental Pollutant Effects on Living Organisms and Biological Materials (S63)	5
17	Specific Nuclear Reactors and Associated Plants (S21)	4
18	Classical and Quantum Mechanics, General Physics (S71)	3
19	Condensed Matter Physics, Superconductivity and Superfluidity (S75)	3
20	Solar Energy (S14)	3
21	Geosciences (S58)	2
22	Hydrogen (S08)	2
23	Management Of Radioactive Wastes, and Non-Radioactive Wastes from Nuclear Facilities (S12)	2
24	Nuclear Disarmament, Safeguards and Physical Protection (S98)	2
25	Plasma Physics and Fusion Technology (S70)	2
26	Physics Of Elementary Particles and Fields (72)	2
27	Astrophysics, Cosmology and Astronomy (S79)	1
28	Coal, Lignite, and Peat (S01)	1
29	Energy Conservation, Consumption, and Utilization (S32)	1
30	Energy Storage (S25)	1
31	Isotopes and Radiation Sources (S07)	1
Total		**361**

The Knowledge Management and Preservation, Engineering, Materials Science, and Radiation Protection and Dosimetry round out the top ten with 20, 14, 13, and 9 publications respectively. Mathematical Methods and Computing completes the list with 8 publications. These rankings highlight

the varied and interdisciplinary nature of scientometric research, emphasizing key areas of scientific inquiry and development.

- **Preferred Journals by Information analysists**

A total of 256 journals publishing information analysis related research are indexed in the INIS, highlighting its critical role in disseminating specialized knowledge and supporting research in this interdisciplinary field. Table 4 shows, the key journals with at least four publications in the field of scientometrics research include a combination of environmental science, chemistry, physics, and engineering disciplines. Leading the list is *Environmental Science and Pollution Research International* with 30 publications, emphasizing its significant contribution to environmental research. *Science of the Total Environment* follows with 25 publications, indicating its role in addressing global environmental issues. Other notable journals include the *Journal of Nanoparticle Research* with 17 publications, *Journal of Physics. Conference Series (Online)* with 12, and the *Canadian Journal of Chemical Engineering* with 9 publications. Journals like *Environmental Research Letters, European Radiology (Internet), Journal of Radioanalytical Chemistry, Voprosy Atomnoj Nauki i Tekhniki, and Applied Energy* each contribute 5 publications, showcasing their diverse coverage in scientific research across various disciplines. These journals are pivotal in disseminating significant scientific advancements and fostering interdisciplinary research collaborations.

Table 4: Important journals in the field scientometrics as per INIS database

SN	Journal	Publications
1	Environmental Science and Pollution Research International	30
2	Science of the Total Environment	25
3	Journal of Nanoparticle Research	17
4	Journal of Physics. Conference Series (Online)	12
5	Canadian Journal of Chemical Engineering	9
6	Environmental Research Letters	7
7	European Radiology (Internet)	5
8	Journal of Radioanalytical Chemistry	5
9	Voprosy Atomnoj Nauki i Tekhniki	5
10	Applied Energy	4
11	Energy Policy	4
12	Environmental Impact Assessment Review	4
13	Environmental Monitoring and Assessment	4

SN	Journal	Publications
14	Environmental Pollution (1987)	4
15	Environmental Research	4
16	Natural Hazards	4

INIS Multilingual Coverage of Scientometrics and Bibliometric Field

The INIS demonstrates a multilingual approach in the scientometric field, covering 361 publications across various languages. English leads significantly with 301 (83.4%) publications, highlighting its predominance in scientometric research dissemination.

Other languages, such as Chinese (10), French (10), Russian (9), and Spanish (9), contribute to the remaining share, along with smaller inputs from Portuguese (5), Japanese (4), Ukrainian (4), and others. These collectively represent about 16.6%, demonstrating INIS's effort to incorporate diverse linguistic contributions. This distribution highlights the global nature of scientometric research while reaffirming the centrality of English in academic publishing.

- **Most Frequently Used Descriptors**

The identification of 2,985 standard terms from 361 publications within the scope of scientometric research in INIS highlights key trends in scientific inquiry and information management. The top 20 standard descriptors identified are listed in Table 5. The most frequently occurring term, "Research Programs," appears 210 times, reflecting a significant focus on structured research initiatives. Other dominant terms include "Reviews" (185 times) and "Information Retrieval" (162 times), underscoring the importance of knowledge dissemination and retrieval methods. Notable regional contributions are seen in the terms "China" (140 times) and "USA" (128 times), indicating substantial input from these countries. Terms like "Data Analysis" (105 times), "INIS" (98 times), and "Knowledge Management" (92 times) emphasize the critical role of data-driven approaches in advancing global scientific collaboration.

Emerging trends include terms like "Environmental Policy" (78 times), "Nanostructures" (73 times), and "Sustainability" (69 times), pointing to growing research interests in ecology and innovation. Methodological terms such as "Risk Assessment" (62 times), "Metrics" (59 times), and "Network Analysis" (57 times) reflect the importance of advanced research techniques. Interdisciplinary research is also evident with terms like "Biomedical Radiography" (42 times) and "Renewable Energy Sources" (39

times). This study not only sheds light on the current state of scientometric research in INIS but also serves as a valuable resource for future research and development.

Table 5: Important descriptors related to scientometric research in INIS database

SN	Descriptors	Frequency
1	RESEARCH PROGRAMS	52
2	REVIEWS	48
3	INFORMATION RETRIEVAL	44
4	CHINA	39
5	DATA ANALYSIS	39
6	INIS	36
7	KNOWLEDGE MANAGEMENT	31
8	MEASURING METHODS	30
9	EVALUATION	26
10	USA	26
11	DATA BASE MANAGEMENT	24
12	ENVIRONMENTAL POLICY	23
13	ENVIRONMENTAL IMPACTS	22
14	INFORMATION DISSEMINATION	22
15	INFORMATION	21
16	INFORMATION SYSTEMS	21
17	BIBLIOGRAPHIES	20
18	COMPARATIVE EVALUATIONS	20
19	DATA COMPILATION	20
20	INDICATORS	20

- **Keywords in abstracts text**

The abstract field in any database is vital for summarizing the core content of a document (Salton 1983), allowing researchers to assess its relevance to their work quickly. In repositories like INIS, abstracts are particularly important for indexing, which helps highlight significant topics and emerging trends. Standardized vocabulary, consisting of controlled descriptors, is essential for maintaining consistency and accuracy in the indexing process. Indexers choose these terms from a designated thesaurus that aligns with the database's focus to ensure clarity and uniformity across the records (Page et al., 2021). Indexers choose these terms from a designated thesaurus, such as the INIS Thesaurus developed by the INIS,

which aligns with the database's focus to ensure clarity and uniformity across the records (IAEA, 2024).

However, uncontrolled or non-standard terminology also plays a key role in research. The abstract field of the INIS repository contains 46,795 words from 361 publications, many of which reflect unstructured terminology. Figure 4 shows the correlation between the frequency of words and font size in the word cloud, with more frequently used words appearing larger. While standardized vocabulary is important for precision, these uncontrolled terms also offer valuable insights to both researchers and indexers, assisting in identifying emerging topics and trends that may not be fully captured by the controlled vocabulary. Free-text terminology, as noted in studies on information extraction, plays a significant role in the indexing process by reflecting more flexible, evolving language that is not confined to predefined terms (Soderland 1999).

Figure 4: Keywords in Abstracts Free Text – The figure displays the frequency of terms in INIS abstracts, with larger font sizes indicating more frequently used keywords

The common keywords in the INIS database, research, analysis, public, use, bibliometric, author, journal, and *science*, indicate how uncontrolled terms contribute to the database. The word cloud technique has played a significant role in text visualization by emphasizing the frequency of terms within a dataset. Words are displayed in varying font sizes to indicate their relative frequency, allowing users to quickly identify key terms. Recent

innovations, such as the "Word Rain" concept, have further advanced this method by offering new ways to present textual data. Studies like Skeppstedt et al. (2024) have explored these developments, applying them to topics such as climate change text analysis.

Conclusion

This study, which analyzes scientometric and bibliometric-related publications in the INIS database, provides valuable insights into the trends in scientometric research publications. The year-wise publication analysis reveals patterns in research output, providing a perspective on the field's growth and evolution. Contributions from various countries, assessed through publication venues and author affiliations, underscore the global nature of nuclear science research and collaboration. The identification of key journals highlights their importance for information analysts, serving as essential resources for tracking developments. Additionally, the analysis of critical terminology in the database emphasizes the relevance of both standardized vocabulary and free-text terms. Free-text terms, effectively visualized using word clouds, reflect the diversity and breadth of topics covered in abstracts. Importantly, INIS operates as an open-access database, offering its resources free of cost to researchers, further enhancing its utility for scientific and academic communities.

This research is significant for library professionals, science analysts, and administrators as it enhances the understanding of indexing, retrieval strategies, and global research trends. It highlights the importance of open-access databases in making knowledge more accessible and fostering scientific progress.

Reference

1. Barboni, E.J. (1977). Functional differentiation and technological specialization in a speciality in high energy physics: the case of weak interactions of elementary particles United States. 251 p; University Microfilms Order No. 77-28,187; Thesis (Ph. D.)
2. Bates, M. J. (1998). Indexing and Searching in the Digital Age. Annual Review of Information Science and Technology, 33(1), 9-62.
3. Braun, T.,; Bujdoso, E. (1979). Growth of a journal reflects trends in the literature of nuclear analitical methods. Journal of Radioanalytical Chemistry, (1-2), 9-31.
4. Broughton, V. (2006). Thesaurus Construction and Use: A Practical Manual. Elsevier.

5. Buckland, M. (1991). Information and Information Systems. New York: Academic Press.
6. Chen, Y., Lin, Q., Chen, Y., Lin, Q., Chen, Y., Lin, Q., Zhu, W., Tang, M., & Li, H. (2024). A scientometric review of knowledge domains on nuclear radiation. Journal of Radiation Research and Applied Sciences, 17(3), 10.
7. Hendley, T.; Dixon, R. (1993). Feasibility study and functional requirements for a digital non-conventional literature system at INIS and Member Sites (INIS-GB--617). United Kingdom
   IAEA (2024). INIS Thesaurus. International Atomic Energy Agency. Retrieved from https://www.iaea.org/resources/databases/inis/thesaurus
   INIS (2021) Subject Categories and Scope Descriptions, IAEA, Vienna, 2021, IAEA-INIS-2, ISBN 92-0-112902-5; ISSN 1684-095X. INIS Reference Series No. 2. https://www.iaea.org/publications/6193/subject-categories-and-scope-descriptions
8. Kademani, B.S.; Kumar, Vijai; Sagar, Anil; Kumar, Anil (2006). Scientometric dimensions of nuclear science and technology research in India: A study based on INIS (1970-2002) database https://mjlis.um.edu.my/article/view/7821/5377
9. Kumar, Anil, Prakash, E.R., & Gupta, Rajiv (2024). Significance of publication analytics in nuclear safety and radiation protection research in India. India: Bhabha Atomic Research Centre, Mumbai (India); 266 p; 2024; p. 177-181; IndSHIV-2024: 25. DAE-BRNS national conference on industrial safety and hygiene - zero incident vision; Mumbai (India); 18-20 Jan 2024
10. Lyon, W.S. (1979). Scientometric study of IAEA activation analysis conferences (CONF-791103--89). United States
11. Page, M.J., et al. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. BMJ Open Access, 37229, Article number n71. https://doi.org/10.1136/bmj.n71
12. Salton, G., & McGill, M. J. (1983). Introduction to Modern Information Retrieval. McGraw-Hill.
13. Skeppstedt, M.; Ahltorp, M.; & Lindström, M. (2024, March 28). From word clouds to Word Rain: Revisiting the classic word cloud to visualize climate change texts. Volume 23, Issue 3. https://doi.org/10.1177/14738716241236188
14. Soderland, S. (1999) Learning information extraction rules for semi-structured and free text. (1999). Volume 34, Issue 1, Pages 233 - 272.
15. Verlini, Giovanni (2010) The IAEA's International Nuclear Information System (INIS) Turns 40
    https://www.iaea.org/newscenter/news/peaceful-nuclear-knowledge-all

Trends in research support services in Indian academic libraries: A scientometric study

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Abstract
This scientometric study explores the trends in research support services in Indian academic libraries, focusing on the growth patterns, citation impact, collaboration dynamics, and emerging themes in the field. Data were extracted from the Scopus database for publications between 2014 and 2024, and Altmetric Attention Scores (AAS) and Mendeley readership were tracked for the top ten highly cited papers. The study highlights significant scholarly contributions in areas such as artificial intelligence (AI), machine learning, and IoT in library services. Findings reveal a fragmented research landscape, with limited cross-topic and international collaborations, indicating a need for greater integration within the field. Keyword analysis identified key themes, including library resources, service quality, digital transformation, and the increasing use of AI in academic libraries. Despite the growing presence of technological advancements, there remains a noticeable gap in dedicated research on *research support services*, which warrants further attention. To enhance the impact of research support services, the study suggests fostering interdisciplinary collaboration, promoting international cooperation, and embracing technological innovations to address the evolving needs of academic institutions.

Keywords
Research support services, library services, academic libraries, scientometric, altmetric

Introduction

Research support services in academic libraries have evolved significantly, reflecting the changing landscape of scholarly communication and the diverse needs of researchers. Traditionally focused on collection management and information retrieval, libraries now offer a broad spectrum of services that support various stages of the research lifecycle. In Hungary, for instance, academic libraries have embraced open access initiatives to facilitate knowledge transfer, although bibliometric and research data management services are still developing (Dessa & Dani, 2024). Similarly, Indian academic libraries are in the early stages of implementing research support services, with a focus on recommending research tools, while research data management remains limited (Singh et al., 2024). In contrast, U.S. libraries provide comprehensive support for systematic reviews, offering resources and tools across different stages, from planning to reference management (Sterner, 2024). The competencies required for librarians to deliver these services effectively are extensive, encompassing skills in data analysis, bibliometrics, and intellectual property rights, among others (Istiana, 2024). In Kenya, enhancing the visibility and utilization of research support services among doctoral students is a priority, with a focus on professional development and proactive strategies (Sawe et al., 2024). Indonesian libraries are exploring business process reengineering to improve their research support services, addressing challenges such as limited resources and the need for collaboration (Maryati et al., 2024). Pakistani libraries, while offering traditional support services, are planning to expand their offerings to include more advanced services, particularly in private sector institutions (Hussain & Rafiq, 2023).

Academic libraries in India have undergone significant transformations in recent years, driven by the evolving needs of researchers and the rapid advancements in information technology. As the landscape of academic research continues to shift, academic libraries have been tasked with expanding their services to better support the research activities of their institutions. (Rastogi et al., 2020) One such area of focus is the provision of research support services, which have become increasingly crucial in enabling researchers to navigate the complex and dynamic world of scholarly communication. Research support services (RSS) in Indian academic libraries are evolving, albeit at a nascent stage, with a focus on enhancing research productivity and integrity through various innovative approaches. The study by Singh et al. highlights that Indian academic libraries are beginning to implement RSS, categorized into eight major areas, including research guides,

consultancy, impact measurement, open access, and research data management (RDM) However, the adoption of these services is limited, with a significant gap in the provision of RDM services, although recommendations for research tools are more commonly offered (Singh et al., 2024). Singh and Siwach's research at Maharshi Dayanand University reveals that faculty and research scholars primarily expect database services, infrastructure facilities, and institutional repositories, while scholarly communication services are less anticipated. Challenges such as inadequate funding for article processing charges and limited access to computers are prevalent, indicating a need for improved infrastructure and training in research support tools (Singh & Siwach, 2024). The integration of ICT-based services is seen as a new frontier, with libraries redesigning their spaces and services to provide 24x7 support, including digital repositories, open data access, and virtual labs, to enhance research output in a digital environment (Singh & Madhusudhan, 2022). The maker culture era further influences the organization of RSS, requiring Fernández-Marcial, 2021). Globally, research support services in top universities focus on RDM, open access, and scholarly publishing, providing a benchmark for Indian libraries to aspire to (Si et al., 2019). The role of libraries in supporting student research is also emphasized, with a focus on access to scholarly databases, research assistance, and collaboration with faculty to foster research excellence (Hafsyah et al., 2023). Overall, while Indian academic libraries are in the early stages of implementing comprehensive RSS, there is a clear trend towards embracing digital transformation and innovative service delivery to meet the evolving needs of researchers (Singh et al., 2024) (Singh & Madhusudhan, 2022) (Si et al., 2019). In the context of India, research on the research support services provided by academic libraries is limited. Reported on the implementation of research data management services at Peking University Library, suggesting a model for Indian university libraries to follow in deploying RDM services. Further insights into the current state and trends in research support services in Indian academic libraries would be valuable in guiding the development of these services and enhancing the support available to researchers.

This study aims to investigate the trends and patterns in the development of research support services offered by academic libraries in India. Through a scientometric analysis, the study examines the current state of research support services, identifies emerging trends, and explores the challenges and opportunities faced by academic libraries in this domain.

Objectives

- Highlighting the most influential documents based on citation counts and Altmetric Attention Scores (AAS).
- Studying co-authorship patterns and country involvement to assess cooperation within the research domain.
- Locating trending topics through keyword analysis to identify emerging areas of interest.

Methodology

The study utilizes Scientometric and Altmetric parameters to analyze the growth patterns of published literature on research support services. Scientometric analysis provides a quantitative evaluation of scientific communications and operates at three levels: the Macro level, which examines global scientific contributions; the Meso level, focusing on the research output of affiliations, institutions, or universities; and the Micro level, which evaluates individual researchers' contributions within specific subject fields. Altmetric parameters complement this approach by assessing the online impact and engagement of the research, offering a comprehensive understanding of its influence (Borgohain et al., 2022). The current study aims to apply scientometric parameters to analyze published literature on gamification research, specifically focusing on its application in teaching and learning, using the Scopus database. The analysis was conducted using two approaches: scientometrics for science mapping and Altmetrics for tracking the social media attention of publications. The data collection process took place in two stages. In the first stage, literature on research support services research from the past 10 years was extracted from the Scopus database. Scopus, a product of Elsevier, is a comprehensive abstract and citation database that includes bibliographic details of scholarly works across various disciplines. It is considered one of the best databases, covering over 24,000 indexed journals and offering integrated metrics, unlike other databases (Singh et al., 2021). Due to its up-to-date and extensive coverage, the study opted to use the Scopus database for the scientometric analysis to ensure the accuracy of the results. To extract the relevant data, the search terms used were (TITLE-ABS-KEY "research support service*" OR "library service"). The preliminary search yielded 10,065 documents. The data was then refined by limiting the publication period to "2014–2024" (as of December 11, 2024). After applying this filter, the results were further narrowed down to 421 items from India, which were selected for the study.

The second step involved tracking the Altmetric Attention Score (AAS) and Mendeley readership of the top ten highly cited research publications. To begin the search process, the authors utilized the Dimension.ai database (https://dimensions.altmetric.com/) to gather the Altmetric data for analyzing social media attention. The data was collected by entering the Digital Object Identifier (DOI) of each publication into the search box and selecting the "DOI" option on the Dimensions.ai platform.

Data Analysis and Interpretation

Influential documents based on the nu mber of citations and Altmetrics Attention Score

Table 1 shows the top 10 highly influential publications on library services that are identified based on citation counts and Altmetric Attention Scores (AAS), reflecting their research impact both academically and publicly through social media. AAS, an article-level metric, is determined by public engagement activities such as views, likes, shares, reads, and tweets on social platforms. Introduced by Jason Priem in 2010, the concept of Altmetrics revolutionized the measurement of scholarly communication impact. It enables tracking of where and why research is being discussed or shared online, offering valuable insights into its influence beyond traditional academic boundaries. Citations, being a traditional metric, often require a longer time to accumulate. To assess the immediate public impact of research, Altmetrics has been introduced as an enhanced measure. The citation counts of papers were sorted in an MS Excel sheet, ranking them from highest to lowest. Based on this sorting, the top ten research papers were selected for the study, providing a focused analysis of their influence. Among the listed articles, *"Internet of Things and Libraries"* by Pujar S.M. and Satyanarayana K.V. has the highest citation count with 51 citations, reflecting significant scholarly recognition. The article with the highest Altmetric Attention Score (AAS) of 16 is *"Adapting Intelligent Information Services in Libraries: A Case of Smart AI Chatbots"* by Panda S. and Chakravarty R., indicating notable online engagement. Additionally, the same article holds the highest Mendeley readership with 185 users, demonstrating substantial academic interest in the integration of AI chatbots in library services.

Sl. No	Title	Citation	AAS	Mendeley redearship
1	Internet of things and libraries	51	0	0

Sl. No	Title	Citation	AAS	Mendeley redearship
1	Internet of things and libraries	51	0	0
	By Pujar S.M., Satyanarayana K.V.			
2	User satisfaction regarding quality of library services of A.C. Joshi Library, Panjab University, Chandigarh *By Mohindra R., Kumar A.*	30	0	0
3	Adapting intelligent information services in libraries: a case of smart AI chatbots *By Panda S., Chakravarty R.*	29	16	185
4	Evaluating library service quality of University of Kashmir: a LibQUAL+ survey *By Kumar A., Mahajan P.*	26	1	111
5	Perception of cloud computing in developing countries: A case study of Indian academic libraries *By Yuvaraj M.*	24	0	0
6	Implementing artificial intelligence in library services: a review of current prospects and challenges of developing countries *By Barsha S., Munshi S.A.*	23	0	0
7	Use of WhatsApp for effective delivery of library and information services *By Ansari M.S., Tripathi A.*	20	0	0
8	Social networking sites adoption among entrepreneurial librarians for globalizing startup business operations *By Gupta V., Rubalcaba L., Gupta C., Pereira L.*	19	0	0

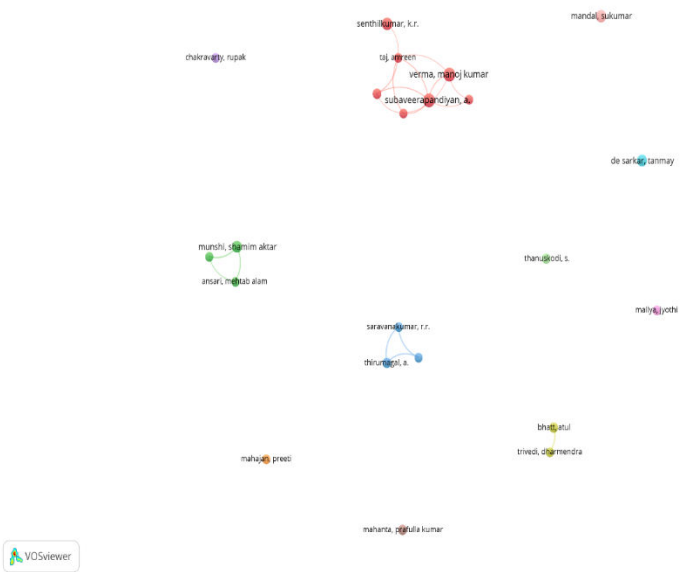
9	Application of artificial intelligence in libraries and information centers services: prospects and challenges *By Jha S.K.*	17	1	195
10	Marketing of library resources and services: A structured literature Review *By Bhardwaj R.K., Jain P.K.*	17	0	0

Source: Authors work

Table 1. Highly cited article and their AAS and reader count

Co-authorship patterns

In research support research, Figure 1 illustrates the network visualization of author collaboration, with clusters represented in different colours. The structure highlights intra-cluster collaboration, with no evidence of inter-cluster collaboration. Using VOSviewer, the co-authorship analysis required a minimum of four documents per author, identifying 706 authors, of which 22 met the threshold. The absence of connecting lines between clusters suggests that authors collaborated within similar research topics but lacked cross-topic collaborations. This indicates a low overall level of author collaboration across diverse areas of research support services.

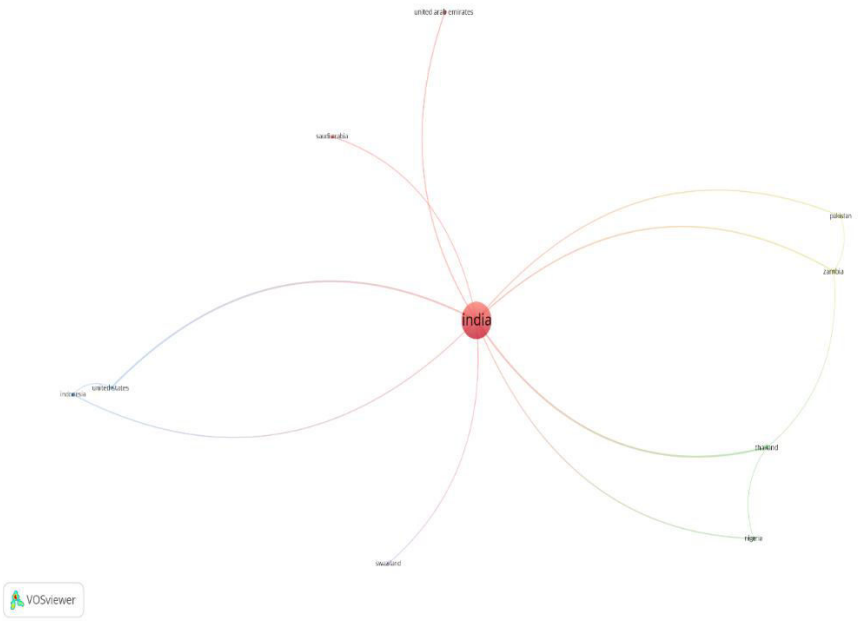


Source: Authors work

Figure 1. Co-authorship of authors

Co-authorship of countries

Collaboration between countries highlights a global network of connections among authors from different nations contributing to research support services. Figure 2 presents a visualization of country co-authorship in this field. Each colored circle represents a country, with the circle's size indicating the number of documents linked to that country. Using VOSviewer, the analysis identified 32 countries contributing at least one document each, with 10 meeting the threshold for inclusion. These 10 countries are organized into a network map divided into five clusters: Cluster 1 (red) includes India, Saudi Arabia, and the UAE; Cluster 2 (green) comprises Nigeria and Thailand; Cluster 3 (blue) features Indonesia and the United States; Cluster 4 (yellow) includes Pakistan and Zambia; and Cluster 5 (purple) contains Swaziland.



Source: Authors work

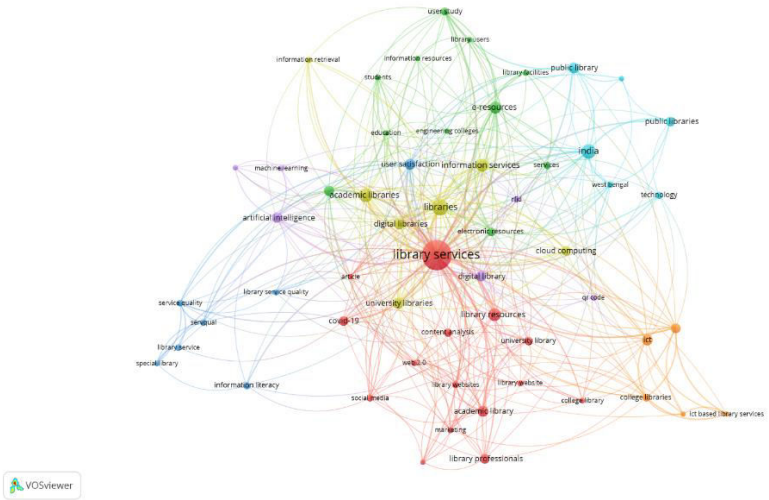
Figure 2. Co-authorship of countries

Keyword Analysis

To explore the intellectual structure of research on support services, this study developed a network visualization map to highlight trends in library services research by showcasing frequently occurring keywords across documents. Figure 3 illustrates the network visualization of keyword co-

occurrence using VOSviewer's clustering method. Keywords are represented as colored circles (nodes), with the circle size reflecting keyword frequency, and connecting lines indicating co-occurrence relationships. Larger font sizes denote higher occurrence frequencies. Uniform cluster colors indicate strongly related keywords. Using a threshold of at least five occurrences, the complete counting algorithm in VOSviewer identified 61 relevant keywords from a total of 1,483. These keywords are grouped into seven clusters based on their similarities

Cluster 1 (red) encompasses 15 keywords focused on library services, including academic libraries, college libraries, library websites, articles, university libraries, library resources, library professionals, etc. Cluster 2 (green) contains 11 keywords related to the application of library services in education, including engineering colleges, library users, students, user studies, information resources, e-resources, etc. Cluster 3 (blue) comprises 7 keywords focusing on the effectiveness of library services, including information literacy, service quality, user satisfaction, etc. Cluster 4 (yellow) includes 7 keywords: academic libraries, cloud computing, digital libraries, information retrieval, information services, etc. Cluster 5 (violet) has 6 keywords: artificial intelligence, machine learning, natural language processing, QR-code, digital library and RFID. Cluster 6 (shallow blue) has 6 keywords: public libraries, technology, public library services, etc. Lastly cluster 7 (orange) has 5 items, college libraries, ICT, ICT based library services, institutional repositories, and library automation.



Source: Authors work

Figure 3. Co-authorship of keywords

Discussion

The findings from the analysis of research on support services provide valuable insights into the influence, collaboration patterns, and emerging trends within this domain. The study highlights the top 10 highly influential publications, based on citation counts and Altmetric Attention Scores (AAS), reflecting their academic and public impact. The article *"Internet of Things and Libraries"* by Pujar S.M. and Satyanarayana K.V. stands out with the highest citation count (51), emphasizing its significant academic recognition. In contrast, *"Adapting Intelligent Information Services in Libraries: A Case of Smart AI Chatbots"* by Panda S. and Chakravarty R. leads in terms of AAS (16), indicating its notable engagement on social platforms, which underscores the increasing public interest in the integration of AI in library services. This finding demonstrates how research in support services not only garners scholarly attention but also sparks public discourse, thanks to emerging technologies such as AI.

The collaboration patterns among authors and countries reveal interesting trends in research support services. The co-authorship network visualization, with distinct clusters, shows that while intra-cluster collaboration is evident, there is minimal inter-cluster collaboration. This suggests that authors tend to focus on similar research areas within the field but rarely engage across different topics. This limited cross-topic collaboration could be indicative of siloed research efforts in specific aspects of support services. In terms of international collaboration, the country co-authorship network also highlights a global reach, with 32 countries contributing to research support services. The five clusters of countries reflect significant regional collaborations, but again, the lack of connections between clusters points to a fragmented approach to international cooperation. This underscores the need for more cross-border collaborations to foster a more integrated research landscape in support services.

Keyword analysis further contributes to understanding the intellectual structure of research in support services. The network visualization of keyword co-occurrence reveals seven clusters that capture the central themes in the field. Cluster 1 (red) focuses on traditional library services, such as academic libraries and library resources, while Cluster 2 (green) emphasizes the educational applications of these services, highlighting their relevance to students and educational institutions. Clusters 3 and 4 (blue and yellow) highlight the effectiveness of library services, including aspects like

service quality and information retrieval, which are crucial for evaluating and improving support services. Clusters 5 (violet) and 7 (orange) delve into the integration of technology, such as artificial intelligence, machine learning, and ICT-based library services, indicating the growing role of digital innovations in shaping the future of research support services. The presence of these technology-focused keywords further emphasizes the trend towards digital transformation in library and information services.

These findings collectively illustrate the dynamic and evolving nature of research support services. The integration of AI, machine learning, and other emerging technologies is reshaping how library services are delivered and experienced, reflecting the broader trends in technological advancement. However, the limited cross-topic and international collaborations suggest that there is room for more integrated and global efforts to address the multifaceted challenges in research support services. The study calls for fostering collaboration across different research domains and geographic regions to promote a more holistic and forward-thinking approach to improving research support services.

Conclusion

this study provides a comprehensive analysis of the growth, impact, collaboration patterns, and emerging trends in research support services. By utilizing scientometric and Altmetric parameters, the research highlights the academic and public influence of key publications, particularly those focusing on the integration of AI and other technologies in library services. However, a notable gap in the literature is the lack of focused research on *research support services* itself, with many studies concentrating on broader topics without diving into the specific challenges and innovations in this area. The study also reveals limited cross-topic and international collaboration, which suggests a need for more integrated efforts across different research domains and geographic regions to address the multifaceted issues in research support services.

To improve the situation, it is crucial to encourage interdisciplinary research that explicitly focuses on the development and enhancement of research support services. Increased collaboration between researchers from diverse fields, including technology, library science, and education, is necessary to promote a holistic approach to addressing the evolving needs of academic institutions. Moreover, fostering international cooperation can help

overcome the fragmented nature of the current research landscape, enabling the sharing of best practices and resources. Finally, embracing emerging technologies like AI, machine learning, and cloud computing, while addressing the unique challenges faced by research support services, could significantly enhance their effectiveness and impact.

Reference

1. Borgohain, D. J., Bhardwaj, R. K., & Verma, M. K. (2022). Mapping the literature on the application of artificial intelligence in libraries (AAIL): a scientometric analysis. *Library Hi Tech*, *42*(1), 149–179. https://doi.org/10.1108/lht-07-2022-0331
2. Dessa, H., & Dani, E. (2024). An Investigation of Current Research Support Services in Hungarian Academic Libraries. *The Canadian Journal of Information and Library Science*, *47*(2), 39-48.
3. González-Solar, L., & Fernández-Marcial, V. (2021). Academic Library Research Support Services in the Maker Culture Era. In *Examining the Impact of Industry 4.0 on Academic Libraries* (pp. 105-129). Emerald Publishing Limited.
4. Hussain, A., & Rafiq, M. (2023). Provision of research support services across the research lifecycle in university libraries. *Journal of Librarianship and Information Science*, 09610006231207661.
5. Idris Siti, Hafsyah., Arifin, Ridwan., & Prayitno, Heri. (2023). 6. How Can Libraries Support Student Research?. https://doi.org/10.21776/ub.knowledgegarden.2023.1.1.8
6. Istiana, P. (2024). Competencies of Higher Education Librarians to Research Support Services: A Narrative Review. *Indonesian Journal of Librarianship*, 29-40.
7. Maryati, I., Purwandari, B., Santoso, H. B., & Budi, I. (2024). Improving Research Support Services in Indonesian Academic Libraries: A Recommendation for Business Process Reengineering Implementation Strategies. *Library Leadership & Management*, *37*(3).
8. Rastogi, S., Sharma, K. G., Varma, S., & Verma, S. (2020). Institutional library reforms are needed to improve ayurveda education, practice and research: Inferences from a case study. In Journal of Ayurveda and Integrative Medicine (Vol. 12, Issue 3, p. 570). Elsevier BV. https://doi.org/10.1016/j.jaim.2020.10.009
9. Sawe, E., Mwai, N., & Oyieke, L. (2024). Nurturing doctoral excellence: effective strategies for research support services in public university libraries of Kenya. *Digital Library Perspectives*, *40*(2), 282-294.

10. Si, L., Zeng, Y., Guo, S., & Zhuang, X. (2019). Investigation and analysis of research support services in academic libraries. *The Electronic Library*, *37*(2), 281-301.
11. Singh, B. P., & Madhusudhan, M. (2022). ICT based research support services in academic libraries: A new frontier to enhancing research integrity and productivity.
12. Singh, K., & Siwach, A. K. (2024). Researchers' Expectations Towards Library Research Support Services (LRSS): A Case Study of Maharshi Dayanand University, Rohtak. *DESIDOC Journal of Library & Information Technology*, *44*(2).
13. Singh, R. K., Raj, R., & Madalli, D. P. (2024). Investigation of research support services (RSS) in academic libraries of India. *Journal of Librarianship and Information Science*, *https://doi.org/10.1177/09610006241245714*
14. Singh, V. K., Singh, P., Karmakar, M., Leta, J., & Mayr, P. (2021). The journal coverage of Web of Science, Scopus and Dimensions: A comparative analysis. *Scientometrics*, *126*(6), 5113–5142. https://doi.org/10.1007/s11192-021-03948-5
15. Sterner, E. A. (2024). Systematic Review Research Guides and Support Services in Academic Libraries in the US: A Content Analysis of Resources and Services in 2023. *Evidence Based Library and Information Practice*, *19*(2), 94-108.

Sandalwood Oil: A Bibliometric Study

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Abstract
This bibliometric study analyzes data on 'Sandalwood oil' from Web of Science Core Collection database to understand its various characteristics such as types of documents, chronological distribution, preferred research areas, preferred source titles and geographical distribution. It is found that 'Article' is the most dominant among the eight different types of documents, literature exhibited an inconsistently upward trend, Chemistry is the most preferred research areain terms of, both, documents produced as well as citations earned, 'Journal of Essential Oil Research' is the most preferred source title in terms of documents produced, and, the United States of America (USA) and India are the two largest contributors to the literature. The list of source titles and the list of contributing countries can be used for collection development in libraries and resource centres and exploring avenues for research collaboration respectively.

Keywords
Bibliometrics; Sandalwood oil; Quantitative studies; Bibliometric analysis; Essential oils

Introduction

Essential oils are plant derived products containing volatile, lipophilic substances (Bauer, 1997). They have been used as medicinal, flavouring and fragrance agents since ancient times, particularly in India, China and Egypt (Brud, 2010). Among the most precious and preferred fragrance materials is the sandalwood. It has been used during religious and customary occasions, for medicinal purposes, and as perfumery ingredient (Sastry, 1944).

Sandalwood oil is amongst the most extensively used ingredients in perfumery, cosmetics and toiletries industry today. The sandalwood oil

derived from the *Santalum album* Linn. (family: *Santalaceae)* species of sandalwood tree (referred to as Sandalwood East Indian), which is native to Mysore and its surrounding regions in India, is most sought-after (Guenther, 1952). The oil is often obtained by steam distillation of the wood and roots of the tree, as a viscous, colourless to yellowish liquid with a sweet, woody and durable odour (Bauer, 1997). It is not unusual that sandalwood is the second most expensive wood in the world, while its oil is also amongst the most expensive essential oils in the world (Arun Kumar, et. al., 2012). However, commercial extinction of sandalwood is anticipated and predicted in most of its native geographies in the near future. This would likely lead to planted sandalwood replacing the wild grown ones by around 2040 (Thomson, 2020).

These aspects were reason enough to assume that there would research carried out and published by researchers from variety of domains such as agriculture, botany, chemistry, forestry, materials science, pharmacy, etc. to ensure sustained availability of existing or improved qualities of sandalwood oil to meet the future requirements. And, to take up a quantitative study of literature on sandalwood oil. Bibliometrics is the quantitative study of documents. Pritchard (1969) coined the term 'Bibliometrics' and defined it as 'the application of mathematics and statistical methods to books and other media of communication.' This study is an attempt to understand the various bibliometric characteristics of literature on sandalwood oil.

Review of previous literature

There are many bibliometric studies published in the literature. A select few such studies published in the recent past and dealing with essential oils, perfumes and fragrance substances are reviewed here.

A bibliometric analysis of Agarwood essential oil research literature was performed by Yusoff,et. al. (2024) by sourcing data for 2019-2023 from both Web of Science and Scopus databases to understand aspects such as authorship, subject areas, citations, source titles, etc. While, Koo (2023) carried out a bibliometric analysis of aromatherapy literature published during 1995-2014 and indexed in Science Citation Index – Expanded database, and used Histcite and VOSviewersoftwares to understand citation characteristics, language distribution, geographical distribution, journal titles, etc.

The Scopus data on Vetiver oil research published during 1961-2022 was used by Kusuma, et. al. (2024a) for bibliometric analysis to study the chronological scatter, identify the most productive subject areas, countries, and organizations, and generate keyword co-occurrences and co-authorship maps respectively using VOSviewer. Likewise, Kusuma, et. al. (2024b) conducted a bibliometric analysis of literature on Sandalwood oil published during 1914-2023 sourcing the data from Scopus database to reveal chronological distribution, subject areas, geographical distribution, apart from using VOSviewer for keyword co-occurrence analysis and co-authorship analysis.

Similarly, Chen and Gong (2022) undertook bibliometric analysis using Bibliometrixand Biblioshinysoftwares to understand the global research trends on *Osmanthusfragrans* literature published between 1975 and 2020 and indexed in Web of Science to find the chronological distribution, most productive countries, organizations and journal titles, etc.

It is to be noted that the previous study on sandalwood oil by Kusuma, et. al. (2024b) was based on data from Scopus database while the present study uses data from Web of Science Core Collection database.

Objectives

The present study was carried out with following objectives,

1) to know the various types of documents in the literature,
2) to understand the chronological distribution of the literature,
3) to find out the preferred research areas from the literature,
4) to find the preferred source titles, and,
5) to understand the geographical distribution of the literature.

Scope

The scope of the present study is limited to the

1) literature indexed in the Web of Science Core Collection database,
2) literature published during the period 1964-2024, and,
3) the citations earned between the year of publication and 2024, more specifically till November 26, 2024.

Methodology

A document search was performed in the Web of Science (WoS) Core Collection database with the following query on November 26, 2024,
All Fields – "Sandalwood oil"
It resulted in 200 documents. The resulting document list was sorted according to date (recent to past) using the provision offered by the source database. Following this, the bibliographic record for each of the 200 documents was downloaded as an MS-Excel sheet as well as a tab delimited text file for further scrutiny and analysis. Each of the 200 document entries were scrutinized to ensure contextual relevance, and none was found to be irrelevant. Hence, the final dataset comprised of bibliographic records of 200 documents published across the period 1967-2024. The dataset was analysed in context of the objectives of the study and the results of such analyses are discussed herewith.

Results and Discussions

Various types of documents
The analysis of the data revealed that there were eight different types of documents representing the literature on 'Sandalwood oil'. The numbers of documents and the citations earned by each of the document types is represented in Table 1.
Table 1: Types of Documents

Document type	no. of documents	percentage share	total citations	percentage share of total citations
Article	174	87.00	4059	83.64
Correction	2	1.00	2	0.04
Editorial Material	1	0.50	1	0.02
Letter	1	0.50	1	0.02
Meeting Abstract	4	2.00	1	0.02
Note	2	1.00	24	0.49
Proceedings Paper	2	1.00	23	0.47
Review	14	7.00	742	15.29
Total	200	100.00	4853	100.00

It was also found that 'Article' was the most dominant document type in terms of, both, number of documents and number of citations, followed by 'Review'.

Chronological distribution

The chronological spread of documents in the dataset is represented in Figure 1. It can be observed from Figure 1 that the chronological distribution of literature exhibits an inconsistently upward trend during the period under study. The most productive year was 2014 with 14 documents published during the year, while there were 15 such years yielding one document each. This apart, since the publication year (1967) of the first document during the period under study, there were 11 years each yielding no document. The Figure 1 also shows that the chronological distribution of cited documents mimics that of annual productivity. The data analysis further revealed that 94% of total documents in the dataset received at least one citation each during the period under study.

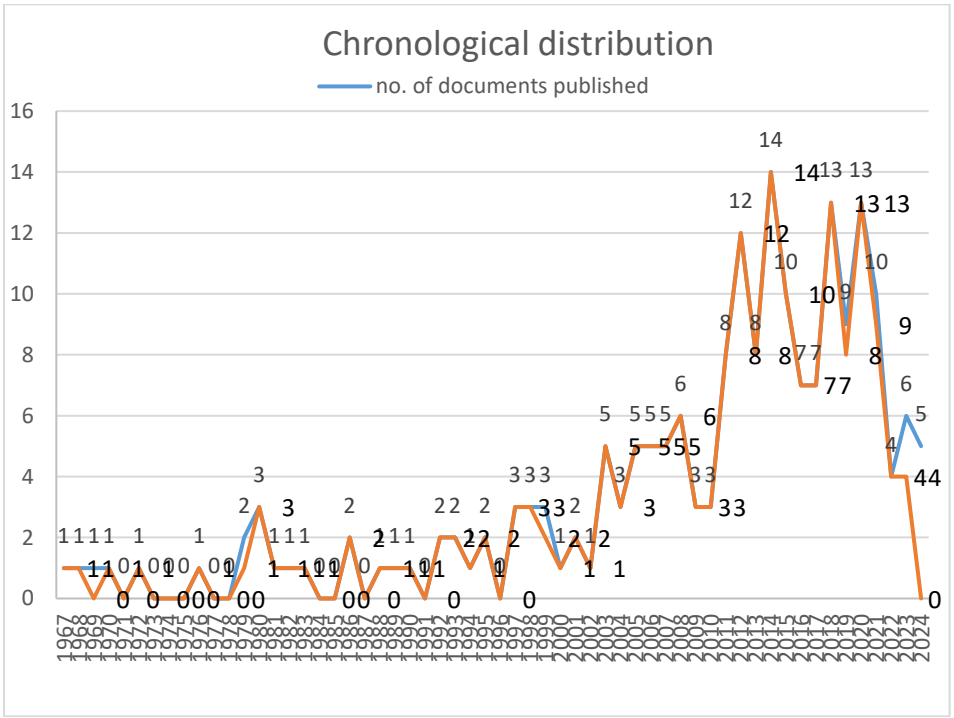

Figure 1: Chronological distribution

Preferred research areas

The Web of Science database assigns at least one Web of Science Research Area (WoS Research Area) to every document indexed. The data analysis revealed that documents in the dataset represented 40 different WoS Research Areas. The ten most preferred WoS Research Areas ranked according to the decreasing numbers of documents represented as well as according to the decreasing numbers of citations are listed in Table 2.

Table 2: Preferred research areas

Research Area	no. of documents	Rank (by documents)		Research Area	total citations	Rank (by citations)
Chemistry	73	1		Chemistry	1405	1
Pharmacology & Pharmacy	32	2		Pharmacology & Pharmacy	1047	2
Biochemistry & Molecular Biology	27	3		Plant Sciences	737	3
Plant Sciences	22	4=		Biochemistry & Molecular Biology	625	4
Food Science & Technology	22	4=		Integrative & Complementary Medicine	522	5
Dermatology	17	6		Food Science & Technology	469	6
Oncology	13	7		Oncology	354	7
Integrative & Complementary Medicine	11	8		Dermatology	347	8
Forestry	9	9		Materials Science	327	9
Engineering	8	10		Science & Technology - Other Topics	246	10

It was found that 'Chemistry' was the most preferred research area in terms of, both, the number of documents yielded and the total citations earned. Likewise, 'Pharmacology & Pharmacy' was the second most preferred

research areas. The ranked list of preferred Research Areas differs from the ranked list from the study by Kusuma, et. al. (2024b). It can be also seen from Table 2 that the eight best ranked research areas (by numbers of documents) are also the eight best ranked research areas (by total citations) albeit in different order.

Preferred source titles

The data analysis revealed that there were 121 unique source titles representing the 200 documents in the dataset. The Table 3 provides a list of best five ranked most preferred source titles, ranked in the order of their decreasing productivity of documents, from the dataset.

Table 3: Preferred source titles

Sr. No.	Source Title	No. of Documents	Total Citations	Rank (by documents)
1	JOURNAL OF ESSENTIAL OIL RESEARCH	7	100	1
2	ANTICANCER RESEARCH	6	114	2=
3	PHYTOMEDICINE	6	437	2=
4	TETRAHEDRON LETTERS	6	74	2=
5	FLAVOUR AND FRAGRANCE JOURNAL	5	147	5=
6	NATURAL PRODUCT COMMUNICATIONS	5	51	5=
7-121	Other 115	165	3930	
	Total	200	4853	

It can be also seen from Table 3 that six source titles sharing the best five ranks yielded more than one-fifth (21.21%) of the documents in the dataset. The data analysis also revealed that the most preferred source titles in terms of documents yielded are not necessarily the ones earning the most citations. And that there were 83 source titles contributing a single document each.

Geographical distribution of the literature

The whole counting technique as explained by Huang, Lin and Chen (2011) was used during data analysis to assign and count credits for contributing

the documents, to understand the geographical distribution of 'Sandalwood oil' literature. It was found that the 200 documents under study were contributed by authors from 36 different countries, while seven documents had undefined authorship and affiliation. Table 4 provides a list of ten most productive countries ranked in order of their decreasing productivity of documents in the dataset. These apart there were as many as 14 countries each contributing a single document to the literature.

Table 4: Geographical distribution

sr. no.	country	no. of documents	total citations	Rank (by documents)
1	USA	46	1027	1
2	India	36	882	2
3	Germany	24	645	3
4	Australia	16	669	4=
5	Peoples R China	16	248	4=
6	Japan	14	341	6
7	South Korea	12	175	7
8	Canada	11	422	8=
9	Switzerland	11	297	8=
10	Austria	9	190	10

The best five ranked countries in Table 4 match with the findings of Kusuma, et. al. (2024b) such that top two ranks are an exact match while the remaining three match in a different order.

Conclusion

The following conclusions can be drawn from this bibliometric study of 'sandalwood oil' literature,

1) The share of 'Sandalwood oil' literature is a very small fraction of the literature on 'essential oils'. This indicates that plenty of scope exists to research 'Sandalwood oil', and contribute to the literature.With 200 documents published over the sixty-one years from 1964 to 2024, 'Sandalwood oil' is still a virgin area for conducting research.
2) Most of the literature on 'Sandalwood oil' is published as 'Article', while 'Review' takes a distant second position.

3) Being an expensive perfumery ingredient, 'Chemistry'dominates the 'Sandalwood oil' research areas. This indicates that research on developing synthetic alternatives is prevalent, as the natural 'Sandalwood oil' is an expensive perfumery ingredient. Peculiarly, research on developing high-yielding and quick-maturing cultivars of sandalwood is not accorded higher research priority, thus, leading to research areas such as 'Forestry', 'Plant science', etc. not being as dominant as 'Chemistry'.
4) There is a large scattering of 'Sandalwood oil' literature despite the existence of dedicated journals in related fields such as 'Essentials oils', 'Perfumery' and 'Fragrances'. However, 'Journal of Essential Oil Research' and 'Flavour and Fragrance Journal' taking up higher ranks in the list of preferred source titles cement their positions as core journals in the niche field.
5) That United States of America (USA) is the most productive country in 'Sandalwood oil' literature is not surprising, considering its research might and productivity in so many fields. But, India, featuring as second most productive country,can aspire to swap positions with the USA by improving its productivity in 'Sandalwood oil' research since sandalwood tree is native to India.

Relevance of the study

This study helped understand the various characteristics of literature on 'Sandalwood oil'. While the findings from this study can be used by the aspiring researchers and organizations for their research planning, exploring collaboration avenues and collection development in their libraries and information centres.

References

1. Arun Kumar, A. N., Joshi, G. & Mohan Ram, H. Y. (2012). Sandalwood: History, uses, present status and the future. *Current Science, 103(12),* 1408-1416.
2. Bauer, K. G., Garbe, D. &Surburg, H. (1997). *Common fragrance and flavor materials: Prepraration, properties and uses* (3rd com. rev. ed.). Wiley-VCH.

3. Brud, W. S. (2010). Industrial uses of essential oils. In K. H. C. Baser & G. Buchbauer (Eds.), *Handbook*
4. *of essential oils: Science, technology, and applications* (pp. 843-854). CRC Press.
5. Chen, T., and Gong, X. (2022). Gloabal research trend analysis of *Osmanthusfragrans*based on
6. Bibliometrix. *Mobile Information Systems, 2022(1),* 4091962.
7. Guenther, E. (1975). *The essential oils, volume 5: Individual essential oils of the plant families.* Robert Krieger Publishing Company.
8. Huang, M. –H., Lin, C. –S., & Chen, D. –Z. (2011). Counting methods, country rank changes, and counting inflation in the assessment of national research productivity and impact. *Journal of the American Society for Information Science and Technology, 62(12),* 2427-2436.
9. Koo, M. (2017). A bibliometric analysis of two decades of aromatherapy research. *BMC Research Notes, 10*, 46.
10. Kusuma, H. S., Al Lantip, G. I., Amenaghawon, A. N., &Darmokoesoemo, H. (2024a). A mini bibliometric analysis of research on Vetiver oil from 1961 to 2022. *Egyptian Journal of Chemistry 67(6),* 257-262.
11. Kusuma, H. S., Luthfiya, Z. D., Amenaghawon, A. N., &&Darmokoesoemo, H. (2024b). A century of sandalwood oil research: Bibliometric analysis using VOSviewer. *Egyptian Journal of Chemistry, 67(7),* 49-55.
12. Pritchard, A. (1969). Statistical bibliography or bibliometrics? *Journal of Documentation, 25(4),* 348-349.
13. Sastry, S. G. (1944). Manufacture of sandalwood oil in India. *Journal of Scientific and Industrial Research, 3(2),* 75-78.
14. Thomson, L. A. J. (2020). Looking ahead – global sandalwood productionand markets in 2040, and implications for Pacific Island producers. *Australian Forestry, 83(4),*245-254.
15. Yusoff, Z. M., Ismail, N., &Nordin, S. A. (2024). Dataset for five recent years (2019 – 2023) agarwood essential oil research trends: A bibliometric analysis. *Data in Brief, 54,* 110310.

Altmetric Analysis of highly cited Indian Oncology Research

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Abstract
Present investigation is an attempt to identify the visibility and impact of highly cited research in Oncology by Indian researchers indexed in Web of Science Core Collection. We also identify the availability of research output on academic social media platform and citation in policy documents by different countries, mention in Clinical guidelines and patent literature. We also traced out availability of highly cited Oncology research publications on other media platforms such as news items, Twitter, Facebook, Reddit and policy documents. Tata Memorial Hospital, Mumbai is the most mentioned research organization with 74 documents, it is followed by Harvard University and University of Washington. Lancet Oncology is the most mentioned journal on Altmetric resources platform.

Keywords
Altmetric, Scientometric, Oncology, research output

Introduction:
Availability of Internet not only bridged the digital divide but also facilitated fast communication of research and information to the students, researchers, and other stakeholders. Scholarly communication is available in pre-published format on platforms like arXiv and other preprint servers. This not only make the information access easy but also ensures its availability to a wider network across the world.
Scholarly communications are analysed on various citation based traditional bibliometric and scientometric indices viz h-index, g-index, i10 index etc. In addition to these metrics Altmetric i.e. Alternative metrics is also being used extensively by research evaluators and policy makers. Source of this metric is based on mention of research item on Twitter, News items, facebook, policy documents, scientific blogs, Wikipedia pages, patent documents and video platforms. There are mainly two sources of Altmetric score i.e. plum

metric and Altmetric.com; Altmetric attention score (AAS) provided by Dimension database is also provided by Altmetric.com

There have been many studies highlighting the correlation between citation and altmetric score. Bansal et al (2019) analysed social medica attention of Indian research output in various subdisciplines and concluded that ResearchGate and Mendley are the most preferred social media platform covering Indian research output. Serghiou and Ioannidis (2018) compared altmetric score of published articles posted on preprint platform and suggested that articles that are available on pre print platform have higher altmetric attention score as compared to article published without preprint. Khazei et al (2019) analysed 2197 contemporary scientific literature in endodontology and found that only 192 publications have recurved Altmetric scores and concluded that publications in this field have lower Altmetric attention score as compared to another scientific domain. Banshal et al (2018) analysed Altmetric of Indian research output in various category and concluded that that ~ 61%of the Web of science indexed scholarly publications are available on ResearchGate.Senar and Polat (2022) analysed highly cited publications on retina published during 2010 and 2020 and concluded that unlike traditional bibliometric indicator Altmetric is not sufficient to determine quality of scholarly output. However, communicating research on social media have higher social impact of research. Kolahi et al (2017) analysed 14884 dental articles from PubMed database of which only 5153 articles were found on Altmetric database and concluded that news outlets, tweeters and scientific bloggers were the most influential resources for Altmetric Score.

Methodology

Web of Science Core Collection database was used for extracting highly cited data on oncology. Search string for extracting data used is (WC=Oncology AND CU=India) Search results were sorted in the decreasing order of citations and metadata of first 1000 records were downloaded in MS-Excel file. All the DOI were searched in Altmetric database using advance search feature. Search output was downloaded in CSV file format and further screened for analysis. Pearson correlation coefficient was used to determine the relation between citation and Altmetric Attention Score.Journal impact factor from Clarivate Analytics were taken from Journal Citation report 2023. Pearson Correlation were calculated using following formula

$$r = \frac{\sum_i (x_i - \overline{x})(y_i - \overline{y})}{\sqrt{\sum_i (x_i - \overline{x})^2} \sqrt{\sum_i (y_i - \overline{y})^2}}$$

Research Question

1. To identify whether there is any significant relationship between journal Impact Factor and Altmetric Attention Score
2. To identify whether there is any correlation between citation and Altmetric Attention Score
3. To identify whether publication in international collaboration have more citation and Altmetric mention
4. To identify whether there is any positive correlation between X sharing and Altmetric score of research publication.

Results and Analysis

Out of 1000 highly cited article from WoSCore collection 829 outputs were available on Altmetric Explorer and 794 outputs were identified with attention. These highly cited publications on oncology were published during 1976-2023. Highest number of publications. Year 2015 have highest number of publications i.e. 69 publications. Last thirteen years i.e during 2011-2023 contributed 629 publications which is ~63% of publications. Figure -1 depicts year wise growth of highly cited publications on Oncology by Indian Scholars.

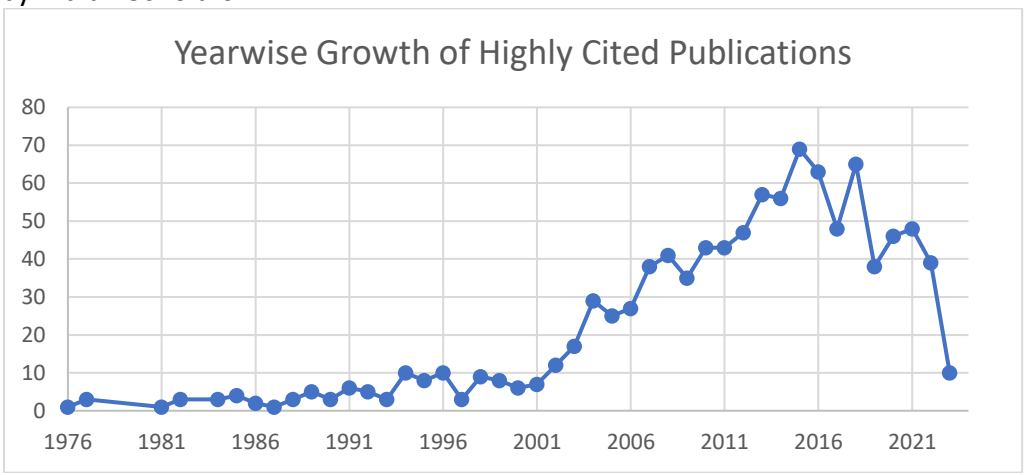

Figure-1: Year wise Highly cited publications in Oncology

These 1000 highly cited publications have been cited202784 with Average Citations per Item202.78 and h-index204. Theses 1000 research article consist of 603 publications which are in international collaboration by Indian Scholars. Tata Memorial Centre is the most prolific Organization with 148 publications. Out of 1000 publications 603 are in international collaboration. Highly cited works on oncology has been mentioned on 18 different altmetric resources which consists of News, Blog, Policy documents, Patent, X (Twitter), Peer review mentions, Weibo, Facebook, Wikipedia, Google+ , Reddit, F1000, Q&A mentions, Video, Clinical guidelines, Bluesky, Number of Mendeley readers and Number of Dimensions citations. Out of these 1000 highly cited publications from Web of Science there were 829 articles on altmetric explorer and 794 outputs with altmetric Attention Score. These 794 article has fetched 27489 mentions from altmetric resources which includes 21930 mentions on social media, 2994 mentions on news and blogs, 2150 mention on policy patent & guidelines, 61 mention on academic resources (Fig-2)

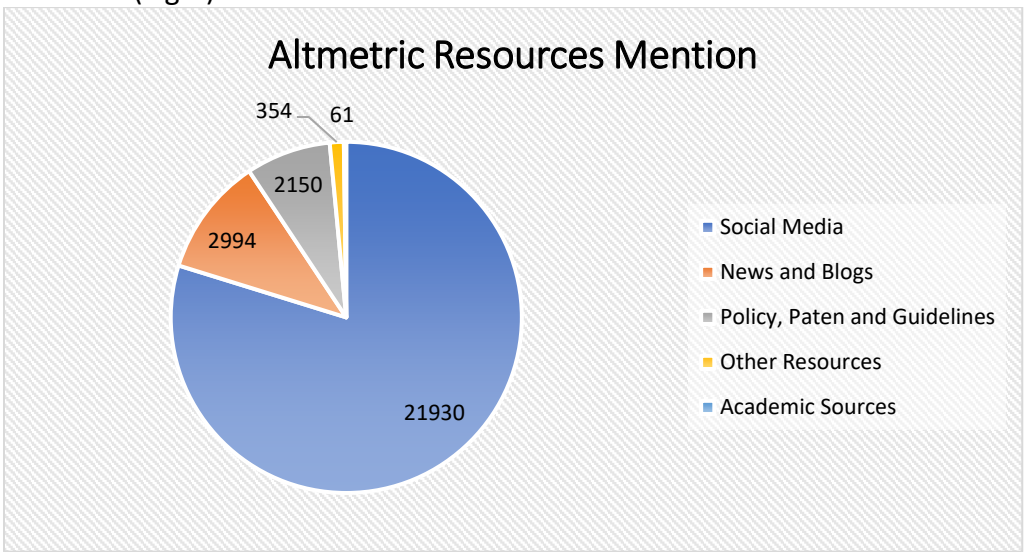

Figure-2: Altmetric resource mention of highly cited Oncology Research

Table 1 depicts the number of articles mention on various Altmetric resources. It indicates that out of 794 outputs having Altmetric mentions, 227 unique articles have been quoted total 2384 times in news mentions, 90 articles have been reported 206 times on Blogs, 117 articles have been used 388 times in policy documents by the Government of different countries, 193 publications have been cited 1024 times in patent literatures, 467 publications have been disseminated18874 times including retweets and reposts on X platform, 8 publications have been quoted 20 times in

peer review mentions, only one publications have been mentioned on Weibo thrice, Facebook represented 164 research publicationswhich have achieved 674 total mentions, Wikipedia quoted 103 research publications and there is total 202 mention on Oncology. Google+ mentions 28 unique highly cited research publications and have 85 total mentions. Reddit platform mentions 14 distinct publications with 21 total mentions, F1000 mentions13 highly cited works on oncology from Indian research institutions with 17 total mentions. 132 unique Highly cited works on Oncology has also been quoted in Clinical guidelines and have 368 total mentions. 667 of 794 publications is available on Mendley and find 163893 mentions, and 671 of these 794 publications have been cited at least once on Dimension Database and cumulative citations of these publications is 176256.

Table 1: - Coverage of highly cited Indian Oncology research output on various Altmetric platform

Parameters	No of articles	% of article	Total mention	Average mention
News mentions	227	28.73	2384	10.50
Blog mentions	90	11.39	206	2.29
Policy mentions	117	14.81	388	3.32
Patent mentions	193	24.43	1024	5.31
X mentions	467	59.11	18874	40.42
Peer review mentions	8	1.01	20	2.50
Weibo mentions	2	0.25	3	1.50
Facebook mentions	164	20.76	674	4.11
Wikipedia mentions	103	13.04	202	1.96
Google+ mentions	28	3.54	85	3.04
Reddit mentions	14	1.77	21	1.50
F1000 mentions	13	1.65	17	1.31
Q&A mentions	1	0.13	1	1.00
Video mentions	43	5.44	78	1.81
Clinical guidelines mentions	132	16.71	368	2.79
Bluesky mentions	1	0.13	1	1.00
Number of Mendeley readers	667	84.43	163893	245.72
Number of Dimensions citations	671	84.94	176256	262.68

Figure 3 depicts list of countries who have cited Indian Oncology research in its policy documents. Among the countries Switzerland has used 216 times the Indian research output while formulating policy documents followed by the United States of Americawith 84 mentions in policy documents. Canada ranks third in terms of mentioning the highly cited research work on Oncology by Indianresearchers which cited 76 times. The United Kingdom quoted 74 times the Indian research output and ranks fourth. It is followed by Netherland (25), Denmark (10), Ireland (8), Australia and Sweden 4 each,

Columbia and New Zealand have mentioned 3 documents each, Bolivia, Italy, Kenya, Norway and Uganda have cited once in their policy documents.

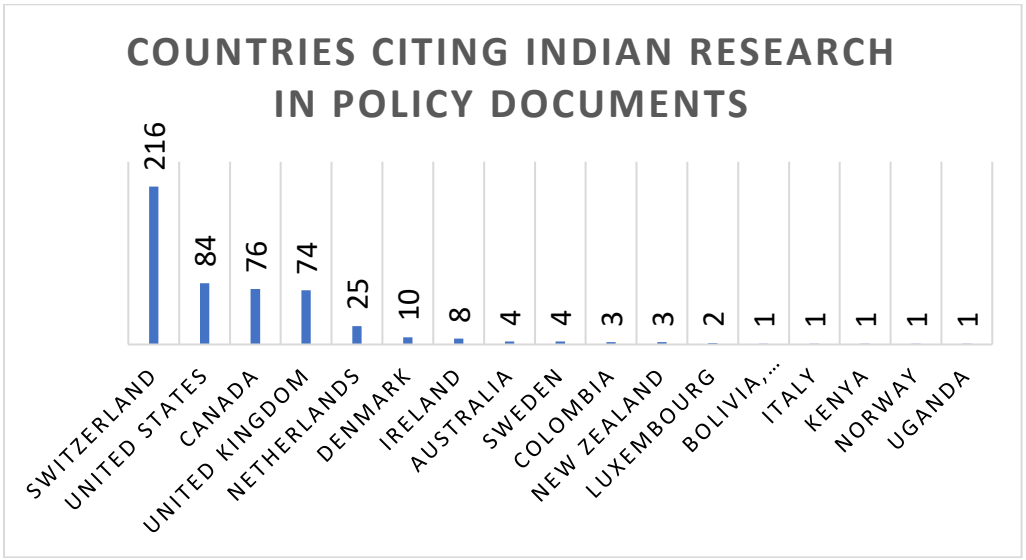

Figure -3: Countries mentioning Indian Oncology research in its Policy Documents

Correlation of citation with that of Altmetric attention were calculated and the value of R is 0.5141.This depicts moderate positive correlation, which means there is a tendency for high Altmetric Score go with high citation rate scoresand vice versa.Similarly,Pearson Correlation value of Altmetric Attention Score with Journal Impact Factor is .05565 which indicates moderate positive correlation with each other. Higher the Impact factor higher is Altmetric Attention Score. Table 2 depicts list of the journals with10 or more publication count. There are 23 journals which have more than 10 publications included in Altmetric database. Lancet Oncology having impactfactor 41.06 (2023) have maximum number of publications with 54 publications with cumulative Altmetric Attention Score of 8818 and received 14044 Citation from Web of Science indexed publication. Lancet Oncology have highest Average Almetric Attention Score per article. It is followed by Journal of Clinical Oncology having Journal impact Factor 42.1 with 49 publications and have 3576 Altmetric attention Score and received 15422 citations , it also has the highest impact in terms average citation per item. It is followed by Seminars in Cancer Biology having impact Factor 12.1 with 39 articles in Altmetric explorer and received 688 Almetric Attention score and 17.64 average AAS per article, it received 8286 citations from WoSCC indexed publications. In the list of the most productive journal,

Annals of Oncology have the highest journal Impact Factor with 56.7, there are 20 articles published by Indian Scholars on Oncology which is among top 1000 highly cited publications. Journal impact factor varies from 0.3 to 56. 7. Journal Oncotarget have not received any impact factor in JCR 2023 release however it was included in earlier version of JCR.

Table 2: - The most prolific journal having highest mention on Altmetric resources

Sr. No	Journal/Collection Title	IF (2023)	No of Publications	AAS	Avg. Altmetric Score	Citation	Avg. Citation
1	Lancet Oncology	41.6	54	8818	163.3	14044	260.07
2	Journal of Clinical Oncology	42.1	49	3576	72.98	15422	314.73
3	Seminars in Cancer Biology	12.1	39	688	17.64	8286	212.46
4	International Journal of Cancer	5.7	33	721	21.85	26686	808.67
5	Cancer Letters	9.1	31	190	6.13	4769	153.84
6	Molecular Cancer	27.7	28	205	7.32	4116	147
7	Cancer Research	12.5	23	286	12.43	4233	184.04
8	Annals of Oncology	56.7	20	863	43.15	4628	231.4
9	Frontiers in oncology	3.5	17	98	5.76	2271	133.59
10	Clinical Cancer Research	10.4	15	268	17.87	1827	121.8
11	Oncogene	6.9	14	78	5.57	2421	172.93
12	Carcinogenesis	3.3	13	485	37.31	1452	111.69
13	Oncotarget	0	13	839	64.54	1729	133
14	JAMA Oncology	22.3	12	5833	486.08	10730	894.17
15	British Journal of Cancer	6.4	11	205	18.64	1959	178.09
16	Stem Cells	4	11	160	14.55	2444	222.18
17	BMC Cancer	3.4	11	82	7.45	1116	101.45
18	Oral Oncology	4	11	51	4.64	1317	119.73
19	European Journal of Cancer (1965)	7.6	11	71	6.45	1485	135
20	Cancers	4.5	11	40	3.64	1240	112.73
21	Molecular Carcinogenesis	3	11	37	3.36	1374	124.91
22	Indian Journal of Medical & Paediatric Oncology	0.3	10	1138	113.8	1156	115.6
23	Journal of Thoracic Oncology	21.1	10	290	29	3261	326.1

Analysis of journal on the basis of various Altmetric resources have been give in Fig -4. It depicts that Journal“LancetOncology” have received highest news attention and in policy documents. It has been mentioned 890 times in news items, 139 policy documents, 78 blog mention, 32 mention by patent literatures, and 54 Clinical guidelines. It is followed by Journal of Clinical Oncology with 238 news mention, 16 blog mention and 90 policy Documents mention. Journal of Clinical Oncology have received highest mention by patent literature i.e, 173 mention and 147 Clinical guidelines. The other significant journal in the list includes Seminars in Cancer Biology, International Journal of Cancer, Cancer Letters, Molecular Cancer, Cancer Research, Annals of Oncology, Frontiers in oncologyand Clinical Cancer Research.Journal of Clinical Oncology was mentioned 173 times in patent literature and followed by the journal Stem Cells having 100 mention by patents. Other than the journals mentioned in the figure 4, International Journal of Cancer, Leukemia, and Annals of Oncologywere mentioned in clinical guidelines by 24, 23and 22times respectively.

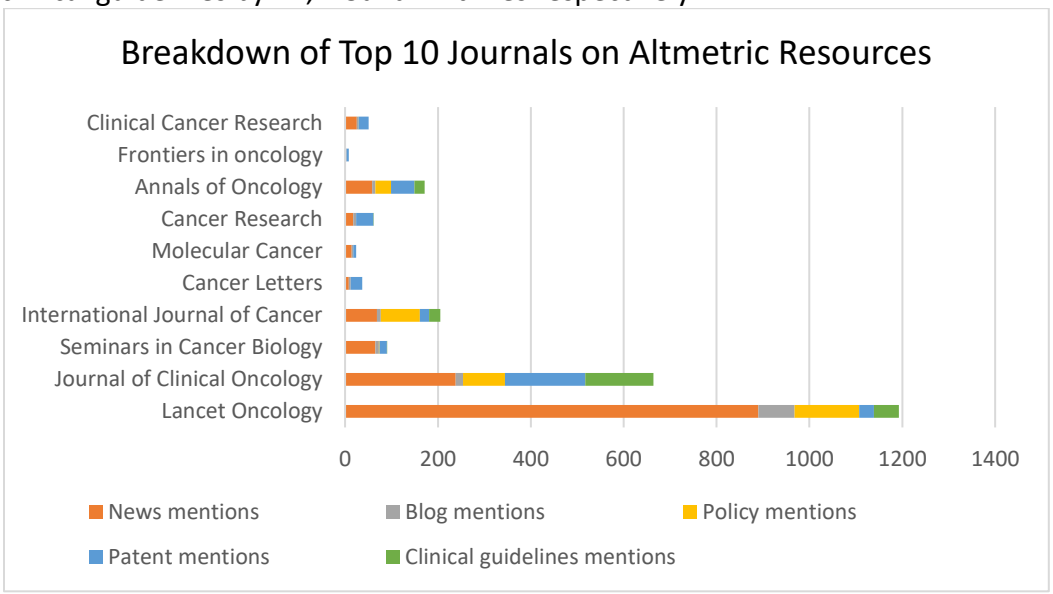

Figure -4 : Top 10 journals based on news, blog, policy, patent and Clinical Guidelines mentions

Analysis of the 10 most mentioned journals on X (twitter) has been depicted in the figure 4.Journal of Clinical Oncology is the most mentioned journal on X platform with 6494 mentions followed by Lancet Oncology 4362 mention. JAMA Oncology ranks third in the list with 3321 mentions followed by Indian

Journal of Medical & Paediatric Oncology with 829 mentions, Leukemiawith 649mention, Annals of Oncology 602 mention. Journal of Global Oncology, Molecular Cancer, European Journal of Surgical Oncology and Radiotherapy &Oncologyreceived353,258, 205 and 197 mentions on X respectively.

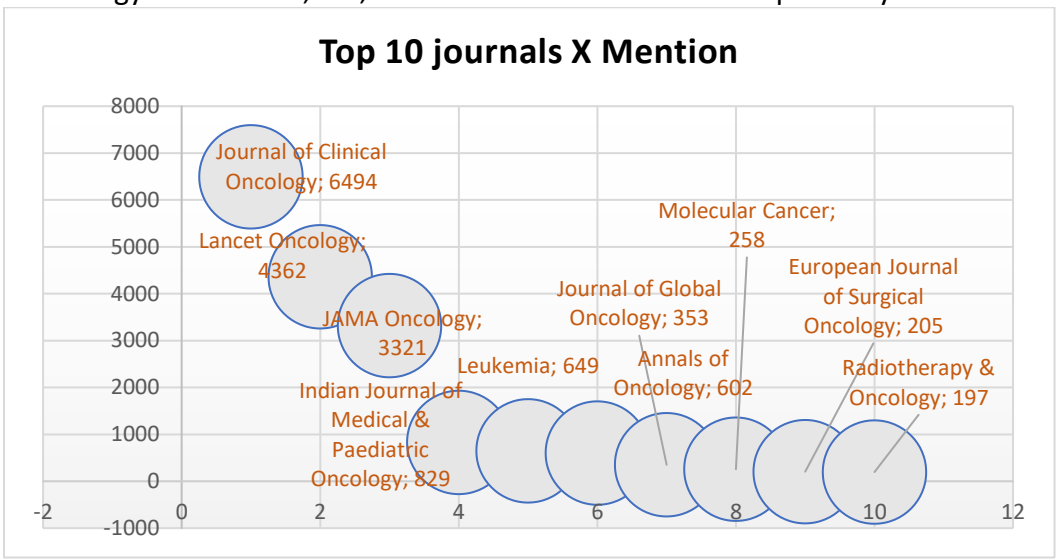

Figure 5: The most prolific journals mentioned on X (Twitter)

Among the organization list (Figure -6) Tata Memoria Hospital have highest number of research publications available on Altmetric database and the most significant organization from India in the field of Oncology research and Cancer therapy. Tata Memorial Hospital have 79 research outputs with 9454 mentions and constitutes 34% of the total research output on Altmetric resources platform. It is followed by Harvard University having 38 outputs with 5040 mentions and represents 18 % of the total research output on Altmetric. University of Washington Ranks third in the list with 20 Outputs and 4415mentions and constitutes 16% of the highly cited research output from India. It also represents that Harvard University and University of Washington are the most preferred institutes for international collaboration by the Indian researchers in the field of Oncology.

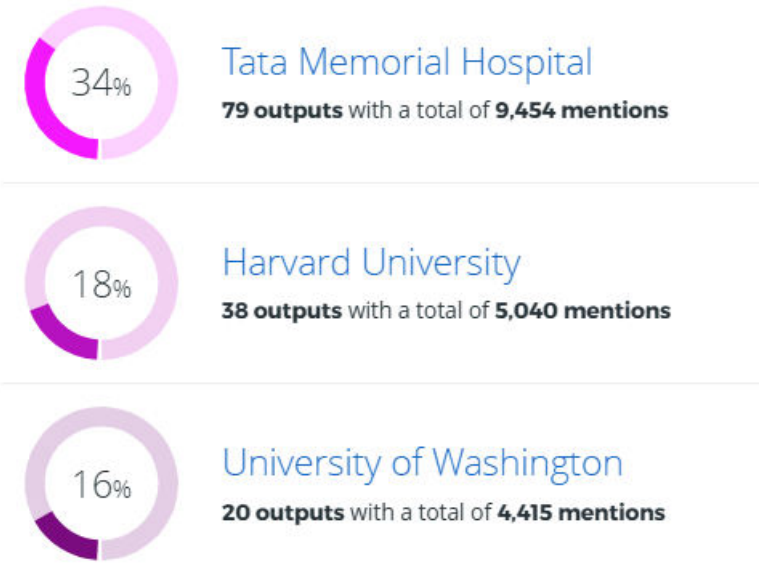

Figure 6: The most prolific Organization of Altmetric Resources (Source: Altmetric Explorer)

Conclusion:

This paper reports some important facts related to social media visibility and impact of Indian Oncology research which have received highest number of citations. It has been observed that there is a moderate positive correlation between the impact factor and Almetric attention Score and Citation rate and Altmetric Attention Score. Tata Memorial Hospital have highest impact on Altmetric on highly cited Oncology research from India. This study is the first study on measuring social media visibility and impact of Oncology research from India and helpful for Health science librarians, Research Scholar and other stakeholder.

References

1. Banshal, S. K., Singh, V. K., Muhuri, P. K., &Mayr, P. (2019). How Much Research Output from India Gets Social Media Attention? *Current Science*, *117*(5), 753. https://doi.org/10.18520/cs/v117/i5/753-760
2. Serghiou, S., & Ioannidis, J. P. A. (2018). Altmetric Scores, Citations, and Publication of Studies Posted as Preprints. *JAMA*, *319*(4), 402. https://doi.org/10.1001/jama.2017.21168
3. Kolahi, J., Khazaei, S., Iranmanesh, P., Khademi, A., Nekoofar, M. H., &Dummer, P. M. H. (2019). Altmetric analysis of the contemporary scientific literature in Endodontology. *International Endodontic Journal*, *53*(3), 308–316. https://doi.org/10.1111/iej.13226

4. Banshal, S. K., Singh, V. K., Kaderye, G., Muhuri, P. K., & Sánchez, B. P. (2018). An altmetric analysis of scholarly articles from India. *Journal of Intelligent & Fuzzy Systems*, *34*(5), 3111–3118. https://doi.org/10.3233/jifs-169495
5. Sener, H., &Polat, O. A. (2021). ALTMETRIC ANALYSIS OF THE MOST-CITED 100 ARTICLES ON THE RETINA PUBLISHED BETWEEN 2010 AND 2020. *Retina*, *42*(2), 283–289. https://doi.org/10.1097/iae.0000000000003318
6. Kolahi, J., Iranmanesh, P., &Khazaei, S. (2017). Altmetric analysis of 2015 dental literature: a cross sectional survey. *BDJ*, *222*(9), 695-699. https://doi.org/10.1038/sj.bdj.2017.408
7. Altmetric.com (accessed on 15.12.2024)

A Webometric study of Library websites of National Law Universities in India

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Abstract
The main objective of this paper is to evaluate and analyse the library websites of National Law universities in India using webometric method. There are total 26 National Law universities in India out of which 21 National Law Universities were found suitable for the study. They were evaluated on the basis of various webometric indicators like Domain age, Domain Authority, Page Authority, Link Analysis, Web Impact factor, Moz Rank, SEO Score, Mobile & Desktop Speed and Social Media followers. Search engine "Bing" was used for the purpose of webpages and rich files. The study revealed that the Library websites of National Law universities need to increase their external links and number of rich files on the website to enhance their quality and quantity on search engine result pages (SERPs).There is also suggestion that the libraries of National Law universities to engage in collaboration amongst them for better user services, resource sharing and community engagement.

Keywords
National Law universities, Webometrics, Web Impact Factor, Domain Authority, Page Authority, MOZ rank, SEO Score, Rich Files

Introduction

National Law Universities (NLUs) are the premier institutions of legal education in India. There are around 26 National law Universities in India. The libraries of National Law University (NLUs) plays a pivotal role of supporting legal education and research in law. Their library websites act as a comprehensive portal of providing access to a wide array of resources including legal databases, e-books, research publications and legal digital repository. Providing 24/7 access to critical information to its students, researchers and faculty. Analysing their digital presence through webometric indicators, such as the link analysis, the number of rich files and search engine visibility can highlight strengths and gaps in their accessibility, usability, and resource dissemination.

Concept of Webometrics

Webometrics is the metrics or measurable study of the web. The term was first coined in 1997 by Thomas Almind and Peter Ingwersen who defined it as "the study of the quantitative aspects of the construction and use of information resources, structures and technologies on the web, drawing on bibliometric and informetric approaches."

This definition covers the four main areas of webometric study:

a. Content analysis of web page
b. Link analysis like external links, in-links, out-links etc.
c. Analysis of web usage involving log files, search history etc.
d. Search Engine Performance

About National Law Universities

Post-Independence a large number of law schools were established throughout the country under an act of the state legislature, recognised as "state universities". The laws for regulation of legal education was made by the parliament with reference to the list I of the constitution of India. Two bodies were made accountable for regulating legal education in India namely,

1. The Bar Council of India (BCI) as a statutory body regulating legal education in India.
2. The University Grant Commission (UGC) as an Umbrella organisation regulating all institutions of higher education.

Most of these universities were nonspecialized and criticized for awarding law degrees as any other graduate degree. They followed the curriculum prescribed by the Bar Council of India, but since they were under the overall control and monitoring of University Grants Commission, it was practically impossible for the BCI to seek reforms in legal education. This set up continued for two decades until the Advocacy Act of 1961 was established. There were mounting pressure on the Bar Council of India over the falling standard of legal education and implementing immediate reforms in the way legal education is imparted in India. Eventually in 1984 "Legitimate Education Committee" of Bar Council of India approved various proposals to modernize legal education. The main proposal being establishment of specialized institutions imparting legal education in an integrated and diversified manner. Thus First National Law University Called National Law Institute University (NLIU) was setup in Bangalore, Karnataka. Currently National Law Universities represent Premier institutions in

the field of legal education. There are total of twenty eight National Law Universities established almost in every state of India, few states having more than 1 national law universities also.

Review of Selected literature

Bjorneborn and Ingwersen (2004) explained the concept of webometrics within the framework of informetics, bibliometrics and cybernetrics studies by using detailed link typology. Jalal et.al.(2010) conducted a study analyzing websites of various Indian universities, including central universities, state universities, and National Institutes of Technology (NITs). Data was collected using web crawlers like SocSciBot 3.0 to generate link data and develop micro-link topologies. The study suggested that Web Impact factor can be used as tool for assessing and enhancing digital visibility. Kadam and Bhusvar (2021) conducted a webometric analysis of the top 25 NIRF Ranked websites of Institutions of higher educations in India. The parameters used for the study were web impact factor, WISER index, Alexa traffic rank, search engine optimisation, the security rank of the website, social media followers and external backlinks. The study found that only 11 institutions had very strong security rank. Patel et.al. (2021) conducted a webometric analysis of NIRF ranked universities in India using internal links, external links, total links etc. as parameters. They used smallseotools.com to calculate the links and Ahrefs SEO tool for website traffic. Pal et al (2021) conducted a evaluative study on the websites of 29 Indian Council Social science research (ICSSR) institutions of India using Google search engine for webpage and SEO Review tools for counting of in links, external links, total links, Meta tags and backlinks. The study gave the overall overview of the websites of ICSSR. Tomar et. al. (2018) did a content analysis of 20 library websites of National law universities of India. Yadav et al. (2023) conducted a webometric study of 23 National Law Universities of India using web impact factors, PageRank, Alexa traffic rank, rich files as webometric parameters. SocScibot was used to visualize the link network and topology of these institutions. There has been very limited webometric studies conducted on National law universities of India.

Scope of the study

As on 2024, there are total of 26 National Law Universities established in India. Out of which the present study is limited to 21 National Law Universities of India. The study focuses on webometric analysis of library websites of the selected National Law universities using various webometric tools and techniques.

Objectives of the study

The main objective of this study is to evaluate webometric parameters of Library websites of National Law Universities of India. The objectives are as follows:

i. To find out the Domain registration and domain age of the websites of National Law Universities.
ii. To find out the Mobile and Desktop speed of the library websites of National Law Universities.
iii. To find out the Domain and Page Authority of the library websites of National Law Universities.
iv. To find out the Internal and External links of these websites.
v. To calculate the Simple Web Impact Factor, External Impact factor and Internal Impact factor of these websites.
vi. To find out the MOZ Rank and SEO score of these websites.
vii. To find out the rich files of these websites.
viii. To find out their Social Media popularity.

Methodology

This study is web-based research on the analysis of library websites of 21 National Law Universities in India. Research method used is observation and survey method. Data for the study was collected in the months of November and December 2024 using Google and Bing search engine. The list of National Law universities with their website and other details were acquired from Wikipedia using Chrome web browser. Official Website of each law university under study was visited and checked for library webpages and websites. Apart from these, following tools and techniques were used for this study:

Details	**Details of the tools**
Domain Registration and Domain Age of the website	smallseotools.com
Mobile and Desktop speed	Pagespeed Insight
Domain Authority and Page Authority	smallseotools.com
External links, Internal links and Total links	Duplichecker.com
Total Rich file (.pdf,.ppt,.doc,.xls)	Bing search engine
Moz Rank	smallseotools.com
SEO Score	smallseotools.com

Social Media Presence	Facebook handles, Youtube Channels, Linkedin profiles, Instagram pages of each selected National law universities were checked.
Number of Webpages	BING Search engine using

Table 1: List of Selected National Law Universities for the study with their official website and library address.

Sr. no	Name of University	Abbr	Year of establishment	Official Website	Library Website
1	National Academy of Legal Studies and Research	NALSAR	1998	https://nalsar.ac.in/	https://library.nalsar.ac.in/
2	Chanakya National Law University	CNLU	2006	https://cnlu.ac.in/	https://cnlu.ac.in/campus-life/library/
3	Gujarat National Law University	GNLU	2003	https://www.gnlu.ac.in/GNLU/Home	https://gnlu.ac.in/library/Home
4	Himachal Pradesh National Law University	HPNLU	2016	https://hpnlu.ac.in/	https://hpnlu.ac.in/page.aspx?page=26
5	National Law University and Judicial Academy	NLUJA	2009	https://nluassam.ac.in/	https://krc.nluassam.ac.in/
6	Maharashtra National Law University Nagpur	MNLUN	2016	https://www.nlunagpur.ac.in/	https://libcatnlunagpur.ltsinformatics.com/
7	National Law School of India University	NLSIU	1986	https://www.nls.ac.in/	https://library.nls.ac.in/
8	National University of Advanced Legal Studies	NUALS	2005	https://www.nuals.ac.in/	https://library.nuals.ac.in/

9	West Bengal National University of Juridical Sciences	WBNUJS	1999	https://www.nujs.edu/	https://library.nujs.edu/
10	Maharashtra National Law University, Aurangabad	MNLUA	2017	https://mnlua.ac.in/	https://mnlua.ac.in/library
11	Maharashtra National Law University Mumbai	MNLUM	2014	https://mnlumumbai.edu.in/	https://mnlumumbai.edu.in/library/index.php
12	National Law Institute University	NLIU	1997	https://nliu.ac.in/	https://nliu.ac.in/gyan-mandir-library/
13	National Law University Delhi	NLUD	2008	https://nludelhi.ac.in/	https://nludelhi.ac.in/library-justice-t-p-s-chawla-library/
14	National Law University Tripura	NLUT	2022	https://nlutripura.ac.in/	https://nlutripura.ac.in/library/
15	National University of Study and Research in Law	NUSRL	2010	https://nusrlranchi.ac.in/	https://nusrlranchi.ac.in/library/
16	Gujarat National Law University, Silvassa Campus	GNLUS	2022	https://www.gnlus.ac.in/	https://sites.google.com/gnlus.ac.in/gnlusilvassalibrary
17	Dharmashastra National Law University	DNLU	2018	https://www.mpdnlu.ac.in/	https://www.mpdnlu.ac.in/aboutlibrary.php
18	Rajiv Gandhi National University of Law	RGNUL	2006	https://www.rgnul.ac.in/	https://www.rgnul.ac.in/library/
19	Dr. Ram Manohar Lohiya National Law University	RMLNLU	2005	https://www.rmlnlu.ac.in/en	https://www.rmlnlu.ac.in/en/page/library
20	Tamil Nadu National Law University	TNNLU	2012	https://www.tnnlu.ac.in/	https://www.tnnlulibrary.net/
21	National Law University Odiha	NLUO	2009	https://nluo.ac.in/	https://nluo.ac.in/library/

Data Analysis and Discussion

Domain registration and age: Through analysis were made to know the domain age of the National Law Universities's websites using smallseotools.com tool. Table 2 reflects the data about the domain registration age of the studied websites.It can be observed from the table that West Bengal National University of Juridical Sciences (WBNUJS) is having the oldest number of years completed domain registration followed by National Law School of India University(NLSIU) completing 20 years of domain registration. National University of Advanced Legal Studies (NUALS) and National Academy of Legal Studies and Research (NALSAR) have completed 18 years of domain registration.

Table 2: Domain Age and Registration of Selected National Law Universities

Sr.no	Name of University	Domain Registration	Domain Age
1	West Bengal National University of Juridical Sciences	29/12/2000	23 Years 10 Month 28 Days
2	National Law School of India University	28/02/2004	20 Years 8 Month 28 Days
3	National University of Advanced Legal Studies	20/03/2006	18 Years 8 Month 5 Days
4	National Academy of Legal Studies and Research	22/08/2006	18 Years 3 Month 3 Days
5	Chanakya National Law University	15/01/2007	17 Years 10 Month 10 Days
6	Dr. Ram Manohar Lohiya National Law University	25/03/2008	16 Years 8 Month 0 Days
7	National Law University Odisha	04/11/2009	15 Years 0 Month 21 Days
8	National Law University and Judicial Academy	26/04/2011	13 Years 6 Month 30 Days
9	Rajiv Gandhi National University of Law	10/05/2011	13 Years 6 Month 15 Days
10	National University of Study and Research in Law	13/09/2012	12 Years 2 Month 12 Days
11	Maharashtra National Law University Nagpur	09/10/2015	9 years 1 Month 29 Days

12	Maharashtra National Law University Mumbai	09/10/2015	9 Years 1 Month 16 Days
13	Himachal Pradesh National Law University	29/12/2016	7 Years 10 Month 27 Days
14	Maharashtra National Law University, Aurangabad	08/08/2017	7 Years 3 Month 17 Days
15	Dharmashastra National Law University	07/06/2018	6 Years 5 Month 18 Days
16	Gujarat National Law University, Silvassa Campus	03/11/2022	2 Years 1 Month 10 Days
17	Gujarat National Law University	2004-03-17	20 Years 8 Month 8 Days
18	National Law University Delhi	2008-09-02	16 Years 2 Month 23 Days
19	National Law Institute University	2010-07-27	14 Years 3 Month 29 Days
20	Tamil Nadu National Law University	2019-04-26	5 Years 6 Month 30 Days
21	National Law University Tripura	2022-10-11	2 Years 1 Month 14 Days

PageSpeed Insights (PSI): It reports on the performance of a website on both desktop and mobile devices .Table 3 reflects the Mobile and Desktop speed and responsive of the website. Google states that the Page speed shows the performance of a web page on both mobile and desktop devices. A score of 90 or above is considered fast and 50 to 90 is considered moderate. Below 50 is slow. It is observed from the table 3 that RMLNLU (95) is having the highest speed on mobile whereas GNLU(20) is having the lowest speed on mobile among the all universities.It was also observed that TNNLU(99) scores the highest and GNLU (11) score lowest on desktop among the all universities.

Table 3: Mobile and Desktop Speed

Sr.no	Name	Abbr	Mobile	Desktop
1	National Academy of Legal Studies and Research	NALSAR	59	73
2	Chanakya National Law University	CNLU	41	57
3	Gujarat National Law University	GNLU	20	11
4	Himachal Pradesh National Law University	HPNLU	78	95
5	National Law University and Judicial Academy	NLUJA	58	83
6	Maharashtra National Law University Nagpur	MNLUN	76	74
7	National Law School of India University	NLSIU	56	89
8	National University of Advanced Legal Studies	NUALS	50	63
9	West Bengal National University of Juridical Sciences	WBNUJS	51	64
10	Maharashtra National Law University, Aurangabad	MNLUA	75	87
11	Maharashtra National Law University Mumbai	MNLUM	49	79
12	National Law Institute University	NLIU	40	59
13	National Law University Delhi	NLUD	31	77
14	National Law University Tripura	NLUT	39	50
15	National University of Study and Research in Law	NUSRL	50	81
16	Gujarat National Law University, Silvassa Campus	GNLUS	31	49
17	Dharmashastra National Law University	DNLU	82	94
18	Rajiv Gandhi National University of Law	RGNUL	64	86
19	Dr. Ram Manohar Lohiya National Law University	RMLNLU	91	97
20	Tamil Nadu National Law University	TNNLU	46	99
21	National Law University Odisha	NLUO	29	72

Domain and Page Authority

Both Domain Authority and Page Authority are the search engine ranking score developed by MOZ (A Search Engine optimization Software Company).Domain authority predicts how well a website will rank on search engine result pages (SERPs) whereas Page Authority predicts how well a specific webpage will rank on search engine result pages. Both's score range from 1 to 100 with higher scores corresponding to a greater ability to rank. It is evident from table 4 that National Academy of legal studies and research(NALSAR) scores highest on both Domain and Page Authority. Maharashtra National Law University Nagpur(MNLUN) scored the least in both cases

Table 4: Domain Authority and Page Authority

Sr.no	Name	DA	PA
1	National Academy of Legal Studies and Research (NALSAR)	45	41
2	Chanakya National Law University (CNLU)	34	27
3	Gujarat National Law University (GNLU)	41	28
4	Himachal Pradesh National Law University (HPNLU)	33	21
5	National Law University and Judicial Academy (NULJA)	31	24
6	Maharashtra National Law University Nagpur(MNLUN)	10	9
7	National Law School of India University(NLSIU)	49	36
8	National University of Advanced Legal Studies(NUALS)	35	28
9	West Bengal National University of Juridical Sciences(WBNUJS)	43	30
10	Maharashtra National Law University, Aurangabad (MNLUA)	31	18
11	Maharashtra National Law University Mumbai (MNLUM)	26	22
12	National Law Institute University (NLIU)	38	26
13	National Law University Delhi (NLUD)	41	26
14	National Law University Tripura (NLUT)	15	13

15	National University of Study and Research in Law (NUSRL)	29	19
16	Gujarat National Law University, Silvassa Campus (GNLUS)	96	51
17	Dharmashastra National Law University (DNLU)	23	20
18	Rajiv Gandhi National University of Law (RGNUL)	33	29
19	Dr. Ram Manohar Lohiya National Law University (RMLNLU)	34	25
20	Tamil Nadu National Law University (TNNLU)	5	18
21	National Law University Odisha (NLUO)	37	26

MOZ Rank: It is developed by a Search Engine optimization Software Company based in America. It is a metric measuring a website's popularity and authority based on the quantity and quality of backlinks. It is calculated on the scale of 0 to 10, with higher score indicating higher authority. Moz Rank can positively impact a website's position in search engine results pages (SERPs).It is evident from table that Gujarat National Law University, Silvassa Campus (GNLUS) has scored the highest MOZ score amongst the other selected national law universities, followed by Maharashtra National Law University Nagpur(MNLUN) scoring the least.

Table 5: MOZ Rank

Sr.no	Name	MOZ Rank
1	Gujarat National Law University, Silvassa Campus (GNLUS)	**5.1**
2	National Academy of Legal Studies and Research (NALSAR)	**4.1**
3	National Law School of India University(NLSIU)	**3.6**
4	West Bengal National University of Juridical Sciences(WBNUJS)	**3**
5	Rajiv Gandhi National University of Law (RGNUL)	**2.9**
6	Gujarat National Law University (GNLU)	**2.8**
7	National University of Advanced Legal Studies(NUALS)	**2.8**

8	Chanakya National Law University (CNLU)	**2.7**
9	National Law Institute University (NLIU)	**2.6**
10	National Law University Delhi (NLUD)	**2.6**
11	National Law University Odisha (NLUO)	**2.6**
12	Dr. Ram Manohar Lohiya National Law University (RMLNLU)	**2.5**
13	National Law University and Judicial Academy (NULJA)	**2.4**
14	Maharashtra National Law University Mumbai (MNLUM)	**2.2**
15	Himachal Pradesh National Law University (HPNLU)	**2.1**
16	Dharmashastra National Law University (DNLU)	**2**
17	National University of Study and Research in Law (NUSRL)	**1.9**
18	Maharashtra National Law University, Aurangabad (MNLUA)	**1.8**
19	Tamil Nadu National Law University (TNNLU)	**1.8**
20	National Law University Tripura (NLUT)	**1.3**
21	Maharashtra National Law University Nagpur(MNLUN)	**0.9**

Web Impact Factor (WIF) is a webometric tool to measure the value of a particular website based on the numerous link it receives from the web divided by the total number of webpages of that particular website at that time. It is used as quantitative tool for ranking, evaluating and comparing web sites, top-level domains and sub-domains amongst the other websites of a particular field or a country. A website with the higher impact factor is said to have higher standing than the lower impact factor websites. There are 3 types of Impact factor

a. **Simple Web Impact factor (SWIF)** is calculated using the ratio of all links to the number of web pages of that particular website.
b. **Internal Web Impact factor (IWIF)** is calculated using the ratio of internal links within the website to a number of web pages of a website.

c. **External Web Impact Factor (EWIF)** is calculated using the ratio of external links to the website by a number of web pages of a website.

Table 4 shows the study of various links and web impact factor of selected library website of National law universities of India .As per the table West Bengal National University of Juridical Sciences (WBNUJS) is having the highest number of webpages followed by National Academy of Legal Studies and Research (NALSAR). National Law University Delhi (NLUD) is having the highest number of external links followed by National University of Study and Research in Law (NUSRL) and Dr. Ram Manohar Lohiya National Law University (RMLNLU). Himachal Pradesh National Law University comes first in having number of internal links followed by Chanakya National Law University (CNLU) and National Law University Odisha (NLUO). National Law Institute University (NLIU) has the highest number of Simple Web impact factor and Internal Web impact factor. National Law University Delhi scores high in External impact factor.

Table 6: Web Impact Factor and Various Link study

Sr. no	Name	Total webpages	Total links	Internal Links	External Links	SWIF	IWIF	EWIF
1	National Academy of Legal Studies and Research	104	63	29	34	0.6	0.2	0.3
2	Chanakya National Law University	2	330	302	28	165	151	14
3	Gujarat National Law University	50	67	60	7	1.34	1	0.1
4	Himachal Pradesh National Law University	8	379	375	4	47	46	0.5
5	National Law University and Judicial Academy	50	76	58	18	1.52	1	0.3
6	Maharashtra National Law	1	42	40	2	42	40	2

	University Nagpur							
7	National Law School of India University	15	61	51	10	4	3.4	0.6
8	National University of Advanced Legal Studies	49	37	19	18	0.7	0.3	0.3
9	West Bengal National University of Juridical Sciences	129	113	94	19	0.8	0.7	0.1
10	Maharashtra National Law University, Aurangabad	4	11	10	1	11	2.5	0.2
11	Maharashtra National Law University Mumbai	30	57	47	10	2	1.5	0.3
12	National Law Institute University	1	209	198	11	209	198	11
13	National Law University Delhi	1	195	148	47	195	148	47
14	National Law University Tripura	10	129	124	5	13	12.4	0.5
15	National University of Study and Research in Law	2	249	203	46	125	102	23
16	Gujarat National Law University,	13	49	45	4	3.7	3.4	0.3

	Silvassa Campus							
17	Dharmashastra National Law University	1	105	96	9	105	96	9
18	Rajiv Gandhi National University of Law	50	28	20	8	0.5	0.4	0.1
19	Dr. Ram Manohar Lohiya National Law University	2	225	181	44	112	90	22
20	Tamil Nadu National Law University	41	19	13	6	0.4	0.3	0.1
21	National Law University Odisha	26	256	234	22	9.8	9	0.8

SEO Score: An SEO score is a metric that measures how well a website is optimized for search engines (SEO) and its performance in technical aspects, content, user experience and mobile responsiveness. It enables website's potential to rank higher in search results and attract organic traffic. SEO scoring is based on a 0-100 scale. A good SEO scoring range falls between 80 and 100. SEO scores below 30 are bad. Low SEO scores can be due to low responsiveness on mobile devices. SEO scores in the 30 to 70 range are medium level performers and has scope for improvement. From the table 5 it is evident that National Law University Odisha (NLUO) scores the highest SEO Score followed by Maharashtra National Law University, Aurangabad (MNLUA) and National Law University Tripura (NLUT). National University of Study and Research in Law (NUSRL), Dharmashastra National Law University (DNLU) and Dr. Ram Manohar Lohiya National Law University (RMLNLU) scores the lowest on SEO.

Table 7: SEO SCORE of Selected National Law Universities' library websites

Sr.no	Name	SEO score
1	National Academy of Legal Studies and Research (NALSAR)	46
2	Chanakya National Law University (CNLU)	50
3	Gujarat National Law University (GNLU)	55
4	Himachal Pradesh National Law University (HPNLU)	43
5	National Law University and Judicial Academy (NULJA)	51
6	Maharashtra National Law University Nagpur(MNLUN)	51
7	National Law School of India University(NLSIU)	60
8	National University of Advanced Legal Studies(NUALS)	45
9	West Bengal National University of Juridical Sciences(WBNUJS)	39
10	Maharashtra National Law University, Aurangabad (MNLUA)	69
11	Maharashtra National Law University Mumbai (MNLUM)	42
12	National Law Institute University (NLIU)	38
13	National Law University Delhi (NLUD)	61
14	National Law University Tripura (NLUT)	65
15	National University of Study and Research in Law (NUSRL)	30
16	Gujarat National Law University, Silvassa Campus (GNLUS)	49
17	Dharmashastra National Law University (DNLU)	33
18	Rajiv Gandhi National University of Law (RGNUL)	62

19	Dr. Ram Manohar Lohiya National Law University (RMLNLU)	39
20	Tamil Nadu National Law University (TNNLU)	58
21	National Law University Odisha (NLUO)	70

Rich Files: Presence of Rich files such as Pdfs. Word documents, PPTs, Excel files on an Institution's website provides a valuable insights into its academic, research and informational output. They complement HTML pages by hosting detailed information that might not fit on webpages of an institution. These files often contain scholarly materials, reports, and educational resources, reflecting the institution's focus on knowledge dissemination and research contributions. Analysing rich files helps quantify the online academic footprint, improve search engine visibility, and assess resource sharing practices. They also offer metadata for SEO, enhance web content diversity, and enable citation and cross-link analysis, making them a critical metric for evaluating the impact and transparency of institutional websites. As it is evident from table 6 that Dr. Ram Manohar Lohiya National Law University (RMLNLU) has the largest number of rich files on their website, followed by Himachal Pradesh National Law University (HPNLU) at 2190 and Chanakya National Law University (CNLU) at 2180. Tamil Nadu National Law University (TNNLU), Gujarat National Law University (GNLU) and Gujarat National Law University, Silvassa Campus (GNLUS) have the least number of rich files.

Table 8: Rich Files of Selected National Law Universities' library websites

Sr.no	Name of the university	Pdf files	PPT files	Doc files	Excel files	Total
1	Dr. Ram Manohar Lohiya National Law University (RMLNLU)	4830	14	0	9	4853
2	Himachal Pradesh National Law University (HPNLU)	2190	0	8	3	2201
3	National Law University Odisha(NLUO)	2170	0	1	17	2188
4	Chanakya National Law University (CNLU)	2180	0	0	0	2180
5	Rajiv Gandhi National University of Law (RGNUL)	2060	0	16	7	2083

6	National Law University Delhi(NLUD)	1820	0	3	3	1826
7	National Law Institute University(NLIU)	1730	0	3	0	1733
8	West Bengal National University of Juridical Sciences (WBNUJS)	1080	0	21	0	1101
9	National University of Study and Research in Law (NUSRL)	1050	0	0	0	1050
10	National Academy of Legal Studies and Research (NALSAR)	728	18	141	8	895
11	Maharashtra National Law University Mumbai (MNLUM)	820	0	28	1	849
12	National Law University and Judicial Academy (NLUJA)	808	0	7	0	815
13	National Law School of India University (NLSIU)	748	0	20	12	780
14	Maharashtra National Law University Nagpur (MNLUN)	525	0	9	0	534
15	Maharashtra National Law University, Aurangabad (MNLUA)	298	0	0	0	298
16	Dharmashastra National Law University (DNLU)	235	0	0	0	235
17	National University of Advanced Legal Studies (NUALS)	132	0	2	1	135
18	National Law University Tripura (NLUT)	118	0	0	0	118
19	Gujarat National Law University, Silvassa Campus (GNLUS)	5	0	0	0	5
20	Gujarat National Law University (GNLU)	4	0	0	0	4
21	Tamil Nadu National Law University (TNNLU)	1	0	0	0	1

Social Media Presence of Selected Law Universities of India

Social Media platforms enable universities to share content, build brand awareness and connect with target audience in real-time. Social media allows

two-way communication encouraging feedback from its existing users and interaction with potential users. Additionally analytics on social media platforms helps institutions like universities to create more visibility, attract more web traffic and build community engagement. In this study an attempt is made to analyse the followers or subscribers on social media platforms like facebook, linkedin, youtube and Instagram of selected law universities of India. From the table it is understood that Most of the selected law universities are active on social media platforms be it facebook, linkedin, youtube and Instagram.It is evident from the table that NLSIU is having the highest number of social media users followed by NLUD and NALSAR. MNLUA and NLUT have less reach on social media compared to other law universities.

Table 9: Social Media Followers/subscribers of Selected National Law universities

Sr.no	Name of the univesity	Facebook	Linkedin	Youtube	Instagram	Total
1	National Law School of India University (NLSIU)	4100	53000	7440	14300	78840
2	National Law University Delhi (NLUD)	12000	42000	8370	10400	72770
3	National Academy of Legal Studies and Research(NALSAR)	1400	1600	61400	5692	70092
4	West Bengal National University of Juridical Sciences (WBNUJS)	6500	17000	3330	3759	30589
5	National Law Institute University (NLIU)	4900	17000	441	657	22998
6	Gujarat National Law University (GNLU)	4600	4000	1400	4667	14667
7	National Law University Odisha (NLUO)	1900	6000	2640	3573	14113

8	Maharashtra National Law University Mumbai (MNLUM)	3400	5000	2220	751	11371
9	Dharmashastra National Law University (DNLU)	953	3000	4880	1760	10593
10	Rajiv Gandhi National University of Law (RGNUL)	5000	3000	530	1410	9940
11	Dr. Ram Manohar Lohiya National Law University (RMLNLU)	1100	3000	1480	1678	7258
12	Maharashtra National Law University Nagpur (MNLUN)	2500	2000	67	1730	6297
13	National University of Advanced Legal Studies (NUALS)	2600	1332	0	2000	5932
14	Tamil Nadu National Law University (TNNLU)	737	2000	2200	146	5083
15	Himachal Pradesh National Law University (HPNLU)	1300	1499	738	1154	4691
16	Chanakya National Law University(CNLU)	157	2000	111	977	3245
17	National Law University and Judicial Academy (NLUJA)	1500	269	716	755	3240
18	Gujarat National Law University, Silvassa Campus (GNLUS)	189	6	1400	0	1595

19	National University of Study and Research in Law (NUALS)	112	1000	182	0	1294
20	National Law University Tripura (NLUT)	297	441	0	196	934
21	Maharashtra National Law University, Aurangabad (MNLUA)	26	2000	561	266	853

Findings and suggestions

i. Most of the NLUs library websites are not having enough speed loading on mobile devices, hence it is suggested that speed on mobile devices should be optimised as most of the users nowadays access mobile devices than desktops.

ii. There is also need to enhance the Domain Authority and Page Authority of these websites as most of NLUs library websites fall under the range of 30-50, whereas the ideal range is above 50.

iii. There is also need to increase external links on these websites to enhance their relevance on search engine results.

iv. More optimization of content on these websites is required to enhance the SEO score which currently falls under the range of 40 to 70 which is basically low as per the parameter of SEO Score. Enhanced SEO score will help in attracting more website traffic.

v. Most of the NLUs library websites need to increase their rich files for better visibility and service.

vi. Most of NLUs are highly active on social media platforms however presence of their libraries are conspicuously few or absent. It is recommended that librarians of these NLUs can take initiative on one or two of these platforms for its users by employing various attractive services, alerts and etc.

vii. There is also a suggestion that all 26 NLU libraries should come together and collaborate in terms of resource and service sharing for enhanced user engagement.

viii. The current study focused on limited and specific core objectives, its scope can be further explored on measuring other webometric

parameters like Content analysis, revised web impact factor, WISER Ranking, link topology, text analysis etc.

Conclusion

There is not much webometric study conducted on the library websites of the National Law University in India. Under the current study different webometric parameters like domain age, mobile speed, desktop speed, mobile friendliness, Domain Authority, Page Authority. Web Impact factor, SEO Score and social media presence were studied. Overall findings reveal that Websites of National Law universities are satisfactory but have lots of scope for improvement in terms of increasing its visibility on web and search engine optimization. The study findings further emphasised that the library websites in particular and official websites in general of National law universities should strengthen their digital presence through optimised content, regular updates and external links. A Robust Digital strategy need to be established by involving concerned Authorities, Webmasters and Librarians of the National law universities to strengthen their digital presence and usability of websites which can further enhance NLUs as leaders in fostering innovation and inclusivity in legal education and research.

References

1. Björneborn, L., & Ingwersen, P. (2004). Toward a basic framework for Webometrics. *Journal of the American Society for Information Science and Technology*, *55*(14). https://doi.org/10.1002/asi.20077
2. Jalal, S. (2010). Web impact factor and link analysis of selected Indian universities. *Annals of Library and Information Studies*, *57*, 109–121.
3. Pal, A., Kar, S., & Sardar, S. (2020). Webometric Analysis of ICSSR sponsored Research Institutions in India. *Library Philosophy and Practice*, *1*(1).
4. Kadam, S., & Mr, B. (2021). Websites of Top Ranked Indian Higher Education Institutions: A Webometric Analysis. *Library Philosophy and Practice (E-Journal).*, *4732*.
5. Patel, A., & Vyas, D. P. (2021). Webpage Analysis of Open University Websites in India: A Webometric Study. *Library Philosophy and Practice*, *5801*.
6. Singh, S., Chauhan, S., & Kumar, M. (2021). Paving Through the Corridors of National Law University Libraries of North India: An Anthology of Resources and Services. *Library Herald*, *59*(3), 272–283. https://doi.org/10.5958/09762469.2021.00037.3

7. Wikipedia Contributors. (2024, December 11). *National Law Universities*. Wikipedia; Wikimedia Foundation. https://en.wikipedia.org/wiki/National_Law_Universities
8. Yadav, A., Yadav, B., & Srivastava, R. (2023). Webometrics study of Website of National Law Universities in India. *Journal of Advancements in Library Sciences*, *10*(1), 40–49.

Real time information services to physicians – A step to achieve UNs SDG3.

Ashwini Bhore

Abstract

The Sustainable Development Goal 3 (SDG 3) of the UN seeks to guarantee healthy lives and advance well-being for everyone by tackling global health issues like lowering mortality, preventing disease, and attaining universal health coverage. Using technology to deliver real-time data, improve decision-making, and improve patient outcomes, real-time information services for doctors offer a revolutionary approach in contemporary healthcare. This poster show how real time services can help accelerate the attainment of SDG 3 by facilitating prompt interventions, maximizing the use of available resources, and increasing access to healthcare to women's and geriatric patients from underprivileged areas.

Keywords

Real time services, SDG, Physicians, Doctors, Healcare Professionals

AI in Libraries: Transforming Information Access and Management

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Abstract
Artificial Intelligence (AI) plays a pivotal role in the 360-degree transformation of libraries. AI has automated library tasks and enabled librarians to provide special and personalised services to users. It has enhanced users experience by faster search and information access. Digital preservation and quick retrieval is also a benefit of AI in libraries. Due to AI library became resource centres or knowledge hub, which were known as the physical repositories of books only. The objective of AI in libraries is to improve and enhance the information accessibility, widen the range of support to research and knowledge sharing. In future, in fully automated libraries users will interact with AI-powered Kiosk for all services. Augmented and virtual reality can enable virtual tours of library. This poster explores AI's importance in library services for the future.

Key Words
Artificial Intelligence, Libraries, Automation, Information Access

Lumea: Library Meets Anywhere

A Smart Mobile Library Concept: Knowledge On-The-Go!

"Your Digital Mobile Library in Your Pocket – Just One Tap Away"

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Abstract

"Lumea" is a forward-thinking combination of light and tech that changes libraries from limited spots to places of knowledge you can access at any point, anywhere. Derived from the Latin lumen (light), it evokes illumination and learning, and "Electronic Access" emphasizes its digital-first, mobile-friendly ethos. Lumea crosses physical and infrastructural divides, and provides e-books, audiobooks, virtual book clubs and live tutoring via apps and responsive platforms. By interlacing innovation throughout its core—AR wayfinding, real time alerts, QR code embeds, and round-the-clock virtual reference services—it is able to stitch together a frictionless user experience. The linguistic diversity and socio-economic challenges of India demand inclusivity, which is why Lumea strives for this through multilingual support, low-bandwidth optimization, and local content preservation. It represents a future for libraries as living, sustainable institutions which value equity, collaboration, engagement, and lifelong learning. Thus Lumea, breaking down the barrier to reading within the four walls; it emanates outward like light, a glimmering build-up of societal discovery sharing the urge for communities to engage in a global dialogue through stories.

Keywords

Lumea, Library 3.0, Mobile Libraries, Lifelong Learning, Virtual Knowledge Hubs.

Role of the Artificial Intelligence in Academic Library in Maharashtra: A Study

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Librarian, GNIMS, Mumbai

Abstract
The study highlights a cautious optimism towards AI adoption in academic libraries in the state of Maharashtra, with recognition of its potential benefits tempered by concerns about Library user, Library Staff and library budget. Aim of this research to understand the library budget allocation and utilization of funds on the library resources for the betterment of the library user. The library team demonstrates proactive attitudes towards accepting and engaging with AI technology. Data were collected through Google Forms from different respondents and analysed using tables and graphs.

Keywords
Role of AI, user better engagement Services, eager to adopt Technology

Library As INNOVATIVE LABS

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Abstract

This poster, titled Reimagining Design Libraries, explores the evolution and innovation in library services, with a specific focus on libraries catering to design disciplines. It highlights key areas such as library automation, the integration of discovery tools, and mobile-based services to enhance user experience. The poster advocates for digital borrowing mechanisms, enabling access to PDFs of existing books and paywalled academic resources, and emphasizes the importance of Selective Dissemination of Information (SDI) for personalized member services. Additionally, it introduces the concept of libraries as innovative labs, fostering creativity and supporting interdisciplinary learning.

Keywords: Innovative Library Labs, User-Centric Library Design, Mobile-Based Library Services.

Preprint Open Access Repositories: Accelerating Scientific Discovery

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Abstract
Preprint repositories have become an essential part of the academic landscape, offering researchers a platform to share their findings with the global scientific community before undergoing the formal process of peer review and publication. These platforms, often non-profit and community-driven, are designed to facilitate the rapid dissemination of research, enabling researchers to receive early feedback and engage with the scientific community. By offering immediate access to research findings, preprint servers help to expedite the communication of new knowledge, fostering collaboration and discussion. Preprint sharing also serves a practical purpose: it allows authors to establish the priority of their discovery, similar to how findings are shared in conference proceedings. While preprints do not undergo the formal vetting process of peer review, they provide an early record of the research that may be cited by others in the field. This can have significant implications for the progression of scientific knowledge. However, preprints can also create challenges when it comes to patenting. In many jurisdictions, publicly sharing a preprint can prevent authors from patenting their discoveries, as the manuscript may be considered prior art. In countries like India, the development of open-access repositories has grown substantially. Indian researchers are increasingly contributing their work to international preprint servers such as arXiv, medRxiv, bioRxiv, RePEc, OSF Preprints, SSRN, ChemRxiv, and viXra. These platforms not only help Indian researchers to gain visibility within the global scientific community but also foster collaboration and the exchange of ideas across disciplines. With more emphasis on open access and the continued support of governmental and private funding, India's research ecosystem is poised to become more robust and internationally recognized. The growing number of open-access repositories in India is expected to play a pivotal role in amplifying the country's contribution to global scientific advancements. As India strengthens its open-access infrastructure, it is likely that the visibility and impact of Indian research will continue to grow, benefiting researchers both within the country and globally.

Keywords
Preprint, Open Access Repositories

Redesigning Innovative Public Library Spaces for Families of Autistic

Medha Mangurkar & Nivedi Pingle

Abstract:
This study explores redesigning public library spaces to meet the needs of autistic children and their parents. Surveys with parents highlighted their need for reliable information on Autism, daily management, and support resources, while libraries were found lacking in disability collections and specialized services. Key challenges include parents' mistrust of online information, limited digital literacy, and libraries' insufficient awareness and staff training on disability needs. The study proposes shifting libraries' roles from information providers to facilitators, emphasizing the "4Cs"—Connectivity, Collaboration, Creation, and Community. Recommendations include inclusive spaces, curated collections, therapy rooms, digital literacy programs, and staff training to create supportive environments for families of autistic children.

Keywords: Autism, library space, disability collection, services, training

Libraries: Where Knowledge Meets Innovation Authors

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Abstract

Libraries have evolved from traditional rooms of storing books and knowledge materials to dynamic spaces of creation and innovation, they are the backbone of knowledge information. This poster describes how libraries have shaped society as guardians of timeless knowledge and harbingers of modern-day access. The contemporary library connects the digital and the physical, encourages community and democratizes access to information. They are exciting spaces for sharing ideas, stimulating people and inspiring lifelong learning. This work describes the unlimited future of libraries with regards to the digital revolution of libraries. Integrating tradition with high-technologies, libraries are envisioned once again as anchors of creativity and imagination, creating a path to a future where information access is seamless and available to everyone. Libraries are living institutions that are evolving with the society. As technology has advanced, libraries have adopted digital tools, Making the physical and virtual spaces a way of innovation and creativity. This bridges the gapsin information equality by ensuring knowledge remains accessible to a diverse audience. Not only are libraries with the help of technology have made the information accessible everywhere, but they are also innovative spaces where people can tinker, collaborate, and create. What does the library of the future mean? This lays the groundwork for the conversation and encourages contemplation on how libraries are still catalysts for inspiration across an ever-changing time. This aims to shed light on the lasting significance and creative potential that libraries have in the formation of societies and the creation of relationships.

Keywords

Libraries, Knowledge, Innovation, Digital Transformation, Community Spaces, Future of Libraries

Makerspaces in Libraries as Innovative Labs: The Role of Cloud-Based Technologies in Learning, Creativity, and Collaboration

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Abstract
Due to advancements in Information technology, Networking, and Computer Technology, libraries' roles have evolved manyfold. Libraries are now undergoing a profound transformation, evolving from conventional roles of storing books and archival materials to dynamic makerspaces or innovative labs. Since libraries are shifting from physical collections to digital collections, there is more space available in libraries to create dynamic zones such as Digital library, maker space or innovative labs for hands- on practices. The evolution of libraries as makerspace or innovative labs is necessary for bridging the digital divide, encouraging experiential learning, and supporting workforce development. The evolution of libraries into makerspace reflects a fundamental shift towards experiential learning, interdisciplinary collaboration and creativity. Makerspaces or Innovative labs enable the user hands-on learning environment with tools like 3D printers, coding platforms, and robotic kits. Integrating cloud-based technologies into these spaces has enhanced their accessibility, scalability, and efficiency because cloud platforms provide storage, and collaborative tools such as 3D modelling, coding, virtual reality, and media production. This poster highlights how cloud-based tools empower libraries to function as dynamic innovation hubs, fostering community engagement, education, skill development, and digital transformation. Cloud-based technologies offer scalability, accessibility, and enhanced collaboration, making makerspaces more inclusive and sustainable. The poster also highlights challenges, such as safety considerations and resource allocation, while proposing practical recommendations for integrating cloud tools effectively.

Keywords: Makerspaces, Innovative Labs, Cloud-Based Technologies

The Role of AI In Digital Libraries

Mayuri Shinde
Library Professional

Abstract
The poster examines how AI might improve library services, emphasizing important uses and strategies. Better information retrieval methods, tailored recommendation services, and more efficient improved digital preservation initiatives and metadata management. AI also makes it possible for user-centric design concepts, automatic text analysis, and intelligent categorization and classification. Libraries are successfully using AI technologies to satisfy the various needs of customers and guarantee effective and user-friendly services through cooperative collaborations, internal training programs, and agile techniques. The poster demonstrates how AI has the ability to transform next-generation libraries into vibrant centers of creativity and information that are ready to flourish in the digital age.

Keywords
Artificial Intelligence (AI), Pros & Cons, AI Applications.

Knowledge Management in e-Learning: The Cent Swadhay Initiative for Banking Sector Training

Anuja Suryavanshi & Manisha Tike
Library Manager, Central Bank of India

Abstract:
Swadhay represents a paradigm shift in the role of library professionals, transitioning from custodians of physical books to curators of engaging, interactive digital content tailored for diverse learning needs. It empowers banking professionals through accessible, user-friendly e-learning resources available 24/7 across multiple platforms. Swadhay bridges foundational knowledge with practical, immersive content, ensuring alignment with the Bank's operational and strategic goals.
Key features include a multi-format library of learning materials, such as text, videos, and ready-reference resources like handbooks and video clips. Innovative content development using animation and visuals enhances the learning experience. Additionally, Swadhay integrates into the Performance Management System (PMS), awarding staff members marks for participation, thus fostering continuous development and knowledge enhancement.
Swadhay's e-learning initiative positions itself as a forward-thinking solution for empowering employees with flexible, accessible, and impactful learning tools essential for professional growth and organizational success.

Keywords
e-Learning, Knowledge Dissemination, Knowledge Management, Banking, Digital Content, Flexible Learning,

Banking News Bytes and Information on the Run: Transforming Knowledge Dissemination in the Banking Sector

Manisha Tike & Anuja Suryavanshi
Library Manager, Central Bank of India

Abstract:
In the dynamic banking sector, timely and concise information is critical for operational efficiency and customer satisfaction. The initiatives *Banking News Bytes* and *Information on the Run* were developed to provide employees with actionable insights, market trends, and concise updates to enhance decision-making and customer engagement.

Banking News Bytes equips staff with daily updates on financial indices, deposit rates, and market news delivered through WhatsApp, Multimedia Messaging Service, and staff portals before 8:30 AM. It promotes intellectual growth with summarized book reviews and comprehensive resources, enabling efficient decision-making and fostering continuous learning.

Information on the Run offers bite-sized updates on banking products, schemes, and regulatory circulars via compact, flyer-style text and voice-over messages. Distributed daily by 6:00 AM, it ensures employees are well-informed, even during short breaks or commutes, enhancing staff awareness and customer service.

Both initiatives streamline information sharing, simplify organizational communication, and foster a culture of continuous learning. By delivering concise and actionable knowledge, they empower employees to excel in their roles and contribute to the bank's strategic objectives.

Keywords
Knowledge dissemination, Banking, customer engagement, Information sharing, Current News

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