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EXPLORING INFORMATION SERVICES AND LIBRARY TECHNOLOGIES

(Proceedings of the 8th I-LISS International Conference on Exploring Information Services and Library Technologies for the Next Generation – ICEISLT- 2024)

Volume - I

Editor-in-Chief
Prof. Dong - Geun Oh

Editors

Prof. B. Ramesh Babu
Dr. P. Rajendran

Associate Editors

Dr. S. Vivekanandhan
Dr. N. Siva

Co-Hosted by: I-LISS, JISTaP, KISTI, KEIMYUNG UNIVERSITY

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Proceedings of the 8th I-LISS International Conference on Exploring Information Services and Library Technologies for the Next Generation (ICEISLT-2024)

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FOREWORD



Prof. Dr. Beongkee Lee
Professor
Dept. of Library and Information Science
Kongju National University, South Korea

I am happy to contribute the Foreword for the pre-conference proceedings of the 8th I-LISS International Conference on "Exploring Information Services and Library Technologies for the Next generation" being organized by the Central Library SRM Institute of Science and Technology (SRM IST), Chennai in association with the International Library and Information Science Society (I-LISS) during 19-20 July 2024 at Kattankulathur campus of SRM IST. I profusely thank the organizers and especially I-LISS President Prof. Dong-Geun Oh of Keimyung University, South Korea, Dr B Ramesh Babu, Co-President, I-LISS and Dr P Rajendran, Secretary- General, I-LISS for inviting me to write the Foreword to the volume.

I understand that the host institute is the head- quarters of I-LISS and has organized a number of conferences / workshops in the last two decades. The theme of the conference is reflecting the contemporary issues in the Libraries in the context of emerging technologies and its impact on the next generation of LIS education and the provision of information services.

On perusing the table of contents, I understand that the pre-conference proceedings include about 119 research papers which have been grouped under nine sub-themes as Emerging Technologies and Innovation, Artificial Intelligence and Libraries, Knowledge Organisation and Technology, LIS Repositories and Security, Informetrics and Metric Studies, Future of LIS, LIS Services and Practices, LIS Education, Information Seeking Behaviour & User Studies.

The contributors representing 9 countries such as South Korea, Thailand, Singapore, Vietnam, Philippines, Qatar, Nigeria & Czech Republic including India. I understand that the contributors are experienced LIS faculty and also practicing professionals including researchers. Their experiences are reflected in the contents of the papers presented in this volume. I wish this volume would pave the way for new knowledge, innovative approaches and transformative ideas that will shape the future of LIS in the context of emerging technologies.

I thank all the contributors for sharing their intellectual thoughts and rich experiences. The relentless efforts of the Organizing Secretary and his team of this conference deserve appreciation. The team of Editors has endeavored much in maintaining the quality of the publication. I am of the opinion that this volume is certainly a good and valuable addition to the LIS literature.

I congratulate the organizers of this conference on choosing a timely and appropriate topic. I also thank the paper presenters for sharing their thoughts and experiences on such an important subject. I hope the two-day international conference would discuss, debate and deliberate these issues that would benefit the library community. I am sure the I-LISS team, the delegates and the invitees will find this platform more conducive environment for their brain storming technical sessions and generate feasible and workable resolutions for the development of the profession in the direction of providing information services especially in the present post-COVID times and in the utilization of emerging technologies suitable for the next generation of the professionals.

I wish the Conference a Grand Success

Prof. Dr. Beongkee Lee

PREFACE

The modern librarianship is shaped by a diverse, highly skilled, and qualified workforce that is better equipped to uphold and advance the profession's fundamental principles. Users of today interact with technology in an environment that is characterized by rapid innovation, strong teamwork, and unparalleled individual contribution via digital media such as social media and e-publishing. Because of the impact of developing technologies, libraries have seen substantial changes in terms of resources and services in recent years. Technology is growing more and more interwoven with society as it continues to evolve. The way we live, work, study, and communicate is changing as a result of the Internet, World Wide Web, mobile phones, digital television, and many other new electronic information and communication technologies (ICTs). Will the way we manage our lives be impacted by technology, and how will it impact the management of libraries? The employment of new, cutting-edge technologies in libraries is one of the biggest developments we anticipate. An international conference has been contemplated to address information services supply for the next generation libraries in the context of emerging library technologies, taking into account these advancements and their effects on libraries. The theme of the International Conference is on "Exploring Information Services and Library Technologies for the Next generation" scheduled during 19-20 July 2024.

A total of about 119 papers have been included in the pre-conference proceedings grouped under the following sections:

Section I	Emerging Technologies and Innovation
Section II	Artificial Intelligence and Libraries
Section III	Knowledge Organisation and Technology
Section IV	LIS Repositories and Security
Section V	LIS Services and Practices
Section VI	Future of LIS
Section VII	Informetrics and Metric Studies
Section VIII	LIS Education
Section IX	Information Seeking Behaviour & User Studies

Articles have been contributed by the distinguished and experienced Library and Information Science professionals, both teaching and practicing, Computer Science professionals, research scholars from various countries such as South Korea, Thailand, Singapore, Vietnam, Qatar, Philippines, and Nigeria & Czech Republic including India.

This conference provides a platform to all stakeholders in the field of libraries and information professions with the objective to promote innovation, augmentation, and utilization of ICT technologies to provide right information to the right user at the right time in a right way.

The Editors thank and congratulate all the contributors and resource persons who have responded spontaneously by contributing the articles in spite of the hardships prevailed during the post- Covid Pandemic environment. Further the Editors states that the views expressed in these papers are of the respective authors only. The I-LISS, SRM IST, Keimyung University, JISTaP or the Editors are no way responsible for the thought content of the articles. The Editors take this opportunity to thank the Organizers of this conference for entrusting the Editorial responsibility of the pre-conference volume.

The Editors profusely thank the Chief Patrons Dr T R Paarivendhar, Founder Chancellor, Mr Ravi Pachamuthu, Pro-Chancellor (Admin), and Dr P Satyanarayanan, Pro-Chancellor (Academic), Patrons Dr C Muthamizhchelvan, Vice-Chancellor and Dr S Ponnusamy, Registrar of SRM IST and other officers for giving permission to I-LISS to host this conference and making this mega event more remarkable in the annals of Librarianship.

The Editors record their deep sense of gratitude and thanks to Prof. Dong-Guen Oh, Professor and Chairman, Keimyung University, South Korea, and President of I-LISS for his continuous support both academically, professionally and also financial support.

The Editors also thank Prof. Dr Beongkee Lee, Professor & Dean, Department of Library and Information Science, Kongju National University, South Korea who contributed the Foreword to this pre-conference volume.

The Editors have taken all the possible efforts to maintain the standard and quality of the conference volume without affecting the thought process and ideas of the contributors. Finally, the Editors thank all the organisers, international and national committee members for their support and encouragement and make this international conference a successful event. It is hoped that, this pre-conference volume will be a valuable addition to the literature in Library and Information Science and Computer Science.

Finally, the printers M/s. New Pioneer Printers, Royapuram, Chennai deserves special thanks for undertaking the job systematically and completing on time.

It is earnestly hoped that the deliberations at this international conference would be promising and rewarding for the delegates and more particularly the pre-conference volume would be a useful source of reference to the LIS professionals including students, faculty and researchers. Editors/ Organisers wishes to have pleasant and stimulating interactions and fruitful meeting with the delegates during the conference. Let us work collectively to explore information services and library technologies suitable for the next generation LIS professionals and make the Information Science profession / Librarianship a thriving, dynamic and noble profession to achieve the blissful and bright future.

12-07-2024
Chennai

Editors

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SECTION I

EMERGING TECHNOLOGIES AND INNOVATION

INFORMATION ECOSYSTEMS: TRENDS AND STRATEGIES FOR LIBRARIES

M.Krishnamurthy[1] & Saurabh Kumar Rai[2]

Information Eco Systems

Ecological concepts like the "ecosystem" in library and information sciences, as well as the potential difficulties of uncritically carrying over ecological terms into the information age. Digital library, open access, open source etc Each of these fields defines information ecosystems differently according to their own needs. Taken together they provide clues for how best to understand this concept within library instruction and scholarly research. The rise of digital humanities research presents libraries with a chance to create better support networks and take on enduring issues in librarianship in fresh ways. Digital humanities is not just about individual scholars using computers in their research. It represents a potentially transformative change across all the ways we work as academics: from the questions we ask, to the kinds of people we work with; from the ways we communicate knowledge to our peers and our students, to the ways we relate to the world beyond the University. (Lach,2012). The University Libraries can significantly contribute to Digital scholarship by providing services that build on their core competencies and complement current offerings, such as research consultations, instructional support, and training and development, according to the findings of the Digital Arts and Humanities group's investigations. Consequently, services related to research project consulting, digital pedagogy and instruction, workshops and trainings, and community building.

Innovative approaches to investigating, such as collaborative, interdisciplinary, and computationally involved research, teaching, and publication, are what are known as digital humanities (DH). DH is an innovative approach to learning that creates new opportunities for research, teaching, and publication by fusing digital technology with traditional humanities. The Humanities in the Digital Age and for It. You could call digital humanities (DH) intercultural studies' alter ego. It takes a multifaceted approach rather than concentrating only on the "Digital" or the "Humanities.

1,2 DRTC, Indian Statistical Institute, Bangalore 560059

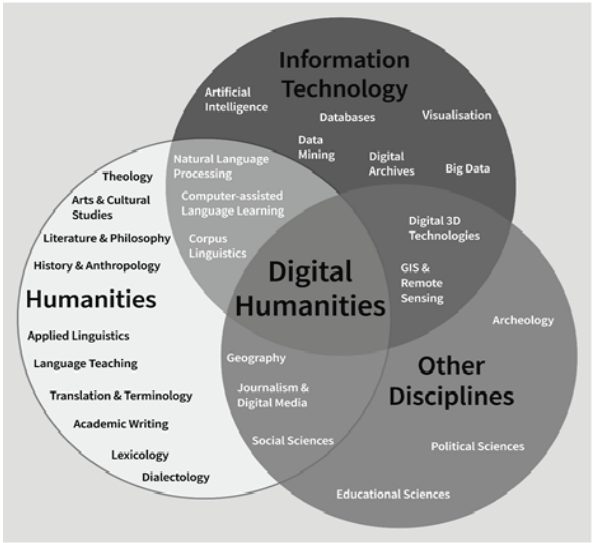


Figure 1: interdisciplinary DH

DH is less a unified than an array of convergent practices that explore a universe in which print is no longer the primary medium in which knowledge is produced & disseminate–Dig. Humanities Manifesto

In this age dominated by the revolution of digital technologies, the realm of humanities stands at a crossroads, poised to embrace a new era of inquiry and understanding. The advent of digital humanities field situated at the intersection of technology and humanistic scholarship, offers huge opportunities to explore, analyze, and interpret the complexities of human culture and expression. As we stand on the threshold of this transformative journey, it becomes imperative to embark upon a comprehensive exploration of the landscape of digital humanities and its implications for scholarly inquiry.

This dissertation seeks to delve into the multifaceted realm of digital humanities, aiming to illuminate its theoretical underpinnings, methodological approaches, and practical applications across various domains of humanistic inquiry. By examining the convergence of digital technologies and traditional humanities disciplines, this study endeavors to unravel the ways in which digital tools and methodologies are reshaping the contours of scholarly research, pedagogy, and dissemination.

At its core, digital humanities encapsulates a diverse array of practices that encompass digitization,data analysis, visualization, text mining, geospatial mapping, and collaborative scholarship, among others. Through the lens of digital technologies, scholars are empowered to interrogate cultural artifacts, historical documents, literary texts, and artistic expressions in novel ways, transcending the boundaries of traditional disciplinary silos and fostering interdisciplinary dialogue and collaboration.

The significance of digital humanities extends far beyond the realm of academia, permeating into broader societal contexts and fostering public engagement with cultural heritage and knowledge. By democratizing access to digital resources, libraries, museums, and cultural institutions play a pivotal role in advancing the democratization of knowledge and the preservation of cultural heritage in the digital age.

The objective of the field of digital humanities is to employ digital tools to research humanities disciplines. Although there are numerous positions and specializations in this huge sector, academic libraries frequently represent the place where librarians in this field works.

Objective of the Study

- To know about Digital humanities in relation with LIS.
- To study application of DH in LIS, its evolution as a domain
- To identify the highly contributing authors, countries, institutions, sources in DH literature.
- To analyze the co-occurrence pattern of all the keywords in DH literature.

Review of Literature

Background

The field of digital humanities has grown rapidly in academic institutions, with libraries playing a key role. Librarians have been expanding their management and technical skills, as well as their knowledge base, to successfully integrate themselves into scholarly conversations on campus. However, subject/liaison librarians, technical service librarians, and library administrators face numerous challenges in this constantly evolving landscape.

Digital Humanities

Digital Humanities (DH) is a new academic discipline that uses computational techniques to solve problems in the humanities and social sciences. It is the result of the merging of digital technologies with social sciences and humanities. Libraries have taken on the responsibility of planning, designing, and developing digital content, digital preservation, and digital archives to preserve historical humanities and archaeological resources. They have played a crucial role in the development of DH. It is inspiring to see library professionals actively engaging with digital humanities. DH is one of the key research areas in the library profession that can integrate with library technologies and methods such as knowledge organization, management, search and retrieval design, user education, metadata, semantic mapping, ontology, thesaurus construction, digital curation, and discovery services, all of which find applications in DH. Libraries explicitly support digital humanities in digital scholarly publishing, digital libraries, digital collections, text mining, and digital pedagogy.

India hass diverse culture, customs, languages, so it has vast potential applications of DH and opportunities for libraries to contribute their value in this area. It opens up more job positions for library professionals. Researchers working with digital methods across a range of disciplines provide access to cultural heritage collections. Text and data mining, digital mapping, text coding, computational text analysis, social networking analysis, and spatial humanities are vital tools and methods of DH. Libraries are strategically embedding digital humanities support into the daily services of the library

Mode of formation of subject

From McCarty viewpoint

Digital humanities emerged as a discipline due to challenges and opportunities presented in Digital Age.McCarty In his book "Humanities Computing presented a diagram (Fig.1) to explain the origins of digital humanities. In the diagram, he referred to the term "Methodological Common" or "Computing Humanities" instead of DH. The octagonal shapes above the commons in Fig.2 represent broad disciplines.

On the other hand, the cloudy shapes beneath the methodological commons suggest "permeable bodies of knowledge" which develop socially, even without the presence of departmental or professional aspects. However, McCarty observed that not all disciplines have an equal standing in the field of digital humanities. He noted that history, particularly the history of science and technology, along with philosophy and sociology, are the primary disciplines, while the rest are secondary.

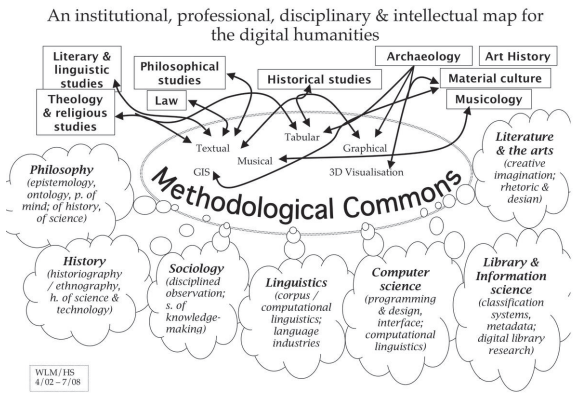


Fig.2 Representation of humanities computing

From LIS Viewpoint

From the Library and information science point of view the mode of formation of the subject "Digital Humanities" is shown in the Fig. 8. In first order, researchers of multiple disciplines of humanities used to apply the computational techniques as a tool for conducting research in their respective fields and computer science researchers used to apply humanities data in their fields. These have given rise the new areas through the

phase relations. Again, in the second order, the computational aspects of these new areas are distilled enough to crystallize as "Digital Humanities" as new subject through the process of distillation.

Robinson, L. et al. (2015) found that new journals specific to digital humanities are being published. However, many research articles on digital humanities appear in journals and other sources related to library and information science. The authors demonstrated extensive knowledge of the inter-linkage between library and information science and digital humanities.

Gupta, N. & Chakravarty, conducted a scientometric study and found that literature on digital humanities is growing positively, with the USA leading in digital humanities research. They found that conference proceedings and book series were the top three most productive documents, followed by journals from the fields of computer science, arts and humanities, and library and information science. The authors summarized their research findings by noting that most publications on digital humanities appeared in the social science field, followed by computer science and arts & humanities fields.

Wang,Q (2018) study titled "Distribution features and intellectual structures of digital humanities: A bibliometric analysis," Wang, Q., conducted a retrospective examination of documents related to digital humanities, an interdisciplinary field. The study aimed to analyze the distribution of research outputs and languages, identify active journals and institutions, dissect category networks and cited references, and interpret prominent research topics. The study utilized data from the Web of Science (WoS) core collection and employed popular visualization tools such as VOSviewer and CiteSpace to process bibliographic data, including authorship, categories, references, and keywords. The findings revealed significant growth in digital humanities research, with English remaining the predominant academic language. The most influential authors typically hail from or have affiliations with Europe and North America, with the UK and USA being leading contributors. Digital humanities emerged as a result of the dynamic interplay between humanistic exploration and digital methodologies, closely associated with fields such as history, literary and cultural heritage, and information and library science.

Research methodology

Literature search technique

This study focuses on bringing out the applications of Knowledge Graphs with emphasis on the Library and Information Science domain. A two-stage hybrid search strategy was employed to collect the relevant literature on this topic.

Conventional Database Query: Databases like Scopus, Library and Information Science Abstracts (LISA), and Google Scholar were searched. The search string used for querying the databases was developed after unstructured preliminary searching on Google Scholar to find out the relevant keywords and join them with Boolean operators "AND" and "OR". As a result, the search string formed was ("Applications" OR

"Practice" OR "Use case") and ("Digital humanities" OR "computing humanities") and ("Library Science" OR "Library and Information Science").

Snowball search: In this search technique we start with an article relevant to current study and search for more articles related to our topic in its bibliography. This technique is extremely useful to find key literature in a particular field as it will be cited by most of the papers in that field. But at the same time, every new article found is older than the current one as we are searching retrospectively. Here, the articles we found during database searches were quite recent, so this method proved to be highly effective in searching for important articles on this topic.

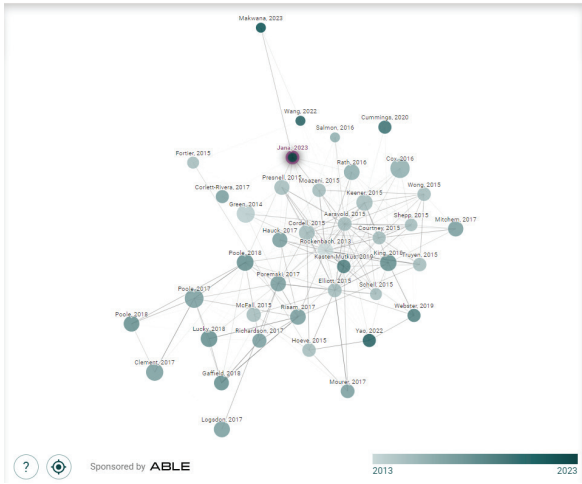
The simple database searching in Google Scholar, Scopus, and LISA resulted in a total of 1,139 documents. To filter these papers for keeping only the relevant ones, inclusion and exclusion criteria was developed.

Inclusion Criteria

- Article should be in the English language.
- Article should be published in the last decade, i.c., between the years 2014 and 2024 for statistical analysis.
- Articles which discuss applications of Digital humanities in Library and Information Science and related areas.
- Finding related papers from connected papers website

Exclusion criteria

- Articles in languages other than English.
- Articles which are not focusing on Digital humanities in context of LIS.



Fig,3

Here,we used coonected papers to visualise related for my study which I have presented below

- Each node is an academic paper related to the origin paper.
- Papers are arranged according to their similarity (this is not a citation tree)
- Node size is the number of citations
- Node **color** is the publishing year
- **Similar** papers have strong connecting lines and cluster together

Digital Humanities In LIS

Libraries, in collaboration with LIS departments, can organize educational events such as lectures, workshops, and seminars on digital humanities (DH) in partnership with humanities and computer science departments. Librarians can offer guidance to faculty, scholars, and students in DH in the following areas:

TOOLS in libraries to facilitate DH

- Creation of digital artifacts webpages using tools like HTML, XML, Responsive Web Designing (RWD), PHP, MYSQL, CSS, Dreamweaver, Photoshop/Core Draw/ GIMP, and Content Management Systems (CMS) like Wordpress, Joomla, Drupal, etc.
- Establishment of digital libraries, Institutional Repositories (IDR), and archiving for digital objects using platforms such as DSPACE, Eprints, GSDL, Omeka, etc., and employing metadata standards like MARC 21, Encoded Archival Description (EAD), Text Encoding Initiatives (TEI), Dublin Core (DC), Categories for the Description of Works of Art (CDWA), Visual Resource Association Core (VRAC), Learning Object Metadata (LOM), E-Government Metadata Standard (e-GMS), Metadata Encoding and Transmission Standard (METS), Metadata Object Description Scheme (MODS), and GEMS: Metadata Harvester.
- Familiarization with programming and scripting languages such as C, Java, Access, PHP, Perl, JavaScript, Python, etc.
- Exploration of Web 2.0 technologies like RSS feeds (e.g., QuiteRSS in WINDOWS and Liferea in LINUX), Social Bookmarking (e.g., Google Bookmarks), Mashup, and WIKI (e.g., Wikimedia).
- Utilization of Semantic Web tools like RDF, XML, and Ontology (e.g., Protégé).
- Adoption of E-Learning software like Moodle and Google Classroom.
- Utilization of plagiarism checkers like Turnitin, iThenticate, Plagscan, Duplichecker, Urkund, etc.
- Application of statistical tools such as SPSS, PSPP, R, etc.
- Use of analytic tools like VOYANT, OpenRefine, RSTUDIO, etc.
- Engagement with altmetric tools such as Altmetric, PlumX, Academia.edu, Research Gate, Google Scholar, and PoP.
- Management of references using tools like Zotero and Mendeley.
- Organization of knowledge using tools like SKOS, XKOS, and Tematres**.**

Application of Digital Humanities In LIS

In the current world digital methods and approaches are changing, collecting digital materials that are born digital, we call it, or they were created in a digital form. Collecting those requires some new ways for us to collect content. Licensing material that's existing in digital form from vendors. libraries also work with a lot of data and data services to help students and faculty manipulate and use computational methods. with different kinds of sources that may take them beyond the traditional bounds of their discipline into some new territory.

when we think about digital scholarship, it really changes and pushes us towards the digital library and the many ways in which those traditional library roles have evolved in a new way. Obviously, there's digital content. More and more scholarship is published in a digital form and converted to a digital form. and that enables new scholarship and new methodologies where the role of digital humanities is significant.

In today's electronic world, library and information professionals are well-versed in the computational tools and procedures necessary for gathering, organizing, preserving, and sharing digital information. Additionally, a lot of these technologies have connections to the field of digital humanities (DH). Thus, librarians are in a good position to oversee DH projects and courses when working with professionals in the humanities and computer science.

Scholars, technologists, and librarians must collaborate in digital humanities research, which is different from traditional humanities study. Because no one person has all the necessary knowledge, abilities, or resources to complete a digital humanities project successfully, collaboration is vital. Particularly subject librarians, with their deep knowledge and specific degrees in their disciplines, provide these interdisciplinary teams with significant insight.

Current DH courses and projects

1. "Digital Humanities in Libraries": Offered by the University of Illinois at Urbana-Champaign's School of Information Sciences, this course emphasizes how libraries can utilize DH tools and methods to enhance accessibility to their collections.
2. "The Digital Public Library of America": This initiative aggregates digital collections from libraries, archives, and museums nationwide, creating a unified platform for users to explore these resources.
3. "Library of Congress Digital Collections": The Library of Congress provides online access to a wide array of digitized materials, including manuscripts, photographs, maps, and music.
4. "Trust Digital Library": A collaborative effort among major research libraries, offering digitized books and other resources to users.
5. "Creating Digital Collections": The University of Maryland's College of Information Studies provides a course teaching students how to digitize and manage collections using metadata and related tools.

6. "Text Analysis in Digital Humanities": This course at the University of North Carolina at Chapel Hill's School of Information and Library Science teaches students computational methods for analyzing textual data.
7. "The Digital Scholarship Lab": Based at the University of Richmond's Boatwright Memorial Library, this project focuses on DH endeavors, employing geospatial data, text analysis, and other techniques to explore historical and cultural subjects.
8. These examples underscore the diverse range of DH courses and projects within library science, indicating a growing trend towards innovative approaches to digitizing and preserving cultural heritage.

Conclusion

Based on previous studies and literature, it is evident that library professionals have the skills to play a significant role in the digital humanities (DH) landscape. Through Gaining knowledge about various DH tools and collaborating with experts from humanities and computer science fields, librarians can effectively contribute to the acquisition, organization, Archival, preservation, information retrieval and dissemination of digital information. This underscores the feasibility of introducing library-centric DH courses in India, where librarians can take a lead role in educating individuals from humanities and social science backgrounds about digital technologies. The synthesis of previous studies highlighted three key perspectives: the historical development of DH and libraries, the current landscape of DH and libraries, and the identified research gaps. It has been observed that DH has impacted various roles within modern academic libraries, including archivists, IT developers, and librarians. The examination of DH theories and concepts offers insights into their potential integration with traditional library collections and services. One significant observation lies in the burgeoning interest among researchers in the field of Digital Humanities. A quantitative analysis revealed a notable trend indicating the gradual development of DH research in India, underscoring its ongoing and evolving nature.

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DEVELOPMENT OF A THAI SPEECH SYNTHESIS MODEL USING TACOTRON2

Chakkrit Saengkaew[1] & Jinnawat Talasee[2]

Introduction

This research aims to develop a Thai speech synthesis system using the Tacotron2 model, one of the most advanced models for generating high-quality and natural-sounding speech. The training data consists of 7 hours of recorded speech data, divided into 3360 audio files, each approximately 5-10 seconds long. Thai word segmentation was performed using the Maximum Matching method to obtain suitable and accurate data for model training. The Tacotron2 model training took 19 hours. The research results indicate that the developed model can generate natural and easily understandable speech. The quality of the synthesized speech, evaluated using the Mean Opinion Score (MOS), achieved an average score of 3.2 out of 5, indicating satisfactory model performance. Additionally, further analysis showed that the model could synthesize correct tone and pronunciation. This research also suggests future improvements, such as increasing the dataset size, enhancing word segmentation techniques, and incorporating additional technologies to further improve the quality of synthesized speech.

Literature Review

Tacotron2 is a speech synthesis model that integrates multiple technologies and concepts from various theories in the fields of artificial intelligence and natural language processing. Here are the relevant theories and technologies:

Sequence-to-Sequence Learning: Sequence-to-sequence learning is a technique used in many natural language processing (NLP) tasks, such as language translation and speech synthesis. The main idea is to build a model that can transform one sequence (e.g., text) into another sequence (e.g., speech). Tacotron2 uses this technique to convert text into mel-spectrograms.

Recurrent Neural Networks (RNNs) and Long Short-Term Memory (LSTM): RNNs are neural networks capable of handling sequential data, as they can store information from previous states. However, standard RNNs face challenges with long-

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term dependencies. LSTM, a variant of RNNs, is designed to address this issue with a structure that better retains long-term information. Tacotron2 employs LSTM in its Encoder to transform text sequences into meaningful vectors.

Attention Mechanism The attention mechanism allows the model to focus on important parts of the input data by calculating the significance of each part in the sequence. This helps in creating target sequences that are better related to the source sequences. The basic equation of the attention mechanism is:

$$Attention(Q, K, V) = Softmax\left(\frac{QK^T}{\sqrt{d_k}}\right)V$$

Here, Q, K and V are the query, key, and value matrices obtained from the linear transformation of the embeddings, and is the dimension of K.

Convolutional Neural Networks (CNNs) CNNs are neural networks that excel at recognizing patterns in spatially structured data, such as images and audio signals. In Tacotron2, CNNs are used in both the Encoder and Decoder to process sequential data.

Spectrogram and Mel-Spectrogram A spectrogram is a visual representation of audio data, showing frequency over time, with the horizontal axis representing time and the vertical axis representing frequency. A mel-spectrogram is a spectrogram that adjusts the frequencies according to the Mel scale, which aligns more closely with human hearing capabilities. Tacotron2 converts text into mel-spectrograms before using the WaveNet vocoder to transform the mel-spectrograms into waveforms.

WaveNet Vocoder: WaveNet is a model developed by DeepMind for generating high-quality speech directly from a spectrogram or mel-spectrogram using the structure of Convolutional Neural Networks (CNNs) and deep learning. The basic equation of WaveNet can be expressed as follows:

$$P(x_t|x_{t-1}, x_{t-2,\dots}) = Softmax(w * h_1 + b)$$

Where is the audio sample value at time is the weight vector, hth_tht is the hidden state at time and the bias.

Experiments

In this experiment, we collected and prepared speech and text data from YouTube videos using the following steps:

Extracting Audio from Videos: We extracted audio from videos on the YouTube channel "Ajarn Yord" using tools capable of Automatic Speech Recognition (ASR) to convert the narrated speech in the videos into text. We then verified and corrected the spelling to ensure the text matched the narration.

Preparing Audio and Text Data: We used a total of 7 hours of audio data, consisting of 3360 files, each lasting 5-10 seconds. These audio files were recorded in WAV format with a sampling rate of 22.05 kHz and a bit depth of 16 bits.

Word Segmentation in Thai Text: Since the Thai language does not have spaces between words, accurate word segmentation is crucial for preparing data for training the Tacotron2 model. We used the Maximum Matching method for word segmentation in Thai text to enable the model to learn and process the data effectively.

Audio Data Processing: The audio data was processed to be in a suitable format for input into the Tacotron2 model. This included normalization and trimming unnecessary parts to ensure high-quality audio data ready for training. For training the Tacotron2 model, we spent a total of 19 hours. The training results indicated that the synthesized speech had a moderate level of naturalness, achieving a Mean Opinion Score (MOS) of 3.2 out of 5.

Table 1: Examples of Audio Files and Speech Scripts

Audio File Part | Audio Script
_HIqoRwACT4-0203.wav|กี่ แค่ มา ล้ม หาย ตาย จาก .
_HIqoRwACT4-0204.wav|กี่ ว้าเหว่ เหมือน กัน อยู่ คน เดียว ใน โลก .
_HIqoRwACT4-0205.wav|ก่อน ตาย ยาย เคย บอก เขา ว่า คน เรา เกิด มา มัน ก็ ต้อง ตาย .
_HIqoRwACT4-0206.wav|ไม่ มี ใคร หนี ความ ตาย พ้น .
_HIqoRwACT4-0207.wav|เขา ก็ เลย มา คิด ว่า .
_HIqoRwACT4-0208.wav|ต่อ ไป เขา ก็ ต้อง ตาย เหมือน กับ ยาย .
_HIqoRwACT4-0209.wav|ถ้า ตาย ซะ เลย ก็ จะ ไม่ ลำบาก มากมาย กว่า ที่ เป็นอยู่แล้ว .
_HIqoRwACT4-0210.wav|ถึง ยัง ไง มัน ก็ ต้อง ตาย อยู่ดี ก็ ตาย ซะ เลย ไม่ ดี กว่า เหรอ .
_HIqoRwACT4-0211.wav|จะ ไม่ ต้อง ทำ งาน หนัก ไม่ ต้อง โดน เขา ก่น ด่า สาปแช่ง .
_HIqoRwACT4-0212.wav|นะ แก ก็ เลย คิด จะ ไป ผูก คอ ตาย .
_HIqoRwACT4-0213.wav|หลวง พ่อ ก็ บอก เขา ว่า คน เรา ฆ่า ตัว เอง มัน เป็น บาป .
_HIqoRwACT4-0214.wav|ชีวิต ของ ตัว เอง ยัง ไม่ .
_HIqoRwACT4-0215.wav|ถ้า ฆ่า ตัว ตาย เพราะ เกิด ชาติ หน้า ก็ ต้อง ไป ฆ่า ตัว ตาย อีก .
_HIqoRwACT4-0216.wav|แล้ว ก็ ต้อง ทำ ซ้ำ อยู่ อย่าง นี้ ชาติ แล้ว ชาติ เล่า .
_HIqoRwACT4-0217.wav|พอ รู้ อย่าง นั้น ท่าทาง เขา ก็ ตกใจ มาก .

Model Training Settings

The Tacotron2 model was trained using the prepared data, with the sampling rate set at 22050 Hz to achieve the best audio quality. The training process took a total of 19 hours, utilizing two NVIDIA Geforce 1080ti GPUs to accelerate the processing speed.

Evaluation

To evaluate the quality of the synthesized speech, we used the Mean Opinion Score (MOS) assessment, a standard method for testing audio quality. Real users listened to and rated the generated speech on a scale from 1 to 5. The average score from this evaluation was 3.2 out of 5, indicating moderate performance.

Analysis

Further analysis revealed that the Tacotron2 model could generate speech with correct tone and pronunciation, which is crucial for the Thai language. Additionally, the model managed well with the diversity of speech in the dataset.

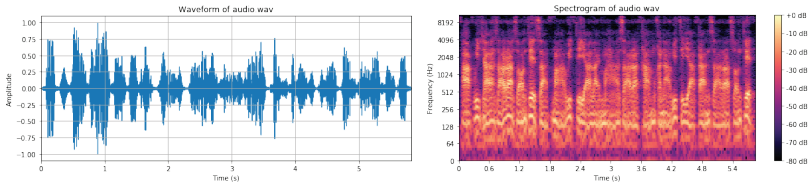


Fig 1: Shows the sound frequency and spectrogram of the audio

From the obtained graph, it can be seen that the Mean Opinion Score (MOS) of the synthesized speech from the Tacotron2 model averages 3.2 out of 5. This indicates that the quality of the synthesized speech is moderate. The naturalness of the speech can be improved by using a larger amount of training data.

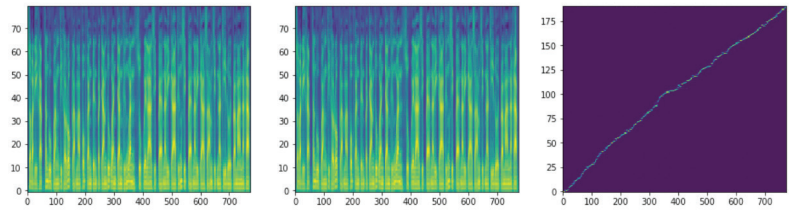


Fig 2: Shows the Mel-Cepstral Distortion (MCD) of the generated model

Future Directions and Recommendations

To further enhance the quality of synthesized speech, several recommendations and future directions are proposed. Firstly, increasing the dataset size with more diverse speech samples will allow the model to learn and generalize better, leading to more natural-sounding speech. Improving Thai word segmentation techniques is also crucial, as accurate segmentation directly impacts the quality of the synthesized speech. Techniques such as deep learning-based segmentation models could be explored to achieve better accuracy.

Incorporating new technologies can significantly enhance the performance of Tacotron2. For instance, using Convolutional Neural Networks (CNNs) can improve feature extraction from audio data, while Recurrent Neural Networks (RNNs) and Long Short-

Term Memory (LSTM) networks can handle sequential data more effectively, capturing long-term dependencies in speech patterns. Furthermore, integrating attention mechanisms can help the model focus on important parts of the input sequence, improving the alignment between text and speech.

Exploring generative adversarial networks (GANs) for post-processing the generated speech could also be beneficial. GANs can help refine the audio output, reducing artifacts and enhancing the naturalness of the speech. Additionally, leveraging transfer learning by using pre-trained models on large, diverse datasets can accelerate the training process and improve the model's performance.

By implementing these recommendations, future research can build upon the findings of this study, leading to more advanced and efficient Thai speech synthesis systems. This will not only improve the quality and naturalness of synthesized speech but also expand the applications of TTS technology in various domains such as virtual assistants, language learning, and accessibility tools.

Conclusion

This research aims to develop a Thai speech synthesis system using the Tacotron2 model, one of the most advanced models for generating high-quality and natural-sounding speech. The training data consists of 7 hours of recorded speech data, divided into 3360 audio files, each approximately 5-10 seconds long. Thai word segmentation was performed using the Maximum Matching method to obtain suitable and accurate data for model training. The Tacotron2 model training took 19 hours. The research results indicate that the developed model can generate natural and easily understandable speech. The quality of the synthesized speech, evaluated using the Mean Opinion Score (MOS), achieved an average score of 3.2out of 5, indicating satisfactory model performance. Additionally, further analysis showed that the model could synthesize correct tone and pronunciation.

The key findings of this research include the ability of the Tacotron2 model to produce natural-sounding and easily understandable speech, the effectiveness of the Maximum Matching method for Thai word segmentation, and a moderate quality score reflected by the MOS of 3.2 out of 5. This research is significant as it addresses the relatively underdeveloped field of Thai speech synthesis, providing a foundation for further advancements. The successful development and implementation of the Tacotron2 model for Thai speech synthesis demonstrate the potential for creating high-quality, natural-sounding speech systems in the Thai language. The techniques and methodologies used in this study, such as the Maximum Matching method for word segmentation and the use of Tacotron2, can serve as a reference for future research in this area.

For future directions, the research suggests increasing the size of the training dataset to include more diverse speech samples, enhancing word segmentation techniques for more accurate data preparation, and integrating additional technologies, such as Convolutional Neural Networks (CNNs) or Recurrent Neural Networks (RNNs),

to further improve the quality of synthesized speech. By focusing on these areas, future research can build on this work to develop even more sophisticated and effective speech synthesis systems. This research not only advances the field of Thai speech synthesis but also contributes to the broader goal of improving natural language processing technologies.

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APPLICATION OF EMERGING TECHNOLOGIES IN AGRICULTURAL UNIVERSITY LIBRARIES IN INDIA

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Introduction

Libraries emerged as a power house of knowledge keeping pace with the technological advancements taken place. It is a well-known fact that libraries were pioneer institutions which started using the emerging technologies to improve the library infrastructure and services such as computers, barcodes, electronic surveillance system, biometric access control systems, RFID enabled security systems, etc., when the technologies were introduced. It is possible once because the librarians always keep them abreast of the latest happenings in their field and also in the field of ICT. The role played by the emerging technologies in the library and information services are vital and they help the libraries to ensure effective and efficient services to the utmost satisfaction of the patrons. In this context, the agricultural libraries, which are known as special libraries, are always in the forefront of implementing the emerging technologies in India. Since the Indian Council of Agricultural Research (ICAR), the apex body which takes of agricultural education and research in India, takes special care about the development of agricultural libraries through library strengthening grants, agricultural libraries get additional fundings apart from the State Grant. Hence, they are able to implement the emerging technologies in the libraries. This paper attempts to study the emerging technologies in the field of library and information science and the status of implementation of the technologies in agricultural libraries.

Emerging technologies in Library and Information Science

The face of libraries have changed now and the library, which was earlier known as a 'store-house of knowledge' has changed to a 'hybrid library' today allowing the users access not only the print resources but digital resources as well. Modern libraries are fully automated and anybody can check the online public access catalogue (OPAC) from anywhere even using their smartphones. Many libraries provide 24x7 remote access/login services. Libraries play a vital role in the creation of digital Institutional Repositories (IRs) where huge number of documents are available in digital format in open web. More

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and more new tools and technologies are being developed and libraries are striving hard to implement them to serve better for the cause of knowledge dissemination. The following are some of the emerging technology trends in libraries where the library professionals and teachers are required expertise in handle them.

- Library Automation
- Digitization and Institutional Repositories
- Electronic Surveillance System
- Library Consortia
- RFID Technology
- Internet of Things
- Big Data
- Makerspace
- Artificial Intelligence – ChatGPT
- Blockchain Technology
- Library Drones
- Library Bookmarks Apps
- User-focused interfaces and application
- Augmented Reality and Virtual Reality
- Digital Interfaces for printed books
- Social Networking Tools
- 3D technologies

Agricultural Education in India

The main aim of agricultural education is to prepare human resources for agriculture sector. In the early years of the 20th century, the British introduced formal education in agriculture primarily to produce revenue workers and landlords and not professional farmers. By 1947 India had 17 colleges of agriculture with annual enrolment of about 1500 students. Considering the importance of Agricultural education and research, the first State Agricultural University (SAU) was established in 1960 at Pantnagar (Nainital) on the pattern of the Land Grant Colleges of the United States by integrating education, research and extension education. Today, India has a large ICAR-AU network with 73 Agricultural Universities awarding various kinds of degrees in different disciplines of agricultural, veterinary and allied sciences. The Agriculture education is imparted at the level of diploma, degree (11 major disciplines at undergraduate), masters (95 subjects at post-graduate level) and doctoral level with a total intake capacity of 35,000 students per year. As of now, it is estimated that there are 3,15,000 professionally qualified persons in agricultural sciences to which about 15000 graduates, 11,000 Masters and 2,500 Ph.D.s in agriculture are added every year.

Global food demand is expected to be doubled by 2050 and at the same time natural resources are gradually reducing and deteriorating. Knowledge based, input efficient, eco-friendly, and high-tech precision agriculture is the next stage for which efforts have been directed by Indian Council of Agricultural Research (ICAR) and

Agricultural Universities in planning, designing and executing the national agricultural educational programmes. In order to face the challenges like increased requirement of food quantities, demand for quality food, threat from natural disasters, dwindling rainfall, decreasing soil fertility, ever rising pollution, there is a need for more and more research in agricultural science.

Role of Agricultural Libraries in Education and Research

An agricultural library is a special library oriented to the service of agriculture. It is an integral part of an agricultural research institution and is indispensable for agricultural education, research, extension and in the administration of agricultural projects, programs and planning activities. Libraries are inevitable for researchers without which they cannot carry forward their research. Modern agricultural libraries stress the importance of rendering the maximum service to agricultural research, teaching, learning and extension.

The role of libraries to support the education and research activities of the SAUs is well understood and quality agricultural education and research is not possible without good library and information services. That is why the Indian Council of Agricultural Research (ICAR), the apex body which takes care of agricultural education and research in the country always gives priority for the development and modernization of agricultural libraries through special grants and projects.

Role of ICAR in modernizing Agricultural Libraries

Several factors have affected the quality of agricultural research at research centres in India before the National Agricultural Research Project (NARP) was implemented by the World Bank in India. Inadequate library and information facilities were one among them. Therefore, when the National Agricultural Research Project (NARP) was implemented by the ICAR, support for the development of a national Agricultural Research Information System (ARIS) to link all of these research agencies was given under a new subproject following project restructuring.

The ICAR provided sufficient funds for developing the network to access the e-resources, and computerization of in-house activities for better management of the agricultural libraries during implementation of National Agricultural Technology Project (NATP) with the funding support of the World Bank. 36 State Agricultural Universities and 84 ICAR Institutes have been provided funds. Funds for the purchase of hardware and software were provided under the NATP.

The agricultural libraries have purchased servers and workstations for strengthening of "Library and Information System" and created LAN (Local Area Network) under client server environment to facilitate the local and remote users for consultation of literature. Most of the libraries purchased the "Library Management Software" package in order to run in-house activities of the library like Circulation, Serial Control, Procurement, Cataloguing and OPAC (On-line Public Access Catalogue)

by using Computer in order to improve their efficiency. Most of the agricultural libraries have digitized their catalogues and implemented barcode technology.

Regional libraries have digitized the abstract of Ph.D. thesis submitted to their universities/institutes and linked it with the database. The libraries got Internet facility from NATP grant. Some of the Regional Libraries were started to access e-resources. The Internet connectivity with sufficient bandwidth was the primary need to fulfil the information need. Considering this scenario the agricultural libraries were provided the Internet connection through dial up mode, leased line, ISDN line, and VSAT link based on their requirements.

After the successful implementation of NATP, the ICAR has launched National Agricultural Innovation Project (NAIP) on July 26, 2006 by Union Minister for Agriculture to fulfil the Government of India's objectives on National Policy on Agriculture (NPA). NAIP accorded priority for the modernization and digitization of agricultural libraries in India. The landmark projects viz., Consortium for e-Resources in Agriculture (CeRA), e-Granth and KrishiPrabha were implemented under NAIP.

Thus, the agricultural libraries in the country are highly indebted to the Indian Council of Agricultural Research for its sustained funding support towards development keeping pace with the technical advancements taking place in the field of library and information science.

Scope of the present study

The scope of this present study is to study the application of emerging technologies in agricultural universities in India. The parameters investigated include the status of automation, status of digitization, membership in KrishiKosh (Institutional Repository), membership in IDEAL (Union Catalogue),Remote Access Services, implementation of RFID technology and Virtual and Augmented reality in the agricultural libraries in India.

Methodology

Required data were collected from the websites of the Agricultural Universities and published reports of the Indian Council of Agricultural Research (ICAR).

Results and Discussion

Library Automation Software

Table 1: Automation Software used by the Agricultural University Libraries in India
(n=73)

Sl. No.	Software	No. of Libraries	%
1.	Koha LMS	73	100

The study revealed that all the libraries (100%) have implemented Koha Integrated Library Management System (Koha ILMS) for automation of their in-house operations. This was possible because of the special initiative taken by the ICAR during implementation of National Agricultural Innovation Project (NAIP) supported by the World Bank.

Library operations Automated

Table 2: Automation of in-house operations
(n=73)

Sl. No.	Operations	No. of Libraries	%
1.	Circulation	68	93
2.	Acquisition	38	52
3.	Technical Processing	73	100
4.	Serials Control	46	63
5.	OPAC	73	100
6.	Stock Verification	43	59

The above table shows that all the libraries have implemented automation for Technical Processing and OPAC, followed 93% for Circulation, 63% for Serials Control 59%for Stock Verification and 52% for Acquisition.

Membership in Krishikosh Institutional Repository

Krishikosh is a versatile open access digital repository catering to the needs of NARES. Krishikosh is collectively managed, centrally aggregated repository with integrated search facility. The implementation of Krishikosh improves the accessibility coupled with preservation of institutional repository. This was achieved to create dependable digital storage and an efficient Integrated Content Management System (ICMS), an open source software DSpace. Considering the difficulty of maintaining Institutional Repository by individual institutions, the ICAR took a decision to implement the national level digital repository where all Agricultural Universities and ICAR Institutes are uploading their documents.

Table 3: Membership in Krishikosh
(n=73)

Sl. No.	Membership in Krishikosh	No. of Libraries	%
1.	Yes	73	100
2.	No	0	0

It is observed that all the agricultural university libraries are members in Krishikosh open access digital repository maintained by the ICAR.

Table 4: Top 10 Agricultural Libraries in terms of Number of Documents uploaded in Krishikosh as on 31-03-2024

Sl. NO	State Agricultural University	Theses	No of documents other than theses	Total
1	TNVASU, Chennai	3367	22606	25,973
2	UAS, Bengaluru	14395	8471	22,866
3	IARI, New Delhi	5990	10813	16,803
4	PJTSAU, Hyderabad	9039	5990	15,029
5	CCSHAU, Hisar	9074	1570	10,644
6	MPKV, Rahuri	9387	56	9,443
7	VNMKV, Parbhani	8826	79	8,905
8	JNKVV, Jabalpur	8652	10	8,662
9	KAU, Thrissur	5941	2347	8,288
10	PAU, Ludhiana	7232	28	7,512

IDEAL: Union Catalogue of Agricultural University Libraries in India

The IDEAL platform has been developed on Software as Service (SaaS) architecture with independently configured instance for each library having OPAC and staff clients running on centralized servers along with option to run local mirror for individual library. It can be accessed at http://ideal.egranth.ac.in. All the libraries of NARES can join IDEAL platform to get themselves integrated to Virtual Digital Library of NARES and get freedom from maintaining hardware and software locally for day to day functioning of their own library. This enables them to focus more on their core competency of managing their library more efficiently.

Table 5: Membership in IDEAL

(n=73)

Sl. No.	Membership in Ideal	No. of Libraries	%
1.	Yes	38	52
2.	No	35	48

The study revealed that out of 73 libraries only 38 libraries (52%) have data in the Ideal. The data in respect of the remaining 35 l(48%) libraries need to be collected and uploaded into IDEAL to serve the purpose for which the IDEAL was created.

The details in respect of total titles and total volumes uploaded by the top 5 agricultural libraries are furnished in Table 6.

Table 6: Top Agricultural Libraries in terms of data available in IDEAL platform as on 31-03-2024

Sl. No.	Library	Total Titles	Total Volumes
1.	PAU, Ludhiana	1,51,060	2,96,613
2.	IARI, New Delhi	1,38,514	2,94,086
3.	GBPUAT, Pantnagar	1,50,736	2,69,931
4.	CCSHAU, Hisar	1,54,512	2,46,106
5.	DPDKV, Akola	1,44,374	2,02,386

The details in respect of data uploaded by the 38 participating libraries which uploaded their catalogue records in IDEAL are furnished in Table 7.

Table 7: Total Resources in IDEAL

Sl. No.	Library	Total Titles	Total Volumes
1.	AAU, Anand	51,146	85,525
2.	AAU, Jorhat	44086	58900
3.	ANGRAU,Guntur	43411	60016
4.	AU, Kota	4446	10689
5.	BAU, Sabour	12533	19408
6.	CCSHAU, Hisar	154512	246106
7.	CU, Imphal	25099	27262
8.	DBSKKV, Dapoli	5710	7554
9.	DPDKV, Akola	144374	202386
10.	DRPCAU,Pusa, Bihar	24030	28107
11.	GADVASU, Ludhiana	13794	21604
12.	GBPUAT, Pantnagar	150736	269931
13.	IARI, New Delhi	138514	294086
14.	IGKV, Raipur	21707	43698
15.	JAU, Junagarh	41334	64817
16.	JNKVV, Library Jabalpur	40008	79262
17.	KAU Central Library	28176	36325
18.	KU Library, Gandhinagar	471	686
19.	KUFOS, Kochi	17022	18653
20.	KVAFSU, Bidar	6319	13449
21.	LLRUVAS, Hisar	1811	1852
22.	MAFSU Univ. Lib, Nagpur	15998	25039
23.	MPKV Central Library	72442	77434
24.	NAU, Navsari	59601	63296
25.	NDVSU Library, Jabalpur	8168	8206

26.	OUAT, Bhubaneswar	21459	28167
27.	PAU, Ludhiana	151060	296613
28.	PJTSAU, Hyderabad	43657	60231
29.	PVNRTVU, Hyderabad	5036	8659
30.	RAJUVAS, Bikaner	13725	39555
31.	RVSKVV, Library Gwalior	8364	8664
32.	SKRAU, Bikaner	11901	16115
33.	SVVU	3887	8244
34.	TNAU, Coimbatore	83732	106383
35.	TNVASU Univ. Lib, Chennai	2250	5757
36.	UAS, Bengaluru	120980	156627
37.	UAS, Dharwad	56960	88089
38.	UBKV, Cooch Behar	21998	34928

Implementation of RFID enabled Security System

Table 8: Implementation of RFID enabled Security System (n=73)

Sl. No.	Implementation of RFID	No. of Libraries	%
1.	Yes	34	47
2.	No	39	53

It has been found from the above table that out of 73 libraries, 34 libraries (47%) have implemented RFID technology while 39 libraries (55%) have not yet implemented. It has been observed that the ICAR development grant was very much useful for many libraries to implement RFID enabled security system in their libraries.

Remote Access Services

Table 9 Implementation of Remote Access Services (n=73)

Sl. No.	Implementation of RFID	No. of Libraries	%
1.	Yes	58	79
2.	No	15	21

The study revealed that out of 73 libraries, 58 libraries (79%) have implemented Remote Access Services while 15 libraries (21%) have not yet implemented the same.

Implementation of Augmented Reality and Virtual Reality

The study found that the Guru Angad Dev Veterinary and Animal Sciences University (GADVASU) has implemented the Augmented Reality and Virtual Reality in its library. To support the mandate of the university of producing competent human resource in livestock sector, in a joint venture involving librarian(s), scientists and technological firm, a total of 14 modules of Augmented Reality (AR) along with mobile

application, 10 modules of Virtual Reality (VR) and 3 modules of 3D animations have been developed under the aegis of Rashtriya Krishi Vikas Yojana (RKVY) project funded by the Government of India.

Implementation of 3D Printing facility

Table 10 Implementation of 3D Printing Facility (n=73)

Sl. No.	Implementation of 3D Printing facility	No. of Libraries	%
1.	Yes	8	11 %
2.	No	65	89 %

The Agricultural Universities have implemented 3D printing facility under NAHEP project supported by the ICAR through World Bank funding support. The student(s) and/or faculty member(s) interested to develop 3D models using the facility give their requisition and library provides them requisite technical support, input material and time slot for 3D printing. The concerned user may come up with their CAD model for 3D printing. In collaboration with faculty and students of the universities, the Universities are developing anatomical, pathological, extension and various other models to aid practical classroom teaching, and for knowledge dissemination amongst farmers and other stakeholders.

Library Mobile App

The following Mobile Apps have been developed for the benefit of scientists, faculty, students of NARES system.

1. Krishikosh App - Institutional Repository was developed by the ICAR-IARI
2. PJTSAU-KMC App was developed by PJTSAU, Hyderabad
3. CeRA App has been developed by the ICAR-IARI.

MOOC

A Massive Open Online Course on Information Handling Skills for Teaching, Learning and Research has been developed by the Professor Jayashankar Telangana State Agricultural University, Hyderabad. The aim of this course is to impart practical knowledge & skills to identify, search, retrieve and utilize information by PG students and Research scholars including Faculty, Scientists and Extension Workers of Agriculture Universities in India.

Findings of the Study

- The study found that 100% of the Agricultural University Libraries in India have automated their library operations and they are using Koha Integrated Library Management System.
- It has been observed that all the libraries have implemented automation for Technical Processing and OPAC, followed 93% for Circulation, 63% for Serials Control 59%for Stock Verification and 52% for Acquisition.

- All the 73 Agricultural University Libraries are participating in the KrishiKosh Digital Repository and contributing contents on regular basis.
- The TANUVAS, Chennai is the top contributor for Krishikosh with a total 25,973 documents followed by UAS, Bengaluru (22,866), ICAR-IARI, New Delhi (16,803) and PJTSAU, Hyderabad (15,029).
- Out of 73 agricultural universities in India, 38 universities (52%) are contributing catalogue records to IDEAL while 35 (48%) university data need to be collected and uploaded into IDEAL to ensure effective resource sharing.
- Among 38 universities, PAU, Ludhiana is the top contributor to IDEAL with 1,51,060 titles and 2,96,613 volumes followed by ICAR-IARI, New Delhi, GBPUAT, Pantnagar, CCSHAU, Hisar and DPDKV, Akola.
- The study found that 34 libraries (47%) have implemented RFID enabled security system and it has to be implemented in 39 libraries (53%).
- The study revealed that out of 73 libraries, 58 libraries (79%) have implemented Remote Access Services while 15 libraries (21%) have not yet implemented the same.
- The study found that Guru Angad Dev Veterinary and Animal Sciences University (GADVASU) has implemented the Augmented Reality and Virtual Reality in its library.
- The study revealed that 8 libraries (11%) have implemented the 3D printing facility while it has not been implemented in 65 libraries (89%).
- Three Mobile Apps have been developed by the NARS libraries for the benefit of stakeholders.
- A Massive Open Online Course on Information Handling Skills for Teaching, Learning and Research has been developed by the Professor Jayashankar Telangana State Agricultural University, Hyderabad.

Conclusion

Agricultural libraries in India are always in the forefront in implementing the emerging technologies starting from library automation, digitization, electronic surveillance system, RFID enabled security system, Mobile App, Remote access services, etc. They are pioneer in automating the library activities and many of the agricultural libraries were automated about three decades back. During the recent years, they also started implementing the emerging technologies like augmented reality, virtual reality, 3D printing, etc. The NARES libraries also pioneer in implementing the e-journal consortium and Consortium for e-Resources in Agriculture (CeRA) is the second largest successful consortium in India which connects all major agricultural libraries in the country and provides seamless access to global knowledge resources available in electronic format. Another flagship contribution of agricultural libraries in India is the KrishiKosh Digital repository which serves as the national level repository for the entire NARES libraries and functioning with a large amount of digital documents including theses and dissertations with a huge user population across the globe. The study concludes that the agricultural libraries in India are keen in implementing the

emerging technologies for the benefit of students, research scholars, faculty, scientists and policy makers and many of the libraries are on par with agricultural libraries in the developed countries.

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BEYOND THE SHELVES;TOMORROW'S LIBRARIES AT THE NEXUS OF EMERGING TECHNOLOGIES

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Introduction

In an era characterized by rapid technological advancements and evolving information consumption patterns, the landscape of information services and library management is undergoing a profound transformation. Libraries, once bastions of print collections and physical spaces, are now embracing digital innovations to meet the diverse needs of users in the digital age. This paradigm shift poses both challenges and opportunities for library professionals, educators, and researchers alike. The advent of emerging technologies such as artificial intelligence, blockchain, and augmented reality has revolutionized the way information is accessed, organized, and disseminated. From AI-driven recommendation systems that personalize user experiences to blockchain-enabled platforms that ensure transparent and secure data management, these innovations hold the promise of enhancing the efficacy and accessibility of library services.

However, alongside these advancements come critical issues and considerations that demand careful attention. Digital divide, information privacy, and ethical implications of AI are just a few of the challenges facing information professionals as they navigate the complexities of the digital ecosystem. Moreover, the rapid pace of technological change necessitates continuous adaptation and upskilling to ensure that library professionals remain adept at leveraging these tools to their fullest potential. Against this backdrop, this paper seeks to explore the transformative potential of emerging technologies in information services and library management. By examining current trends, challenges, and opportunities, this research aims to provide insights into the implications of technological innovations for the next generation of library practices and educational paradigms. Through empirical investigations and theoretical analyses, this paper endeavors to shed light on the strategies and best practices that will enable libraries to thrive in the digital era. By embracing emerging technologies and addressing critical issues head-on, libraries can position themselves as dynamic hubs of knowledge and information, serving the diverse needs of users in an increasingly interconnected world.

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Background and Significance

The digital revolution of the 21st century has fundamentally transformed the way information is created, disseminated, and accessed. In today's age of remarkable technological progress, libraries, formerly known for their print collections and physical environments, are leading the way in a digital revolution.The emergence of digital technologies, coupled with changing user expectations and information consumption patterns, has necessitated a reevaluation of traditional library practices and services. Libraries have traditionally served as vital repositories of knowledge, preserving cultural heritage and facilitating access to information for generations of learners, researchers, and the general public. However, the advent of the internet and digital technologies has revolutionized the information landscape, presenting both opportunities and challenges for libraries worldwide. The proliferation of digital resources, online databases, and electronic journals has democratized access to information, enabling users to retrieve and disseminate knowledge with unprecedented ease and speed.

Amidst these rapid changes, libraries are faced with the dual challenge of embracing digital innovation while upholding their core mission of providing equitable access to information for all. The significance of integrating emerging technologies in library services cannot be overstated, as these innovations hold the potential to revolutionize the way libraries fulfill their mandate in the digital age. By harnessing the power of emerging technologies such as artificial intelligence (AI), blockchain, and augmented reality (AR), libraries can enhance their services, optimize resource allocation, and foster greater engagement with users. AI-driven recommendation systems, for example, enable libraries to personalize user experiences, providing tailored recommendations based on individual preferences and behavior patterns. Similarly, blockchain technology offers libraries a secure and transparent framework for managing digital assets, ensuring the integrity and authenticity of digital collections. AR technologies, on the other hand, enable libraries to create immersive learning experiences, engage users in new and innovative ways, and bridge the gap between physical and virtual spaces. Moreover, the integration of emerging technologies in library services has profound implications for addressing critical issues such as digital literacy, information accessibility, and social inclusion. By leveraging these technologies, libraries can expand access to knowledge and information, particularly for underserved communities and marginalized populations. AI-driven recommendation systems can help bridge the digital divide by providing personalized recommendations tailored to the needs and interests of diverse user groups. Similarly, blockchain technology can facilitate transparent and equitable access to digital resources, ensuring that all members of society have equal opportunities to benefit from library services. The integration of emerging technologies in library services has the potential to revolutionize education and research paradigms, empowering learners and researchers to access, analyze, and disseminate information in new and innovative ways. By embracing digital innovation, libraries can position themselves as dynamic hubs of knowledge and learning in the digital age, serving as catalysts for innovation, creativity, and lifelong learning. As libraries navigate the complexities of the digital frontier,

continued investment in technology, education, and collaboration is essential to ensure that they remain relevant and responsive to the evolving needs of users and communities in an increasingly interconnected world.

Literature Review

The literature surrounding the intersection of information services, emerging technologies, and library management provides valuable insights into the ongoing transformations in the field. Scholars have extensively explored the impact of technological advancements on library practices, educational paradigms, and user experiences, offering a rich tapestry of perspectives and findings. One significant area of inquiry revolves around the adoption and integration of emerging technologies in library services. Studies by Borgman (2015) and Chowdhury (2019) have examined the implementation of AI-driven recommendation systems and machine learning algorithms to enhance information retrieval and user engagement in libraries. These technologies enable personalized services and content recommendations, thereby enriching the user experience and fostering greater satisfaction among patrons. Moreover, researchers such as Lankes (2016) and van der Velde (2020) have explored the role of blockchain technology in revolutionizing data management and preservation in libraries. By leveraging blockchain's decentralized and immutable nature, libraries can ensure the integrity and authenticity of digital assets, thus mitigating concerns regarding data tampering and provenance. Additionally, blockchain-based platforms facilitate transparent and traceable transactions, enhancing trust and accountability in library operations.

In parallel, the literature also delves into the broader societal implications of technological innovations in library management. Scholars like Jaeger (2018) and Hirsh (2021) have investigated the digital divide and its impact on information access and equity, particularly among marginalized communities. They highlight the importance of addressing socio-economic disparities and digital literacy gaps to ensure equitable access to library resources and services for all members of society. Furthermore, ethical considerations surrounding the use of emerging technologies in library settings have garnered significant attention in the literature. Works by Koehler (2017) and Martin (2022) underscore the importance of ethical frameworks and guidelines to govern the responsible deployment of technologies such as AI, biometrics, and data analytics in libraries. They emphasize the need for transparency, consent, and accountability in data practices to uphold user privacy and autonomy.

Scholars have examined the concept of the library as a platform, emphasizing the importance of open access, interoperability, and collaborative partnerships in shaping the future of library services. Works by Palfrey and Gasser (2016) and Wouters and Costas (2012) explore the concept of the library as a networked ecosystem, highlighting the role of libraries as connectors, facilitators, and enablers of knowledge creation and dissemination. Moreover, scholars such as Mattern (2014) and Zerhusen (2018) have investigated the concept of the library as a laboratory, advocating for experimentation, prototyping, and innovation in library practices and services. By embracing a culture of

experimentation and and collaboration, libraries can harness the collective intelligence of their communities, co-create knowledge, and drive positive social change. Furthermore, the literature review delves into the evolving role of librarians as educators, advocates, and change agents in the digital era. Works by Rosenfeld and Morville (2015) and Nichols and Lowe (2017) explore the concept of the librarian as a guide, emphasizing the importance of information literacy, critical thinking, and digital skills in navigating the complexities of the information landscape. Moreover, scholars such as Lankes (2011) and Pomerantz (2015) advocate for a proactive and participatory approach to librarianship, empowering librarians to engage with users, co-create value, and lead initiatives that promote information equity and social justice. By embracing these new roles and identities, librarians can leverage their expertise, creativity, and passion for service to shape the future of library practices and services in the digital age.

Overall, the literature review illuminates the multifaceted nature of the relationship between emerging technologies and library management, highlighting both the opportunities and challenges inherent in this dynamic landscape. By synthesizing insights from diverse scholarly perspectives, this review sets the stage for the research gap undertaken in this study, offering a comprehensive foundation for better understanding.

Findings

Libraries are expanding their digital collections to encompass various languages, accommodating diverse linguistic backgrounds. Additionally, they're prioritizing accessibility by integrating features like screen readers and captioning into their websites and catalogs, ensuring usability for individuals with disabilities. To further engage users, especially those unable to visit in person, libraries are implementing virtual assistance through chatbots and video conferencing. Collaborating with community organizations helps tailor services to meet the unique needs of underserved populations. Libraries also prioritize user privacy, particularly for marginalized communities, safeguarding data and addressing surveillance concerns. By employing algorithms, libraries enhance user experience by recommending relevant resources based on individual interests and preferences. Integrating emerging technologies into library operations brings about profound long-term effects that extend beyond mere efficiency gains. By adopting technologies such as AI-powered search engines, digital catalogs, and virtual reality platforms, libraries enhance accessibility, expand resources, and diversify services. Integrating emerging technologies into library operations brings about profound long-term effects that extend beyond mere efficiency gains. Through digitization, artificial intelligence, and data analytics, libraries enhance accessibility, personalized services, and resource management. Over time, these advancements alter user behaviors, fostering greater reliance on digital resources, personalized recommendations, and remote access. Consequently, libraries evolve into dynamic hubs of knowledge, catering to diverse user needs while optimizing resource allocation and strategic decision-making. The ongoing integration of emerging technologies not only enhances operational efficiency but also reinforces the library's role as a vital cornerstone of education and information

dissemination in the digital age. They contribute to cultivating a tech-savvy user base and positioning themselves as vital players in the knowledge economy of the future. Adopting emerging technologies in library management presents various legal and regulatory considerations. Firstly, data privacy laws, such as the GDPR (General Data Protection Regulation), must be adhered to when handling patron information, ensuring consent, data minimization, and security measures are in place. Secondly, intellectual property rights must be respected, especially concerning digitization efforts and licensing agreements for digital content. Lastly, mitigating algorithmic bias is crucial to ensure fair access and representation within library services, necessitating regular audits, transparency in algorithmic decision-making, and ongoing training to address biases that may arise in automated processes. Compliance with these legal and regulatory frameworks is essential to responsibly harness the benefits of emerging technologies while safeguarding user rights and ensuring equitable access to library resources. User-centered design principles can be effectively applied to the development of technology-driven library services by prioritizing the needs, preferences, and behaviors of library patrons throughout the design process. This involves conducting thorough user research to understand their goals and challenges, creating personas to represent different user groups, and iteratively testing prototypes to gather feedback and make improvements. Additionally, designing intuitive user interfaces, ensuring accessibility for individuals with diverse needs, and implementing responsive features that adapt to users' interactions are crucial steps. By continuously incorporating user feedback and testing, technology-driven library services can be tailored to meet the evolving needs, ultimately enhancing their experience and engagement with the library resources and services. The synthesis of findings reveals several key insights into the transformative potential of integrating innovative technologies in information services. AI-driven recommendation systems have emerged as powerful tools for personalized knowledge discovery, enhancing user experiences and promoting information accessibility. Blockchain technology holds promise for ensuring data integrity and security in library operations, thereby fostering trust and transparency in knowledge dissemination. Furthermore, these advancements have implications for addressing critical issues such as digital literacy and social inclusion, particularly in underserved communities. By examining the intersection of technology and social dynamics, this research offers a nuanced understanding of the broader implications of digital innovations in library.

Discussion

The exploration of emerging technologies in library services represents a paradigm shift in the way information is accessed, organized, and disseminated. One of the key areas of exploration is the integration of artificial intelligence (AI) and machine learning algorithms in library operations. AI-driven recommendation systems have emerged as powerful tools for personalized knowledge discovery, enhancing user experiences, and promoting information accessibility. By analyzing user preferences and behavior patterns, these systems can suggest relevant resources, thereby enriching the user's journey through the library's digital landscape. However, the deployment of

AI in libraries also raises ethical considerations such as privacy, bias, and algorithmic transparency. As libraries harness the power of AI, it becomes imperative to ensure responsible use and governance frameworks to safeguard user privacy and uphold ethical standards.

Another significant area of focus is the adoption of blockchain technology in data management and preservation. Blockchain's decentralized and immutable nature offers a promising solution for ensuring data integrity and authenticity in digital assets. By leveraging blockchain, libraries can mitigate concerns regarding data tampering and provenance, thus enhancing trust and transparency in knowledge dissemination. Moreover, blockchain-based platforms facilitate transparent and traceable transactions, fostering accountability and reliability in library operations. However, the implementation of blockchain technology presents technical challenges and regulatory considerations that must be addressed. Scalability, interoperability, and compliance with data protection regulations are critical factors to consider in the adoption of blockchain solutions in library management. Libraries can leverage augmented reality (AR) technologies to create immersive learning experiences and engage users in new and innovative ways.

Moreover, the integration of emerging technologies in library services necessitates a user-centered approach to design and implementation. User research, usability testing, and feedback mechanisms are essential for understanding user needs, preferences, and behaviors throughout the development process. By prioritizing user-centric design principles, libraries can create intuitive and accessible interfaces that enhance user experiences and engagement with library resources. Moreover, accessibility features such as screen readers, captioning, and assistive technologies ensure usability for individuals with diverse needs, fostering a more inclusive environment for all patrons.

Furthermore, the importance of continuous adaptation and innovation in navigating the complexities of the digital landscape. Libraries must remain agile and responsive to emerging trends, user needs, and technological advancements to stay relevant in an ever-evolving environment. Professional development, training, and upskilling programs are essential for equipping library staff with the knowledge and skills to leverage emerging technologies effectively. Moreover, a culture of innovation, experimentation, and risk-taking fosters creativity and resilience in addressing challenges and seizing opportunities in library services. However, the integration of emerging technologies in library services also presents challenges and considerations that demand careful attention. Issues such as data privacy, algorithmic bias, and digital literacy gaps underscore the importance of responsible technology adoption and ethical practices. Moreover, the rapid pace of technological change necessitates continuous adaptation and upskilling among library professionals to ensure that they remain adept at leveraging these tools to their fullest potential. Additionally, libraries must prioritize user-centered design principles to ensure that technology-driven services are accessible, intuitive, and inclusive for all members of the community. By addressing these challenges and considerations, libraries can harness the full potential of emerging technologies to enhance information access, promote digital literacy, and foster equitable access to library resources for all.

Methodology

The methodology employed in this research combines both quantitative and qualitative approaches to provide a comprehensive understanding of the impact of emerging technologies on information services and library management. Quantitative methods, such as surveys and data analytics, are utilized to gather empirical data on user perceptions, technology adoption rates, and usage patterns. Qualitative methods, including interviews and case studies, are employed to explore in-depth insights into the socio-cultural implications and ethical considerations of technological interventions in library settings. By triangulating data from multiple sources, this mixed-methods approach enhances the validity and reliability of the research findings. As a college student, I embarked on a research journey to explore the integration of emerging technologies in information services and library management. Here's how I approached each aspect and the evidence I gathered: Conducted surveys and interviews with students, faculty, and library patrons to understand their information access needs and preferences,Utilized low-cost tools like Google Forms and online survey platforms to collect data,Analyzed the data to identify common pain points and preferences, Utilized existing library data and tracked usage patterns over several semesters and academic years, Analyzed trends in borrowing habits, resource utilization, and user engagement metrics, Compared data before and after the introduction of new technologies to identify changes in behavior and outcomes, Followed industry blogs, podcasts, and social media channels to stay informed about emerging trends and innovations.

Conclusion

In conclusion, this paper has explored the transformative potential of emerging technologies in information services and library management, shedding light on the challenges, opportunities, and implications for the next generation. Through a comprehensive review of literature, rigorous empirical investigations, and theoretical analyses, this research has elucidated the multifaceted nature of the relationship between technology and library practices. Our findings underscore the importance of proactive adaptation and innovation in navigating the complexities of the digital frontier. From AI-driven recommendation systems to blockchain-enabled data management, emerging technologies offer unprecedented opportunities to enhance information access, user engagement, and operational efficiency in libraries. However, these advancements also raise critical issues surrounding privacy, equity, and ethical use, necessitating careful consideration and responsible practices.

Moreover, this research highlights the need for inclusive and user-centric approaches to technology adoption, ensuring that libraries remain accessible and responsive to the diverse needs of their communities. By prioritizing digital literacy initiatives, addressing digital divides, and upholding ethical standards, libraries can harness the full potential of emerging technologies to foster a more inclusive and equitable information ecosystem. As we look towards the future, this paper calls for continued dialogue, collaboration, and action to shape the trajectory of information

services and library management. By embracing innovation, embracing diversity, and embracing inclusivity, libraries can position themselves as dynamic hubs of knowledge and learning, empowering individuals and communities to thrive in the digital age. Ultimately, this research endeavors to inspire meaningful change and transformation in the field, paving the way for a more resilient, responsive, and future-ready library ecosystem.

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CLOUD COMPUTING AND ITS APPLICATION IN LIBRARIES: AN OVERVIEW

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Introduction

Cloud computing is a paradigm shift in the way computing resources such as servers, storage, and software applications are delivered to users. Instead of hosting these resources locally, cloud computing relies on remote servers and the internet to provide users with access to computing resources as a service. This means that users can access these resources from anywhere in the world as long as they have an internet connection

Cloud computing has several benefits, including scalability, cost-effectiveness, flexibility, and accessibility. It has revolutionized the way businesses, organizations, and individuals' access and use computing resources. Libraries are no exception to this trend. In libraries, cloud computing has found several applications. One of the primary applications of cloud computing in libraries is in the provision of digital services such as e-books, e-journals, and other electronic resources. With cloud computing, libraries can host these resources on remote servers and provide users with access to them from anywhere in the world. Another application of cloud computing in libraries is in the provision of library management systems. These systems are used to manage the library's resources, including books, journals, and other materials. With cloud computing, libraries can host these systems on remote servers and provide access to them from anywhere in the world. This allows librarians to manage the library's resources more efficiently and effectively.

Cloud computing has also found applications in the provision of online catalogues and search tools. With cloud computing, libraries can host these tools on remote servers and provide users with access to them from anywhere in the world. This allows users to search for library resources online and access them remotely. In conclusion, cloud computing has several applications in libraries, including the provision of digital services, library management systems, and online catalogues and search tools. With cloud computing, libraries can provide users with access to library resources from anywhere in the world, making it easier for users to access and use library resources.

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Meaning of Cloud Computing

According to **(NIST)** the National Institute of Technology and Standards, Cloud computing is a model for enabling convenient on-demand network access to a shared pool of configurable computing resources(Ex. Networks, Server, Storage, Applications and services) that can be rapidly provisioned and related with minimal management effort or service provider interaction."

Essentials of Characteristics:

On-demand self-service: Users can access computing resources on-demand without the need for human intervention from the service provider.

Broad network access: Computing resources can be accessed from any device connected to the internet, including laptops, desktops, smartphones, and tablets.

Resource pooling: Multiple users can share a single pool of computing resources, allowing for efficient resource utilization.

Rapid elasticity: Cloud computing resources can be quickly scaled up or down to meet changing user demands, allowing for greater flexibility and cost-effectiveness.

Measured service: Cloud computing resources are typically metered, allowing users to pay only for the resources they use.

Resilient computing: Cloud computing providers ensure high levels of availability and reliability through redundant infrastructure and automated failover mechanisms.

Security: Cloud computing providers typically offer robust security measures to protect user data, including encryption, access control, and data backup and recovery.

These characteristics are what make cloud computing an attractive technology for organizations looking to leverage the benefits of digital transformation, such as improved agility, scalability, cost savings, and collaboration.

Types of Cloud Computing

There are three main types of cloud computing: public cloud, private cloud, and hybrid cloud.

Public Cloud: A public cloud is a cloud computing environment where resources are owned and managed by a third-party cloud service provider, and multiple users share the same infrastructure. Public clouds offer easy access to computing resources on-demand, and users only pay for the resources they use. Some examples of public cloud providers include Amazon Web Services (AWS), Microsoft Azure, and Google Cloud.

Private Cloud: A private cloud is a cloud computing environment that is owned and managed by a single organization. In a private cloud, the infrastructure is not shared with other organizations, providing greater control and security over data and computing resources. Private clouds can be hosted on-premises or by a third-party provider.

Hybrid Cloud: A hybrid cloud is a cloud computing environment that combines elements of both public and private clouds. In a hybrid cloud, an organization can use a private cloud for sensitive data and applications, while leveraging the scalability and cost-effectiveness of a public cloud for less sensitive workloads. Hybrid clouds can also help organizations avoid vendor lock-in and provide greater flexibility in managing their computing resources.

In addition to these three main types of cloud computing, there are also several other cloud deployment models, including community cloud, multi-cloud, and distributed cloud. Each of these deployment models offers unique benefits and trade-offs, depending on an organization's specific needs and requirements.

Types of Cloud Computing Services

There are three main types of cloud computing services, also known as cloud service models:

Infrastructure as a Service (IaaS): IaaS is a cloud computing service that provides virtualized computing resources, including servers, storage, and networking, as a service over the internet. In this model, the cloud service provider is responsible for managing the underlying infrastructure, while the user is responsible for managing the operating system, applications, and data. Examples of IaaS providers include Amazon Web Services (AWS) EC2, Microsoft Azure VMs, and Google Compute Engine.

Platform as a Service (PaaS): PaaS is a cloud computing service that provides a complete development and deployment platform for applications, including hardware, operating system, and middleware. In this model, the cloud service provider is responsible for managing the underlying infrastructure, operating system, and middleware, while the user is responsible for managing the applications and data. Examples of PaaS providers include Heroku, Google App Engine, and Microsoft Azure App Service.

Software as a Service (SaaS): SaaS is a cloud computing service that provides access to software applications over the internet. In this model, the cloud service provider is responsible for managing the underlying infrastructure, operating system, middleware, and software application, while the user only needs to access the application through a web browser or mobile app. Examples of SaaS providers include Salesforce, Google Workspace, and Dropbox. Each of these cloud computing service models provides different levels of abstraction and control over the underlying infrastructure, platform, and applications, allowing organizations to choose the right level of service for their specific needs and requirements.

Initiatives of Cloud Computing

There have been several initiatives in cloud computing that aim to promote the adoption of cloud technologies and improve their effectiveness. Here are some of the most notable initiatives:

Cloud Standards Customer Council (CSCC): The CSCC is a group of cloud consumers and providers that works to promote best practices and standards for cloud computing. It aims to educate users about cloud computing and help them make informed decisions about cloud adoption.

Cloud Security Alliance (CSA): The CSA is a non-profit organization that works to promote best practices for secure cloud computing. It provides guidance on cloud security, certification programs for cloud providers, and research on cloud security threats and trends.

National Institute of Standards and Technology (NIST) Cloud Computing Program: NIST is a government agency that provides guidance on cloud computing standards and best practices. It has published several documents on cloud computing, including the Cloud Computing Reference Architecture and the Cloud Computing Synopsis and Recommendations.

OpenStack: OpenStack is an open-source cloud computing platform that provides a set of software tools for building and managing cloud environments. It is widely used by organizations for private and public cloud deployments.

Cloud Native Computing Foundation (CNCF): The CNCF is a nonprofit organization that works to promote the adoption of cloud-native technologies, including Kubernetes, Prometheus, and Envoy. It provides guidance on best practices for deploying and managing containerized applications in the cloud.

These initiatives play a critical role in advancing the adoption and effectiveness of cloud computing technologies. They provide guidance and best practices for cloud providers and users, promote interoperability and portability between cloud environments, and help to ensure the security and reliability of cloud computing.

Cloud Computing: Application In Libraries

Cloud computing has numerous applications in libraries, and it can help libraries improve their efficiency, accessibility, and scalability. Here are some of the ways that cloud computing can be applied in libraries:

Digital Library Services: Cloud computing can be used to provide digital library services, such as digitization, metadata management, and digital preservation. By using cloud-based services, libraries can store, manage, and provide access to digital collections more efficiently and cost-effectively.

Library Management Systems: Cloud-based library management systems (LMS) can help libraries manage their collections, circulation, and cataloguing more effectively. Cloud-based LMS can be accessed from anywhere with an internet connection, making it easier for library staff to work remotely or on-the-go.

Collaboration and Resource Sharing: Cloud computing can enable libraries to collaborate and share resources more easily. Cloud-based collaboration tools, such as

Google Docs and Dropbox, can help library staff work together on projects and share resources across different libraries and institutions.

Online Reference Services: Cloud-based reference services, such as chat and email reference, can help libraries provide reference services more efficiently and effectively. By using cloud-based services, libraries can provide reference services 24/7, from anywhere in the world.

Electronic Resource Management: Cloud computing can be used to manage electronic resources, such as e-books and databases, more effectively. Cloud-based electronic resource management systems (ERMS) can help libraries track usage, manage licenses, and provide access to electronic resources more efficiently.

Overall, cloud computing can help libraries reduce costs, improve efficiency, and provide better services to their users. By leveraging the scalability and flexibility of cloud-based services, libraries can adapt to changing user needs and technological advancements more easily.

Enhancement of Library System By Using The Cloud Computing

The use of cloud computing can enhance the library system in several ways. Here are some of the ways that cloud computing can benefit libraries:

Cost savings: By using cloud-based services, libraries can save on hardware and software costs. The cloud provider is responsible for maintaining the infrastructure and hardware, reducing the need for libraries to purchase and maintain their own equipment.

Scalability: Cloud computing allows libraries to scale up or down their resources based on demand. This means that libraries can adjust their computing resources as needed to accommodate changes in user demand or the size of their collections.

Accessibility: Cloud computing enables library staff to access the library system from any location with an internet connection. This means that library staff can work remotely or on-the-go, improving their flexibility and productivity.

Data backup and recovery: Cloud computing providers offer data backup and recovery services, which can help libraries protect against data loss due to hardware failure, natural disasters, or other issues.

Collaboration: Cloud computing enables library staff to collaborate more easily, even if they are located in different locations. Cloud-based collaboration tools, such as Google Docs and Microsoft Teams, can help library staff work together on projects and share resources.

Improved user experience: Cloud computing can improve the user experience by providing faster and more reliable access to library resources. Cloud-based library management systems can be accessed from anywhere with an internet connection, improving accessibility for library users.

Overall, cloud computing can help libraries improve their efficiency, reduce costs, and provide better services to their users. By leveraging the scalability and flexibility of cloud-based services, libraries can adapt to changing user needs and technological advancements more easily.

Role of Cloud Computing Librarian

Cloud computing has become an essential tool for librarians in managing library services and resources. Here are some of the roles and responsibilities of a librarian in the context of cloud computing:

System administration: Librarians may be responsible for managing and maintaining cloud-based library management systems, ensuring that they are configured correctly, and troubleshooting any issues that arise.

Data management: Librarians must ensure that data is appropriately stored, managed, and secured in the cloud. This includes managing metadata, access rights, and backups.

Collaboration: Librarians can use cloud-based collaboration tools to work with colleagues across different locations or institutions. They can also use cloud-based platforms to communicate with users, share resources, and collaborate with external partners.

Training and support: Librarians must provide training and support to staff members on using cloud-based tools and services. They may also offer training and support to library users on accessing and using cloud-based library resources.

Cost management: Librarians may be responsible for managing the library's cloud computing budget, ensuring that costs are optimized and that the library is getting the most value for its money.

Security management: Librarians must ensure that cloud-based library systems and resources are secure from cyber threats, data breaches, and other security risks. This includes implementing security policies, access controls, and encryption.

Overall, the role of a librarian in the context of cloud computing is to ensure that the library's cloud-based services and resources are efficiently managed, secure, and accessible to users. Librarians must stay up-to-date with technological advancements and best practices in cloud computing to ensure that the library is taking full advantage of the benefits of cloud computing.

Advantages of Cloud Computing

Cloud computing offers several advantages to businesses, organizations, and individuals. Here are some of the main advantages of cloud computing:

Cost savings: Cloud computing reduces the need for businesses and organizations to invest in expensive hardware and infrastructure. This can result in significant cost savings, as cloud providers offer pay-as-you-go models that allow users to pay only for the resources they use.

Scalability: Cloud computing allows businesses and organizations to quickly and easily scale their computing resources up or down based on demand. This means that they can avoid the costs of overprovisioning, as they can adjust their resources as needed.

Flexibility: Cloud computing offers users flexibility in terms of access to computing resources. Users can access cloud-based services and applications from anywhere with an internet connection, allowing them to work remotely or on-the-go.

Data backup and recovery: Cloud providers offer data backup and recovery services, which can help businesses and organizations protect against data loss due to hardware failure, natural disasters, or other issues.

Collaboration: Cloud-based collaboration tools allow teams to work together more effectively, even if they are located in different locations. This can improve productivity and collaboration across different departments and teams.

Security: Cloud providers typically offer robust security features, such as encryption and access controls, to protect against cyber threats and data breaches. This can help businesses and organizations to improve their security posture and protect sensitive data.

Overall, cloud computing can offer significant advantages to businesses, organizations, and individuals, including cost savings, scalability, flexibility, data backup and recovery, collaboration, and security.

Disadvantages of Cloud Computing

While cloud computing offers many advantages, there are also some disadvantages to consider. Here are some of the main disadvantages of cloud computing:

Internet dependency: Cloud computing requires a reliable and fast internet connection. If the internet connection is slow or unreliable, it can lead to performance issues and decreased productivity.

Limited control: Users may have limited control over the cloud infrastructure and services, as they are managed by the cloud provider. This can make it difficult for users to customize the services to meet their specific needs.

Security concerns: While cloud providers offer robust security features, there are still concerns around data privacy and security. Users must trust the cloud provider to keep their data secure, which can be a concern for some users.

Potential downtime: Cloud services can experience downtime due to technical issues or maintenance. This can lead to loss of productivity and revenue for businesses and organizations.

Cost over time: While cloud computing can offer cost savings in the short term, it can become more expensive over time as users require more resources or services.

Compatibility issues: Some applications and services may not be compatible with cloud computing environments, which can make it difficult for users to migrate their existing systems to the cloud. Overall, while cloud computing offers many advantages, there are also some potential drawbacks to consider. Users must carefully evaluate their needs and requirements before deciding to migrate to the cloud.

Conclusion

In conclusion, cloud computing has become an essential tool for libraries in managing their resources and services. By leveraging cloud-based systems and services, libraries can improve their efficiency, accessibility, and collaboration while reducing costs and improving security. Cloud computing has enabled libraries to expand their reach, offer new services and resources, and collaborate with other libraries and institutions across the world. Some of the applications of cloud computing in libraries include managing library management systems, storing and managing digital resources, offering remote access to library resources, and providing collaboration tools for librarians and library users. However, while cloud computing offers many benefits, there are also potential challenges and limitations that users must consider. Overall, cloud computing is transforming the way libraries operate and provide services, and it will continue to be an important tool for libraries in the future. Librarians must stay up-to-date with technological advancements and best practices in cloud computing to ensure that they are taking full advantage of the benefits that cloud computing can offer

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CHATGPT: AN OPPORTUNITY FOR LIBRARY PROFESSIONALS

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Introduction

Artificial intelligence has advanced significantly as a result of the field's rapid expansion, especially in Natural Language Processing (NLP). These developments have led to the development of conversational AI chatbots, which can comprehend natural language queries and produce text that appears human in response. Among other AI chatbots, ChatGPT distinguishes out for its exceptional performance and adaptability. It has shown advantages in several areas, such as boosting productivity, enhancing accessibility, and encouraging creativity in resolving routine operating issues.

Background of Artificial Intelligence (AI) and ChatGPT

Artificial Intelligence

The replication of human intelligence by a machine or system is known as Artificial Intelligence. The objective of AI is to create a machine that can think and act like humans and perform various tasks such as

- **Perception**: AI systems use sensors and computer vision to interpret and understand the world. This can include recognizing objects in images, understanding speech, or interpreting environmental data.
- **Reasoning**: AI must be able to process information logically to make decisions. This involves drawing conclusions from available data, solving problems, and deducing new information.
- **Learning**: Machine learning allows AI to improve its performance over time by learning from data. This can involve supervised learning, unsupervised learning, reinforcement learning, and more.
- **Planning**: AI systems must be able to set goals and devise strategies to achieve them. This involves predicting the consequences of actions, selecting the best actions, and adapting plans as needed.
- **Prediction**: AI can analyze patterns and trends in data to make predictions about

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future events. This is crucial for tasks like weather forecasting, financial modeling, and risk assessment.

- **Improvisation**: AI systems need the flexibility to adapt to new situations and handle unexpected challenges. This involves creative problem-solving and the ability to generate novel solutions.

AI is developed using 3 types of intelligence such as Perceptual Intelligence, Cognitive Intelligence, and Decision-making Intelligence.

AI systems' perceptual intelligence aids in the interpretation and comprehension of environmental sensory data. Processing inputs from several sensors, including cameras, microphones, and other devices, is a part of it. Its parts include computer vision for image and video analysis, speech recognition for sound identification and interpretation, and natural language processing for comprehending and responding to human language.

The term "cognitive intelligence" refers to the capacity of an AI system to reason, learn, and solve issues. It has to do with the mechanisms that let machines mimic the way people think. It comprises applying logical reasoning to solve problems, knowledge representation to encode information, and machine learning to learn and make predictions based on algorithms.

The ability of the AI to make judgments based on the data it has processed and the objectives it must meet is known as decision-making intelligence. It includes the procedures that direct the AI's responses and behaviors. Control systems, optimization, and automated planning are some of its uses.

ChatGPT

OpenAI's ChatGPT is a cutting-edge conversational robot that uses artificial intelligence (AI) to produce and comprehend language that appears human. ChatGPT is a major advancement in machine learning and natural language processing (NLP), as it is based on the GPT-4 model of the Generative Pre-trained Transformer (GPT) architecture. It can generate text with context and has conversational skills that enable it to participate in lengthy conversations while maintaining context.

The field of natural language processing (NLP) brings together computer science, artificial intelligence, and linguistics. It has components like Text Preprocessing, Syntactic Analysis, Semantic Analysis, Machine Learning, and Deep Learning. Some of its uses include information retrieval, which involves improving search engines' comprehension of and ability to respond to user queries; machine translation, which involves automatically translating text between languages; text summarization, which involves condensing lengthy documents into shorter summaries while maintaining important information; chatbots and virtual assistants, which involve developing conversational bots that automatically converse with clients in natural language; Sentiment analysis, which is the process of determining how consumers feel about particular goods, services, subjects, etc. by examining social media postings, comments, and other feedback, and speech recognition, which turns spoken words into text.

A wide range of tasks are accomplished by ChatGPT using NLP. Tokenization, sentiment analysis, named entity identification, and part-of-speech tagging are a few of the widely utilized NLP techniques in ChatGPT. With the use of these methods, NLP ChatGPT's powers are enhanced and it becomes possible for it to decipher the meaning, intent, and even the emotion included in the input.

ChatGPT can produce text by using natural language processing (NLP). It can also assist with creative writing, such as creating content for stories, poetry, plays, essays, and emails. It is capable of quickly summarizing news articles and documents. Using chatbot technology, it can handle consumer inquiries, handle problems, and function as a virtual personal assistant that can handle duties like scheduling, reminding people of appointments, answering questions, and more. This allows for real-time customer care. It may conduct interesting dialogues by upholding context and, in therapeutic contexts, can deliver compassionate replies to provide emotional support. With the use of ChatGPT's multilingualism feature, which improves customer service, it can translate languages from one language to another using the NLP machine translation capability.

To help businesses better understand customer attitudes and enhance services, it conducts sentiment analysis on customer comments. It does product analysis and is useful for extracting opinions from text data. It does information tagging, which involves labeling pertinent information in documents to facilitate data organization and retrieval, as well as Named Entity Recognition (NER), which recognizes and categorizes entities such as names, dates, locations, and organizations inside text. NLP makes research and data analysis easier for ChatGPT by assisting with the extraction of valuable information from massive databases. In addition to classifying information into pre-defined categories that support CMS, it can assist in text classification to identify spam emails and texts.

By topic modeling, or finding and grouping related themes inside huge text corpora, it improves content organization and document clustering, or grouping related documents to make document management and retrieval easier. This helps with text clustering.

It facilitates intent identification, which identifies usage intents in conversations and allows for suitable actions and replies, as well as language comprehension, which includes contextual understanding, which processes and comprehends the context of user inputs to enable accurate and relevant responses.

It does assist with dialogue management, which comprises error handling to identify and correct mistakes or misconceptions in discussions, enhancing user experience, and flow control to regulate the pace of conversations, guaranteeing coherent and natural interactions.

Scope of the ChatGPT in assisting Libraries' Reference Services

ChatGPT's integration with reference services at libraries has the potential to completely change how they communicate with their users by giving them access to fast, precise,

and contextually relevant information. The program utilizes natural language processing (NLP) to improve user experience, optimize library operations, and guarantee effective information access. This study primarily focuses on

- Investigating various features of ChatGPT.
- Looking into the integration of ChatGPT into the library domain to offer users an improved virtual reference service.

Objective of the paper

The objective of this paper is to investigate and evaluate the potential advantages that ChatGPT may offer librarians in many facets of their line of work. This involves investigating how ChatGPT can improve reference services, user engagement, information retrieval, etc. The goal of the paper is to provide librarians with actionable insights about how ChatGPT might be included in library services to increase productivity, accessibility, and user satisfaction.

Features of ChatGPT

Briefly stated, some of the key features of ChatGPT are:

- **Advanced Neural Network**: Generates high-quality text using transformer architecture.
- **Contextual Understanding:** Preserves context during protracted discussions.
- **Extensive Training Dataset:** For a wide knowledge base, pre-trained on a variety of text material.
- **Fine-tuning:** enhanced for improved dialogue handling using certain conversational datasets.
- **Tokenization:** Uses byte pair encoding to efficiently process and produce text.
- **Response Generation:** Produces thoughtful and original responses by using sampling methodologies.
- **Content filtering**: It is one of the safety precautions to avoid negative outcomes.
- **User Interfaces:** Easily accessed through web interfaces, APIs, and application integrations.
- **Scalability:** Real-time performance is backed by a strong infrastructure.
- **Feedback Integration:** Constantly enhanced by user input

Application of ChatGPT in Reference Service

Reference service is an important personalized service provided by the reference librarian in libraries and information centers. With the advent of technology, the traditional reference service has given way to virtual, or digital, reference services. When a client uses a computer or any other type of technology to speak with reference specialists without being physically present, the service is referred to as a virtual reference. Email, chat, voice-over-IP, videoconferencing, instant messaging, and co-browsing are some of the common communication methods used in virtual reference. User satisfaction is high for Virtual Reference Services (VRS).

Different approaches to integrating ChatGPT to offer Virtual Reference Services are:

Email Technology

Electronic mail, commonly known as email, is a popular method for sending messages between electronic devices over a network. It is one of the most widely used forms of communication on the internet. As one kind of virtual reference service, email reference services are being implemented and used by libraries, according to several research. Email is considered the most economical method of delivering VRS because it is continuously supported by the FAQ database. Mobile phones and desktop/laptop PCs are typically required to support email VRS. Email technology is quick, inexpensive, and simple to set up and operate.

ChatGPT can be integrated with Email to offer VRS to users. This process involves a few steps like setting up an email system using services like Gmail, Outlook, or dedicated email services like SendGrid, Mailgun, or Amazon SES, creating an account, integrating it with the ChatGPT API, and automating the workflow.

Voice Over Internet Protocol (VoIP) Technology

Voice over Internet Protocols is a communication technique that allows voice messages to be sent over IP-based networks as digital packets. These IP-based networks may be found on a public or private network.

Several essential steps are involved in integrating ChatGPT with VoIP (Voice over Internet Protocol) so that customers can receive reference services. These include choosing VoIP service providers such as Twilio, Nexmo (Vonage), and Plivo, setting up a VoIP system, creating an account, integrating with the ChatGPT API, and automating the workflow.

Instant Messaging (IM) Technology

Instant messaging (IM) allows for the immediate exchange of text over the Internet, typically via a dedicated chat window. Advanced IM applications support features like file transfers, hyperlinks, and audio/video chats. Integrating ChatGPT with IM for library reference services involves several steps: selecting a suitable messaging platform (e.g., Facebook Messenger, WhatsApp, Telegram, Microsoft Teams), developing an interface for ChatGPT, integrating APIs, training the model on library-specific queries, and ensuring seamless communication. This integration enhances the accessibility and efficiency of virtual reference services.

Social Media Technology

The growing importance of social media in libraries is evident globally. Integrating social media with library services offers various benefits, including fostering direct user interaction, connecting with the community over distances, and promoting library events such as services, exhibitions, and guides. Utilizing platforms like Facebook and Twitter

allows libraries to stay relevant and responsive to their clients. By establishing Facebook and Twitter profiles on their websites, libraries can reach a broader audience and provide virtual reference services effectively.

There are multiple processes involved in integrating ChatGPT with social media technologies to offer virtual reference services for libraries. These include selecting social media platforms such as Facebook, Twitter, Instagram, LinkedIn, and more. Establish APIs and developer accounts, build and set up bots, integrate ChatGPT with the bots, train ChatGPT to answer queries specific to libraries, and maintain a smooth connection.

The integration of ChatGPT into the Reference service is expected to augment the efficacy of a library, given their shown assistance in:

- **Answering Reference Queries:** General reference inquiries like "What are the library's opening hours?" can be promptly answered via ChatGPT.
- **Assistance in searching Catalogues and Resource navigation:** To locate particular books, journals, or other resources in the library catalog, users can ask ChatGPT for assistance.
- **Research Assistance:** Research projects can be guided step-by-step using ChatGPT, which can help with creating research questions, choosing keywords, and recommending pertinent databases and resources.
- **Resource Recommendation:** ChatGPT is capable of making books, articles, databases, and other resource recommendations based on users' interests or study subjects.
- **Help with Citation:** Users can request assistance with citations in several different formats, including APA, MLA, Chicago, and others. Examples and instructions on correctly citing various sources can be found on ChatGPT.
- **Library Services and Policies:** ChatGPT can provide users with information about a range of library services, including interlibrary loans, study room bookings, and access to special collections.
- **Support for accessing Full-Text Articles:** Users can get help from ChatGPT on how to obtain full-text articles via open-access resources or library subscriptions.
- **Multilingual Support**: The multilingual capability of ChatGPT enables non-native speakers and people from other countries to utilize library services. Users can better grasp items that are not in their native tongue by using it to translate words and phrases. Navigating and using library resources is made easier for users when they receive instructions in their preferred language.
- **Subject-Specific Queries**: Users working on particular topics can receive information and guidance that are specifically customized to them.
- **Tutorials and Instructions:** Tutorials on the usage of digital archives, e-book platforms, and database search interfaces are available through ChatGPT.
- **24*7 availability:** Regardless of the library's operating hours, ChatGPT's 24/7 support guarantees that users may get assistance whenever they need it. Customer satisfaction is increased and wait times are decreased when they obtain prompt replies to their questions. It effectively responds to several questions at once.

- **Event and Programme Information:** Users can ask questions about programs, workshops, and activities held by the library.
- **Personalized Help:** ChatGPT can improve user experience and make library services more approachable and user-friendly by interacting with users to offer tailored recommendations and support.

Conclusion

The incorporation of ChatGPT with reference services offered by libraries offers librarians a noteworthy prospect to improve user involvement and assistance. ChatGPT meets the various demands of library users by providing multilingual support and round-the-clock availability, making aid available whenever and wherever it's needed. In addition to increasing the effectiveness of reference services, this technical development creates a welcoming atmosphere that appeals to a worldwide clientele. As libraries continue to change in the digital age, using AI tools like ChatGPT can free up librarians to work on more difficult and specialized projects, improving user experience overall and reaffirming the library's position as a vital community resource. Using ChatGPT represents a progressive approach to library services that welcomes innovation.

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A BLOCKCHAIN-ENABLED SMART LIBRARY MODEL FOR SECURED LIBRARY OPERATIONS IN DIGITAL ENVIRONMENTS

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Introduction

Libraries need to adopt new technologies in the information age tosupply the most information quickly. Libraries must employ cutting-edge technological solutions to improve their operations since digital assets and intellectual property rights are crucial. Blockchain technology has recently gained relevance in a narrow area of business technologies. It is primarily utilized for distributed, time-stamped transaction record verification and storage in a digital trading environment. It can store data in a dispersed, temper-resistant environment.

Blockchain technology validates transactions in libraries without the need for individual institutions or manual verification. It permits transactions by anonymous entities and the trusted flow of resources via a central authority. Blockchain transactions are unchangeable in a library setting and allow for smart contracts, which carry out terms autonomously without a central authority. Blockchain applications are appropriate for a range of library uses. It is difficult to falsify or change library transactions.

Recently, Blockchain technology has compelled libraries to use the available resources effectively. It facilitates data protection, preservation, and dependability in the library setting and can easily collect, store, and disseminate reliable information in a library setting. Blockchain applications for smart library systems (*Suresh & Kiran, 2022)*include digital rights management and scholarly publications, building a metadata system for libraries and data centers, publishing e-books and safeguarding digital first sale rights, research institution networks, and library chain management for transactions.

Blockchain in Smart Libraries

Blockchain technology is dispersed and redundant, which makes it harder for transactions to be copied, forged, or counterfeit (*Abid Hussain, 2021*). *Suresh &Kiran (2022)*looked at its creative uses in libraries now and in the future. According to *Vivien et al. (2023)*, Blockchain technology can potentially improve several library functions,

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including research, data administration, collection development, circulation, and storage. In order to achieve effective library setups, *Jha (2023)*emphasized the use of Blockchain technologies in information centers and libraries. Through the innovative workload-proof technique, a smart library management system built on Blockchain technology can remove the potential of tampering with the library transaction data (*Liu, 2019*). Additionally, with a distinct and secure access mechanism, a Blockchain-based smart library management system (LMS) for online data distribution can eliminate the possibility of manipulation and unauthorized access to library data (*Sharma & Batth, 2022*).The suggested framework allows users to access the database safely and load-free.

Blockchain-based smart cloud service systems (*Yeping Zhen, 2022*) can be helpful for library management and service optimization. It can significantly raise user satisfaction ratings on the service system and enhance the functionality of the smart cloud service system overall. Additionally, *Xiaobo & Jin (2024)*describe how a Blockchain-based smart library service architecture provides a value-added approach for smart library operations including resource sharing, security, and expediting the lending and return of books. It can fulfill readers' growing service needs and raise the standard of resource services. Experiments have been conducted to confirm this method's usefulness and efficacy.

Traditional Library Transactions

*Hu (2022)*claims that while smart libraries might enhance user experience, they may also have security issues with resource gathering, data storage, and information distribution. Library transactions are, by nature, transient in older systems. Most operational data for libraries pertains to patron services and is retained for the time necessary to meet operational needs. Most libraries erase, or at the very least reduce, transactions once the active lending or use activity is over out of concern for patron privacy.

The library must be able to identify the precise person who checks out a book to send circulation alerts and collect any fines or fees for items that are not returned. Upon receipt of the item back, the library has two options: either expunge the transaction from its files or take out any information linking a particular person to it. A variation of this procedure applies to services like interlibrary loans, online access to digital items, reference encounters, etc. Libraries require statistics describing the activity, yet the records of such transactions are seldom kept for long. It appears counterintuitive to remove transactions or to require changes to transactions when they change from identifiable to non-identified formats.

Blockchain technology can be utilized to create a smart value-added service platform that addresses the problems with data storage, resource gathering, and information sharing that an innovative library faces (*Hu, 2022*). Blockchain can collect, store, and distribute reliable information in library environments without posing many technical challenges.

Blockchain Solutions for Smart Libraries

Blockchain technology is an unchangeable ledger system that ensures that once information is entered, it cannot be changed later on without the approval of all the parties in the network. This capability is perfect for overseeing library operations. It can provide the safe storage and retrieval of digital assets, such as e-books, articles, and multimedia materials, reducing the possibility of unwanted additions or removals.

Blockchain makes loan transactions transparent by offering an auditable borrowing and returning activity record. Libraries can easily enforce lending policies, automate lending procedures, and expedite interlibrary loans using smart contracts. This expedites resource access, which lowers administrative overhead and improves user experience.

Proposed System

This article proposes to design a Blockchain-enabled smart library model for secured and protected transactions in library systems. The suggested model can solve the problem of the centralized LMS's low security and efficiency in a distributed environment. The suggested model can offer safe, load-free database access from anywhere.The proposed Blockchain-enabled library model may have various modules such as financial management, digital rights management, the authenticity of cultural heritage,and interlibrary loans and resource sharing.

The suggested model guarantees improved privacy and data security for the library environment. In the Blockchain environment, data breaches can be minimized by storing sensitive data, including transaction details and personal information of library patrons. With a unique and safe access method, the system eliminates the possibility of manipulation and unauthorized access to library data. Data security is ensured while distributing the risk of harm to the central database.

Blockchain Technology

Blockchain framework successfully adopted in libraries to deliver smart library services to patrons. *Shahzad et al. (2024)*offered creative literature on the prospective and difficulties related to Blockchain in the context of librarianship. Blockchain technology is a very new, complex, and trusted technology applied in different areas, including educational institutions and libraries. According to *Kofi Sarpong et al. (2021),*blockchain technology is distributed and immutable, making it hard for transactions to be altered, replicated, or falsified. The ability to lessen the influence of third parties during transactions in a distributed environment has grown significantly over time. Digital signatures and cryptocurrencies (Bitcoin) have drawn much interest. In order to use Bitcoin, real currency must be exchanged for electronic cash at predetermined rates. Individuals on the site are identified via digital signatures.

Blockchain technology can potentially transform the way we conduct business and exchange information. Blockchain technology is "a decentralized, digital ledger

that records transactions securely and transparently."It generates an unchangeable transaction record that is accessible to all network users. This technology can completely transform businesses by offering a transparent and safe business method despite the need for intermediaries.

1. Blockchains are classified as private, public, and hybrid. Each type of Blockchain (public to private, permissioned to hybrid) has unique applications and benefits.
2. Public Blockchain is open to anyone and allows for anonymous transactions. Examples are Bitcoin and Ethereum.
3. Private Blockchain is only accessible to a select group of users and requires permission to access. Organizations can use private Blockchain to store and share sensitive information securely.

Hybrid blockchains integrate aspects of both private and public blockchains. They support private and public transactions based on the user's requirements. Organizations that use a hybrid Blockchain can securely store data while allowing public access to certain information.

Blockchain Applications. Blockchain can be applied to various sectors like finance, healthcare, and supply chain management, including educational institutions and libraries. A Blockchain architecture for smart education (*Palanivel, 2020*) might take advantage of the Blockchain's advantages and simplify the global ecosystem to build a recognized higher education credit system worldwide. They can be used to streamline transactions and reduce fraud, securely store patient data, and track products from production to delivery, ensuring transparency and accountability. As Blockchain evolves, its potential applications will only continue to grow. *Consensus Mechanisms.* Blockchain platforms may include many consensus mechanisms, such as Proof of Stake (PoS), Proof of Capacity (PoC), Proof of Burn (PoB), and Proof of Elapsed Time (PoET).

- *Proof of work (PoW)* is a decentralized consensus method in which network participants must try to decipher a cryptographic puzzle. It is also known as mining, and it involves getting paid for labor completed. It ensures that peer-to-peer (P3P) transaction processing is secure and free from third-party interference. PoW at scale uses a significant amount of energy, which rises when more miners access the network.
- *Proof-of-stake (PoS)* is an alternative to PoW, the original consensus method used to authorize transactions and build new blocks. PoW strategies allow miners to solve cryptographic challenges, while PoS systems demand validators to retain and stake tokens to be eligible for transaction fees. PoS is seen as less harmful regarding the potential for a network assault since it builds compensation in a way that makes an attack less advantageous.
- *Proof of Capacity (PoC)/Proof of Space (PoS).***PoC/PoS** is a consensus mechanism in the Blockchain. PoSrequires separate mining hardware for processing power, and PoW bets miners' currencies differ. PoC enables network members (nodes) to mine a new block and validate transactions using their available hard drive space.

- *Proof of Burn (PoB).*PoB encourages recurring money burning to prevent favoritism between new and existing network users. This implies that the mining power is diminished virtually every time a new block is mined. Additionally, it encourages miners to engage in ongoing transactions instead of one-time investments.
- *Proof of Elapsed Time (PoET).*PoET is a network consensus technique that guards against excessive energy and resource use. To maintain process efficiency, a fair lottery mechanism is implemented.
- *Proof of Importance (PoI).*PoIis employed to ascertain the qualified users who can execute the computations required to append a fresh data block to a blockchain and obtain the corresponding reward.

Distributed Ledgers. Distributed ledger technology is intended to store data for which many robust, scalable commercial solutions are available. This technology can significantly enhance the management and tracking of loaned library materials to their members. It can handle the items checked out or lent to members, the date the borrower is expected to return them, user movement inside the library, data storage, operations, and the parties involved in billing and withdrawing library resources. The library's supply chain management procedure includes these procedures and actions. Using Blockchain technology, managers may keep an unchangeable and permanent distributed record of all borrowing and lending activities while tracking the status of these activities in real-time.

Blockchain in Academic Libraries

Blockchain in education *(Palanivel, 2020)*can achieve greater transparency, credibility, accessibility, and traceability across various use cases like digital credentials, student record management, secure data sharing, content management, and more. It produces new library opportunities by preventing data manipulation of institutions' databases *(Liu, 2019).*Distributed ledgers track ownership and intellectual property rights for various media, including music, film, art, and commodities. Blockchain facilitates the acquisition of materials for libraries that can enhance collection upkeep. It can strengthen data privacy, safeguard member and patron records, and foster better library staff-to-member cooperation.

Blockchain technology is being investigated for its novel applications in many library branches (Sanjay & Nabi, 2020), both now and in the future.Ashwin & Ajay (2020)systematically investigated Blockchain technology and its applications mainly in libraries. According to Manish Verma (2021),blockchain technology can identify plagiarism in library documents. Libraries and information centers may benefit from blockchain technology by improving services now and in the future (Suman & Patel, 2021).

Blockchain-based library applications can help librarians become aware of this disruptive technology and provide guidance on implementing it in their libraries. *Hafijull Mondal (2021)*studied how Blockchain technology is used in contemporary libraries. The following use cases enable the Blockchain scenarios in smart library systems.

Digital Rights Management (DRM) System. Libraries can quickly identify and utilize a DRM solution based on Blockchain technology to secure digital first-sale rights. Writing a paper recognizing digital first-sale rights will include researching this point with a well-regarded copyright expert, which could be a good deal for libraries.

*Enhanced Metadata System for Libraries.*Libraries and other educational institutions can create a genuinely distributed metadata system by utilizing a permissionless, distributed metadata system. Thanks to the system's selective reading and output selection based on hash signing, data quality would be maintained as it scaled neatly.

Peer-to-peer (P2P) Sharing of Resources. The Blockchain-enabled library P2P sharing may facilitate community members' ability to verify the availability of various tools or services for a more effective sharing economy. Blockchain can help make these shared documents more secure by making it more challenging to alter them. P2P examples include promoting community-based collections, fostering collaborations amongst groups, and being linked to a network of libraries. Examples of Blockchain systems for library management are Publica, LibChain, and Orvium.

Results and Discussions

Blockchain technology can be used to design a smart cloud service system that is appropriate for improving services and handling libraries in the distributed environment. This section discusses the proposed model, which comprises the requirements, design goals, model, discussions, and benefits.

Smart Library

A Library Management System (LMS) is a web-based library management solution that can improve library practices through value-added features and services. Presently, LMSs are challenging in distributing library value-added services much more than operational efficiency. It desires to provide patrons with significant staff fulfillment and knowledge skills every time they cooperate with the LMS. The LMS can have the following modules: acquisition, cataloging, circulation, Web OPAC, and serials.

- *Acquisition.*This module allows multi-location (cloud) libraries to integrate centralized procurement to carry out hassle-free tasks like processing invoices according to location and centralized ordering.
- *Cataloguing*. This module allows the library members to search other catalogs (such as Z39.50, SRU-SRW, OAI-PMH, LIBSYS, etc.). The search results can be editable and downloadable. The cataloguer works on a flexible interface (such as MARC21) that flexibly user-defined reports.
- *Circulation.* This module offers circulation by integrating Biometric or RFID devices. This module can alert library members and patrons through regular SMS/e-mail reminders. It is possible for library users to self-loan, self-reserve, and self-renew. With location-based validations and checks, multi-location (cloud) circulation is facilitated.

- *Serials.* This module can handle the earlier/other versions through APIs (such as MARC21). It relates to the Web OPAC and manages all online journals and subscriptions to accommodate the libraries' evolving subscription trends.
- *Web OPAC.* This module emphasizes meeting the needs of the library users. It includes a search/advanced search strategy. Patrons get comprehensive information and allow advanced search in the library databases.

Other features of the LMS are remote login, supporting diverse data (such as text, image, audio, and videos), integration with other networks, etc.

Blockchain-enabled Smart Library

The proposed Blockchain-enabled smart library model, as shown in Figure 1,can avoid missing booking and provide a better solution for advanced book circulation in the smart library environment. It is a practical, traceable, and blockchain-based intra-campus book-sharing program. It reduces the possibility of a book being lost by permanently storing all of the shared information of an authorized book on the blockchain, which allows any library member to track the history of borrowings. It introduces smart contracts to automate the circulation of books with minimal human intervention and improve efficiency in the smart library environment.

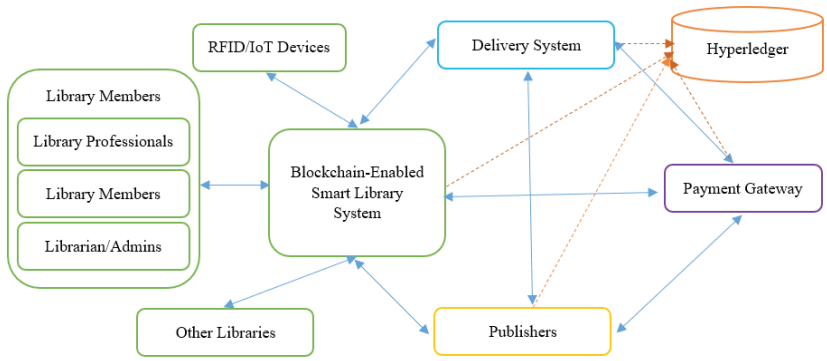


Figure 1: The Proposed Blockchain-enabled Smart Library Model

The proposed method has the potential to significantly raise user satisfaction ratings on the smart cloud service system and enhance the functionality of all system components.

Requirements

The requirements can be functional and non-functional. Blockchain can address requirements for non-functional scalability, ownership, security, interoperability, and reliability.

- *Interoperability.*All data on the Blockchain system are shared across the peer network, and transactions are accessible to all. The Blockchain-enabled library is a worldwide source of truth for all participating libraries and their members.

- *Ownership*. The proposed model does not have a single data owner. Instead, ownership is held by the participating group, which offers a framework for mutually agreeable control.
- *Reliability*. It guarantees that transactions on the blockchain are unchangeable records that can be multiplied and signed.
- *Scalability*. The proposed model is robust to scalability issues because of its distributed architecture.
- *Security.*Library users can digitally sign hashes of sensitive data kept off-chain when necessary. Data can be encrypted using the keys that the appropriate library members possess.

The functional requirements are multimedia and mobile apps, RFID devices, technologies, data sets, etc.

- Multimedia-enabled digital libraries, Mobile Apps with geolocation, and other required technologies must be created and integrated with the library operations.
- RFID tags manage books for automatic issues and returns.
- Smart library architecture can use SDN and RFID technologies for an effective and affordable designover conventional libraries.
- Massive library data sets are put up in data centers (DCs), and VPN and VLAN technologies are used to access them.

Design Factors - New technologies can improve efficiency, inform collection growth, and expedite library operations. As such, library staff members have several essential factors to consider when deciding which digital resources to offer their patrons. Design the Blockchain-enabled smart library model considers various design goals of accessibility, diversity, sustainability, and trustworthiness,

- *Accessibility.*It guarantees that library resources and technology are usable by individuals with various abilities, which is crucial for fostering diversity and fair access to knowledge.
- *Diversity.*Smart libraries offer various resources that reflect users' preferences and passions according to their social groups.
- *Sustainability.*With searchable, current editorial material available in digital format from all over the world, it can assist a library in lessening its impact on the environment by reducing the need for the branch to provide printed copies of prominent publications.
- *Trustworthiness.*It uses a variety of tactics and procedures to guarantee that the resources made available through your branch are reliable.

Unique Features - The unique features of the proposed model are interlibrary loan and digital rights management.

- *Publication Management.*Regarding using resources (books, journals, periodicals, etc.), libraries and their patrons must pay for the complete package instead of only the parts they use. Blockchain-enabled platforms allow authors to publish their books by defining the terms and conditions through a smart contract (Ethereum). Authors

can pre-sell their tokens and generate money for first payments by enabling anyone to buy the book with book tokens.

- *Inter-Library Loan.*With the proposed model, borrowers do not need to visit libraries in person to check out books; instead, they can lend them to other borrowers. The distributed library management system allows users to check out books straight from the library,deprived of returning the original copy to the establishment. The system can facilitate interlibrary borrowing practices. The Blockchain model can provide a library ecosystem where users can quickly, easily, and securely access their desired services.

Modules - The Blockchain-enabled library model may have various modules such as intelligent library management, financial management, digital rights management, the authenticity of cultural heritage, and interlibrary loans and **plagiarism**.

Smart Library Management. The Blockchain-enabled library performs book issue and return, procurement (books, journals, print articles, and online journals), subscription, despatch and delivery, payment, fine calculation and payment, interlibrary loan, etc.

Financial Management. It manages late fees, subscription costs, and other transactions that can be carried out safely and openly. This module increases financial accountability, decreases the possibility of errors, and provides accuracy.

Digital Rights Management (DRM). This module ensures that digital content access is traceable, safe, and compliant with license agreements. Libraries may easily manage digital rights for digital resources, including e-books, audiobooks, and online databases.

Authenticity of Cultural Heritage. This module can maintain authenticity for libraries holding rare manuscripts, old documents, or relics. Libraries can protect cultural assets and stop the spread of fake items to record provenance and ownership histories.

Interlibrary Loans. This module offers a clear and safe record of all loan and borrowing transactions. This can streamline procedures, reduce administrative burdens, and improve library cooperation.

Plagiarism is seen as a breach of editorial ethics and scholastic dishonesty. It can result in sanctions like fines, jail time, expulsion from the workplace, suspension, and more.

Figure 2 presents Blockchain-enabled smart library operations. It comprises smart devices (IoT/RFID and smartphones), Blockchain Apps, library applications (such as LMS, publisher, payment, delivery, and plagiarism), and library resources. Various Apps are connected to the library applications (nodes) through REST APIs.

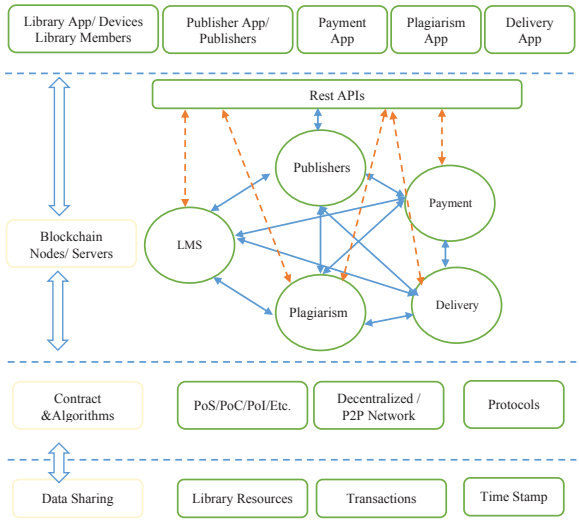


Figure 2: Blockchain-enabled Smart Library Operations

IoT/RFID devices can provide location-based services, guiding library users to specific resources and offering personalized notifications via mobile apps. They provide an innovative solution for disabilities with navigation systems. The IoT/RFID systems allow for the simultaneous reading of multiple RFID tags, accelerating circulation operations' check-out and check-in processes. The patrons can check out multiple items at once and return items directly to book drops equipped with RFID readers, reducing staff workload and enhancing the user experience. IoT/RFID library systems encode the circulation status on the RFID tag, ensuring items are properly checked out before leaving the library. Hand-held inventory readers can quickly scan RFID tags on shelves without the need to remove or tip books, enabling efficient inventory management and identification of misplaced items.

- *Applications.* It includes various client Blockchain Appssuch as LMS, publisher, payment, delivery, and plagiarism for access to the library resources.
- *Blockchain Nodes*. It includes services such as LMS, publisher, payment, plagiarism, and delivery. LMS performs various library services such as book issue/return, cataloging, fine calculation, alerting the members, plagiarism detection, etc. Publishers offer the purchase of resources, payment settlement, and delivery of the resources. The delivery channel performs the delivery of resources and alerts the library members.
- *Contracts and Algorithms*. It comprises Blockchain platforms (Ethereum and Definity) and algorithms (PoW, PoC, PoI, etc.)
- *Data Sharing*. It shares various library resources with timestamps and allows the creation of chains.

The proposed Blockchain model is an inherently sustainable operating model,

with community members sharing access to the same resources. It saves money by allowing numerous users to share books, periodicals, and DVDs instead of buying duplicates of these resources. This minimizes waste and boosts energy efficiency by lowering material use and encouraging resource reuse.

In this scenario, Smart Contracts enable the LMS to reduce its inventory by issuing, returning, fine payments, and issuing no dues directly from the CheckOut/CheckIn Kiosk to the member. The library members have registered their details in the LMS portal. A Smart Contract sends the smart devices, mobile number/e-mail, membership IDs, etc., to the library database. The workflow of book issue, book return, fine payment, and no dues, as per the below flow:

Book Issue Transaction

1. Library members log into the Smart Library portal using the LMS App with their credentials using two-factor authentication methods (passwords and OTP). They search the required books and their locations using Web OPAC.
2. They place their membership cards with RFID-enabled books in the CheckOut Node.
3. The LMS system sends an OTP to their smart devices/phones. After entering the valid OTP, the borrowed books were transferred to their accounts.
4. The Node/the library professional approved the book lending transactions after verifying the library's stock.

Book Return Transaction

1. Library members place the borrowed books in the CheckIn Node.
2. The LMS system checks the due date.
3. If there are no dues, LMS sends an OTP to their smart devices/phones. After entering the valid OTP, the borrowed books were transferred to their accounts.
4. the fine calculation module will be activated if there are any dues.
5. The CheckIn Node/the library professional approved the book lending transactions after verifying the library's stock.

Acceptable PaymentTransaction

1. The LMS system calculates the fine and sends this information to the library members via SMS/e-mails.
2. The library members'payment gateway processes the financial transaction.
3. After a successful financial transaction, the library professional allows a return of books in the CheckIn Node.
4. The library professional approved the book returning transactions after verifying the library's stock.

Issue No DuesTransaction

- The library members apply the No Dues through the LMS App.
- The LMS checks the dues and approves the request.
- The LMS system generates the No Dues with the timestamp and dispatches it to the library members.

All the above transactions are made available in the Hyperledger (Cloud) in an immutable manner. Figure 3 shows how the transactions are created and stored in the Hyperledger.

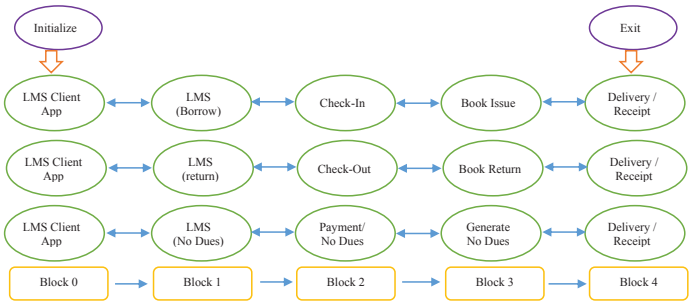


Figure 3: Creation and Storing of Transactions in the Hyperledger.

*Benefits and Challenges***.**Increasing digital access to library resources can reduce the need for physical materials and transportation. This includes digitizing collections, offering eBooks and online databases, and library resources accessible remotely. The advantages of the proposed model are accountability, decentralization, non-tampering, and consensus mechanisms. However, the challenges and considerations associated with the system are cost and infrastructure, training, integration, regulatory compliance, etc.

- *Cost and Infrastructure.* It requires high investment in technology infrastructure and ongoing maintenance. Smaller libraries may have difficulties in adapting this technology due to possible fiscal constraints.
- *Integration*. Integrating Blockchain with LMSs can be complex. Libraries must ensure compatibility and seamless integration to avoid disruptions.
- *Regulatory Compliance*. Libraries must navigate legal and regulatory frameworks related to data protection and privacy when implementing blockchain solutions in a distributed manner.
- *Training*. Patrons and library staff need training to understand and use blockchain-based library systems.

Use Cases: The real-time examples are Libraries in South Korea and Stuttgart Public Library in Germany.

- In South Korea, some public libraries are exploring Blockchain to enhance transparency in the donation process (*Lee Jaekyuet al., 2018*). Blockchain records and verifies donations, ensuring that funds are allocated appropriately and that the process is transparent to donors.
- Stuttgart Public Library is piloting a Blockchain to certify diplomas(*Castro et al., 2021*). By recording diploma information on the blockchain, the library aims to create a secure and verifiable system for credential verification.

Discussions

Advancements in technology impact library sustainability by addressing economic, social, and environmental challenges through improved IT practices and enhancing information services for patrons. Libraries use author profiles in databases, citation systems, web catalogs, retro-cataloging, digitizing collections, and the Open Science communication channel to promote the outcomes of scientific endeavors. Policies that shape and grant access to global library resources facilitate collaboration between scholars from different countries.

Blockchain technology is ideal for managing library operations in a distributed environment. Digital assets can be securely stored and accessed through blockchain platforms, mitigating the risk of unauthorized alterations. It facilitates transparent lending transactions, providing an auditable trail of borrowing and returning activities. By leveraging smart contracts, libraries can automate lending processes, streamline interlibrary loans, and enforce lending policies seamlessly. By distributing cataloging tasks across a network of participants, libraries can ensure redundancy and integrity in their metadata records, safeguarding cultural heritage for future generations.

Blockchain can enhance the traceability and provenance of digital assets through robust governance frameworks to address privacy concerns and compliance with copyright laws. Libraries must navigate the delicate balance between accessibility and protection, ensuring that blockchain solutions uphold ethical standards and respect the rights of content creators. However, integrating blockchain in libraries raises essentialintellectual property rights, copyright management, and digital preservation considerations.

Future Works

Library professionals are looking to provide various services for diverse problems in the vast and unexplored field. Blockchain technology may help to create decentralized libraries rather than centralized library databases. Members of the library can manage their borrowing history and circulation information. The development opportunities of 5G (*Li Jiahui et al., 2020)*promoted the application of 5G in the library field. Hence, the future of the library may be tied to the technological development of Web 4.0, characterized by convergence, re-mixability, standardization, participation, usability, economy, and design. Future smart libraries may be designed based on 5G mobile Internet, digital twin, and metaverse technologies for real-time transactions, tracking, and visualizations.

Conclusion

Due to the widespread adoption of technology, libraries worldwide need to reposition themselves in the present day of digital transformation to continue providing valuable information services and remain relevant in the lives of the public. Additionally, libraries require creative digital transformation to maintain current information services and boost their effectiveness in using information as a fragment of their directive to exploit digital technology systems. As a result of digitization, the spread of the Internet, and technical improvement, teaching and learning are now conducted in different ways.

Blockchain technology can potentially transform library administration procedures completely. Libraries may redefine digital preservation and intellectual property management while improving the security, transparency, and accessibility of their collections by embracing Blockchain. It can embrace the digital era and work to preserve knowledge and promote innovation in the intelligent libraries and information ecosystem.

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ASSESSMENT OF KNOWLEDGE, PERCEPTIONS, AND CHALLENGES ON THE USE OF ARTIFICIAL INTELLIGENCE TOOLS AMONG ACADEMIC FRATERNITY

Dr. M. Panduranga Swamy[1], Dr. D. Gnanasekaran [2], & Dr. Vineeta Jain[3]

Introduction

In the year 1989, McCarthy coined the term Artificial Intelligence (AI) to refer the idea of making intelligent machines to substitute humans for performing complex tasks. This term has now become very familiar among professionals in almost all fields. McCarthy first used the term artificial intelligence (AI) in 1989 to describe the concept of creating intelligent machines to take the place of people in difficult activities. Professionals in nearly every field are now highly familiar with this word.

Being integrated with AI technique, the hardware machines like computers and robots can perform intelligent tasks that are typically completed by humans (Ranschaert et al., 2019). These applications include education (Niloy et al., 2024), information retrieval, business, e-commerce, providing helpful services (Shawar & Atwell, 2007), clinical practice (Hardy, 2019; Lewis, Gandomkar, and Brennan, 2019), speech recognition, customer service, computer vision, anomaly detection, supply chain, weather forecasting (IBM, 2024), engineering, medicine, and dentistry (Sur et al., 2020; Sajjad et al., 2021), and so forth.

The teaching and learning processes in academic and research institutions have been impacted by recent advancements in AI. The academic community has come to know AI as a speedy solution to problems (Masa'deh, 2024) and its tools are used for coding, data analytics, language processing, machine translation, generating text, audio, and video material, and more. AI tools are being used by faculty members and students as an addition to enhance the teaching and learning processes.

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Related Works

The value of AI technologies has already been the subject of numerous studies. In 2020, Ali, Naeem, and Bhatti evaluated the usage of AI tools for user support in Pakistani university libraries. AI-based services like voice search, text data mining, Google Translate, and assistant are utilized in libraries, and librarians are aware of these technologies. People are not aware of chatbots and robotics. A survey of Canadian vascular surgeons' opinions on artificial intelligence and machine learning (AI/ML) was conducted by Li, et al. in 2022. According to the findings, half of the respondents are either extremely poor or impoverished, have no awareness of AI/ML, and are keen to understand the idea. In their survey of the application of AI concepts in radiography practices, Akudjedu, et al. (2023) evaluated the knowledge, attitudes, and expectations of radiography professionals around the globe regarding AI. They concluded that appropriate training is necessary for the professionals to guarantee the implementation's safe and successful application. In their examination of dental professionals' attitudes, perceptions, and barriers regarding the use of AI tools, Singh et al. (2023) and Dashti et al. (2024) concluded that while students are aware of AI, they still need access to technical resources and sufficient training to fully realise its potential benefits. According to Chowdhury et al.'s (2024) investigation, six variables have a beneficial influence on university students' use of ChatGPT. The study recommended developing a strategy to maximise ChatGPT's application in educational settings. Masa'deh (2024) assessed the factors influencing students' attitudes towards adopting and using ChatGPT for learning at a Jordanian university using the Technology Acceptance Model (TAM) and discovered that there was a positive influence on students' attitudes towards ChatGPT adoption and usage. Steiss (2024) compared the essays written by the students to the quality of feedback provided by ChatGPT and human raters and discovered that the former was generally better in terms of criteria-based feedback, precise instructions for improvement, accuracy, prioritising crucial features, and a supportive tone. In every aspect, ChatGPT's input was superior to the typical human evaluation in terms of quality, while assessments from highly qualified evaluators were of a higher calibre. The impact of AI-based social learning networks on Saudi university students' learning environments was investigated by Saqr et al. in 2024, and the findings are statistically significant in the positive direction.

The reviews above highlight the research done to gauge the knowledge of AI among librarians, medical practitioners, and other professionals. Students' opinions regarding ChatGPT have also been assessed. There are numerous AI-based solutions available for use in educational settings. Thus, the study aims to assess the use, knowledge, and perception of academic fraternity about various AI-based tools in academic institutions.

Materials and Methods

A Google Docs form was used to create an online survey that was then distributed to members of the academic community, including faculty members, scholars, and students at select universities in the states of Andhra Pradesh and Tamil Nadu. Between

March 17 and April 15, 2024, the respondents were sent the questionnaire to collect data on their familiarity with and use of artificial intelligence (AI) products. Demographics, awareness, the rationale behind employing AI technologies, the duration of time spent using them, the requirement for training, etc. were all covered by the questionnaire. Microsoft Excel was used to assess the gathered data.

Objectives

The study started with the following objectives.

- To find the channels of knowledge on AI
- To ascertain the mode of training the respondents took to get working knowledge of AI tools.
- To examine the awareness of various AI tools among the respondents
- To assess the purpose of using AI tools by the respondents
- To identify the availability of AI policy in the institutions
- To evaluate the impact of AI tools in the academic and research activities.
- To identify the challenges experienced by the respondents in using AI tools and their results.

Results

The online questionnaire was circulated among the academic fraternity in select universities in Andhra Pradesh (A.P), Tamil Nadu (TN) and Uttar Pradesh (UP). A total of 224 replies were received, of which 71 (31.70%) came from faculty members, 117 (52.23%) from students, and 36 (16.07%) from research scientists. of these, 143 (63.84%) are male and 81 (36.16%) are female replies. of the respondents, 99 (44.20%) are urbanites, 72 (32.14%) are semi-urbanites, and 53 (23.66%) are from rural areas.

Channels of Knowledge

The features of the AI knowledge channels are given in Fig. 1. of the different avenues via which information about AI is available, the majority of respondents learned about it from the internet (67.41%), friends and seniors (48.21%), seminars, conferences, and webinars (42.41%). In terms of teaching about AI, faculty members (29.46%), and parents and relatives (6.25%) had very little influence.

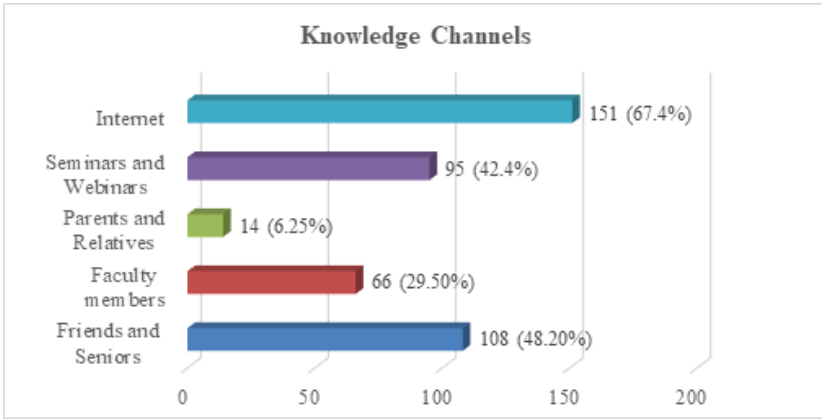


Fig.1 Channels of Knowledge for AI

Training Undergone for AI

A total of 142 respondents have increased their understanding about artificial intelligence by participation in training courses offered through a variety of venues, including academic training, webinars and seminars, and self-study. The information regarding the training method used to teach the respondents about artificial intelligence is detailed in Fig. 2.

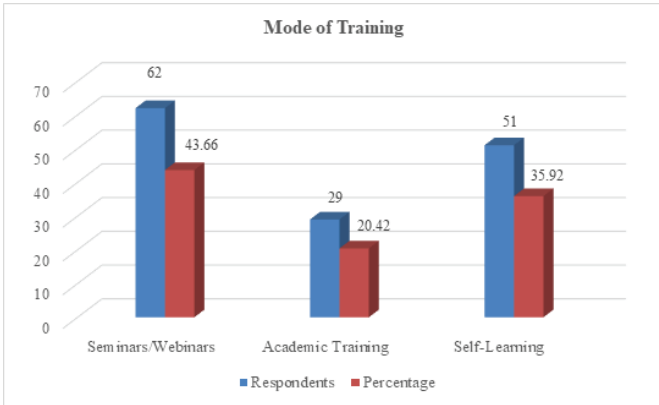


Fig.2 Mode of Training

Familiarity on AI

In order to assess their knowledge with AI ideas, the respondents were asked to score their answers on a five-point scale. Based on the replies we obtained, we were able to determine that roughly 54.01% of respondents were somewhat familiar with AI principles, 27.68% were not very knowledgeable, 16.52% were very familiar, and 1.79% were not familiar at all. The specifics can be seen in Figure 3.

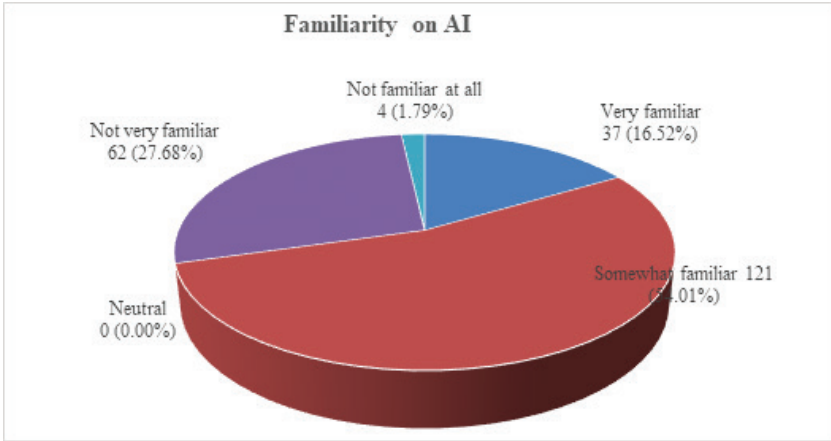


Fig.3 Familiarity on AI

Awareness on AI Tools

AI tools come in a variety of forms and are useful for many tasks. The specifics of the various categories of AI technologies and the respondents' awareness of them are shown in Table 1.

Table 1 Awareness on AI tools among the respondents

S. No.	AI tools	Respondents (N=224)	Percentage
1	AI chatbots (e.g. ChatGPT, Bing Copilot, Bard, etc.)	208	92.86
2	Plagiarism tools (e.g. Grammarly, DrillBit, Copyleaks, Turnitin, etc)	144	64.28
3	Search engines (e.g. Duckduckgo, Wolfram Alpha)	129	57.58
4	Literature Review (e.g. LazyScholar, Researchrabbit.ai, Consensus, etc.)	129	57.58
5	Machine translation (e.g. Google Translate, DeepLearning, etc)	111	49.55
6	Speech recognition/speech-to-text/dictation tools (e.g. Apple Voice Control, Dragon, Whisper, etc.)	73	32.58
7	Text or code generation (e.g. Llama 2, GPT-4, Mistral, Claude, etc.)	64	28.57
8	Predictive analytics tools (e.g. SAS Viya, IBM SPSS, H2O.ai, etc.)	46	20.53

Around 92.86% of those surveyed are familiar with AI chatbots. Among the most popular chatbots are Bard, Bing Copilot, and ChatGPT. According to Mageira et al. (2022), chatbots are proficient in providing instructional materials, engaging in dialogue with students, and providing prompt feedback. The respondents know more about AI plagiarism tools (64.28%), search engine and literature review tools (57.58%), machine translation (49.55%), and other related topics than they do about chatbots. A meagre of the respondents are aware of the tools for speech recognition (32.58%), text/code generation (28.57%), and predictive analytics (20.53%).

Purpose of Using AI Tools

AI tools are employed to reduce the workload associated with different tasks. The specific goals for which the AI tools are utilised are indicated in Table 2.

Table 2. Purpose of Using AI Tools?

S. No.	Purposes of using AI tools	Respondents (N=224)	Percentage
1	Writing research papers & Data Analysis	142	63.39%
2	Literature review	121	54.02%
3	To improve language and coherence	118	52.67%
4	Analyze and summarise the large amounts of information	112	50.00%
5	Creating presentations	104	46.42%
6	Interactive learning modules	85	37.98%
7	Translation capabilities in multiple languages	64	28.57%
8	Grading student work	56	25.00%

According to the study, the vast majority of respondents use AI technologies for their research. 63.39% of the respondents are using the tools for writing research papers and data analysis; 57.58% are using them for literature reviews; 54.02% are using them to improve their language skills; 50.00% are using them for summarising and analysing large amounts of data; and 46.42% are using them to create presentations.

Availability Institutional Policy on AI Tools

Establishing a policy for the use of AI tools would be crucial for any institution to avoid the negative effects of overusing or abusing these tools for research and academic purposes. In order to determine whether AI policy was available at their institution, the respondents were asked to mark their answers. There were three possible answers to the question: 1) Yes, 2) No, and 3) I'm not sure. Figure 4 shows that about 18.30% of respondents said their institution has a policy, 28.57% said their institution does not, and it is surprising to learn that the majority of respondents (53.13%) are unaware that the policy is available at their institution. It is understood from these responses that the respondents are unclear about the availability of the policy at their institution.

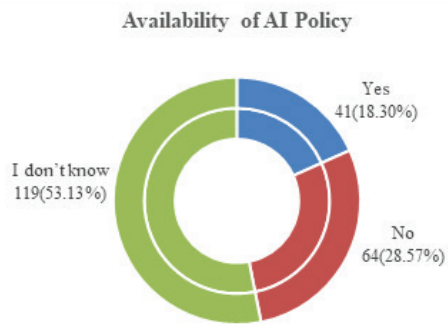


Fig.4 Availability of AI Policy

Impact of Using AI Tools

The question, "How has using AI tools impacted your productivity and output?" was posed to the responders. Four options were presented to them: 1) significantly impacted; 2) moderately impacted; 3) minor impact; and 4) no impact. It was discovered that 43.75% of the respondents reported being moderately impacted; significant impact (33.93%) and slight impact (18.75%) followed. According to 3.57% of the respondents, the use of AI tools has had no effect on their research and academic output productivity. The impact of applying AI technologies on productivity and output is detailed in Fig. 5.

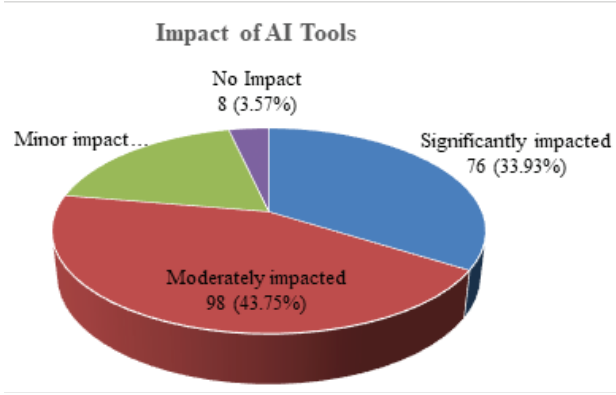


Fig.5 Impact of AI Tools

Challenges experienced in using AI tools

Respondents were presented a series of questions and asked to rate their answers on a three-point scale in order to examine the issues they had with using AI techniques. The specific difficulties that the respondents encountered when utilising AI tools are shown in Table 3. A little over 86 (38.39%) of the respondents reported getting findings that were skewed or incorrect. 60 (26.79%) of the respondents said that there is a lack of transparency and explanation in the outcomes produced by AI techniques. According to over half of the respondents (50.89%), utilising AI tools for research and academic reasons causes people to become overly dependent on AI and lessens their capacity for critical thought. A little over 83 (37.05%) of the respondents reported having privacy and security concerns when utilising AI solutions. 68 (30.35%) respondents experienced the difficulty in integrating the AI output in with the existing workflows.

Table 3. Challenges Experienced in Using AI Tools

S. No.	Concerns Experienced in Using AI Tools	Agree	Neutral	Disagree
1	Biased or inaccurate outputs	86 (38.39%)	99 (44.20%)	39 (17.41%)
2	Lack of explaining ability and transparency	60 (26.79%)	113 (50.45%)	51 (22.77%)
3	Overreliance on AI and reduced critical thinking	114 (50.89%)	87 (38.84%)	23 (10.27%)

4	Security and privacy issues	83 (37.05%)	112 (50.00%)	29 (12.95%)
5	Difficulty in integrating with existing workflows	68 (30.36%)	124 (55.36%)	32 (14.29%)

Conclusion

The purpose of the survey was to find out how respondents felt about utilising AI tools and how it affected their academic and research endeavours. Online resources are a great way to learn about AI tools, and webinars, workshops, and seminars are the best ways to receive training. Merely 1.79% of the participants expressed unfamiliarity with AI techniques. The remaining 98.21% are acquainted with the, with familiarity ranging from not very familiar to very familiar. The tools are primarily used for writing research papers, reviewing literature, and detecting plagiarism. It has been observed that the productivity of AI tools is significantly impacted by these uses. Conversely, the participants reported encountering certain difficulties in utilising AI products and their level of productivity. It is also acknowledged that the respondents' ignorance of the AI policy's accessibility at their institution exists. In light of the results, it is recommended that universities develop well-defined AI policies for their academic and research community on how to use AI tools and optimize their application for learning, research, and other objectives while upholding ethical standards.

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THE TRANSFORMATIVE POWER OF AI: REIMAGINING LIBRARIES IN THE DIGITAL AGE

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Introduction

In recent decades, Artificial Intelligence (AI) has profoundly reshaped our world and the way we think, act and make decisions (Vysakh & Babu, 2020). Leading organizations such as Google, IBM, Amazon, Netflix, and Expedia have increasingly embraced various facets of machine learning and artificial intelligence to enhance their offerings. Moreover, across diverse sectors including healthcare, education, meteorology, commerce, finance, agriculture, and governmental and non-governmental agencies worldwide, there is a growing interest in leveraging these technologies. Their adoption aims to simplify and neutralize workload, increase and speed up productivity, reduce human interaction and most importantly lead the digital-world in a smart and sophisticated way.

Libraries have historically served as gateways to knowledge, evolving alongside technological advancements. From the papyrus scrolls of ancient Egypt to the digital databases of today, libraries have constantly adapted to meet the information needs of their patrons. In the current digital age, Artificial Intelligence (AI) emerges as a powerful tool with the potential to significantly reshape libraries.

AI encompasses a range of technologies that enable machines to simulate human intelligence, including learning, problem-solving, and decision-making. By applying AI within libraries, we can create a more dynamic and user-centric experience, fostering deeper engagement with information resources. This paper investigates the diverse applications of AI in libraries, analyzing its impact on both user services and internal operations.

Getting to know AI terminology

Below are some key terms to know for developing competency in AI technologies, and some of their applications.

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Machine Learning (ML)

Machine learning is like teaching computers to learn from examples and experiences, rather than programming them with specific instructions for every task. In machine learning, computers analyze data, recognize patterns, and make decisions or predictions based on what they've learned.

Neural Networks

A kind of machine learning that analyses data and discovers patterns by simulating the functioning of the human brain. It can be used for big dataset analysis as well as for learning and forecasting user behaviour.

Natural Language Processing (NLP)

Computer-human language interaction. Can support search functions and text analysis such as topic modeling, sentiment analysis, named entity recognition.

Language Models

Algorithms for understanding human language. Can enhance library information retrieval, text summarization, and support user assistance chatbots.

Computer Vision

Machine learning for interpreting visual data. Can be applied in digitizing library materials or for advanced image-based searches.

Topic Modeling

A statistical model to discover topics in text-based documents. Useful for organizing digital collections, enhancing metadata, and improving scholarly search tools.

Generative AI

Algorithms, such as ChatGPT, trained on a model of language (text), audio or visual data that creates new text, image, or audio outputs, based on user instruction (prompts). Language-based generative AI assists in summarizing, revising, translating, or developing new texts, while image or sound-based generative AI can be applied to create illustrations, data visualizations, or synthesized music. Multi-modal generative AI algorithms use text to create images (Jenkins and Zhang, 2024).

AI-powered Information Access and User Experience

Natural Language Processing (NLP)

One of the most significant applications of AI in libraries is Natural Language Processing (NLP). NLP allows computers to understand the nuances of human language, enabling them to interpret search queries with greater accuracy.

The goal is to enable natural languages such as French, English, or Chinese, to serve either as the medium through which users interact with computer systems or as the object that a system processes. In libraries, NLP can be used to design intelligent expert reference system or information retrieval system, where users can interact directly with the system using natural languages. The computer takes in the natural language as input, analyses and processes it, then respond accordingly with the needed information. NLP has been used as medium of interaction

in database management systems and as object/input for processing in automatic text translation or text summarization (McGraw-Hill Encyclopedia of Science and Technology, 2007).

Traditionally, library catalogs relied on keyword-based searches, often leading to irrelevant results or missed opportunities for discovery. NLP-powered search engines can comprehend the intent behind a user's query, even if phrased ambiguously, and deliver more relevant and comprehensive results.

For example, a user searching for "causes of the French Revolution" might receive not only factual information but also primary source documents, biographies of key figures, and multimedia resources. This enriches the research experience by providing a broader context and diverse perspectives.

Improved Information Retrieval

AI-powered algorithms enhance the efficiency and accuracy of information retrieval. By analyzing vast amounts of data and user behavior, AI systems can generate more relevant search results, helping students and researchers find the resources they need quickly and efficiently. This saves valuable time and improves the overall user experience (Chiancone, 2023).

Recommendation Systems

AI-powered recommendation systems personalize the library experience by suggesting resources tailored to individual user preferences. Similar to recommender systems used in e-commerce, libraries can leverage user borrowing history, browsing behavior, and ratings to suggest relevant books, articles, and databases. This not only helps users discover new and interesting materials but also streamlines their research process by filtering through vast amounts of information.

Chatbots and Virtual Assistants

Chatbots powered by AI can act as virtual assistants, providing real-time assistance to library patrons. These chatbots can answer basic reference questions, guide users towards relevant resources, and even schedule appointments with librarians. This not only extends library services beyond traditional operating hours but also offers a convenient and accessible way for users to get help, particularly for those who might be hesitant to approach a librarian directly.

These virtual assistants offer round-the-clock support, improving the overall user experience and ensuring that students and researchers receive prompt assistance (Chiancone, 2023).

AI for Streamlined Library Operations

Automating Repetitive Tasks

Libraries contend with numerous repetitive tasks, such as cataloging new acquisitions, managing overdue books, and generating reports. AI-powered automation tools can streamline these processes, freeing up librarians' valuable time to focus on higher-level tasks such as user engagement, collection development, and programming.

For instance, AI can automatically categorize and tag new books based on content analysis, significantly reducing the time required for manual cataloging. Similarly, AI can handle overdue book notifications and renewals, reducing the administrative burden on library staff.

Predictive Analytics

AI-powered predictive analytics can analyze user borrowing patterns and resource usage to anticipate future needs. This data-driven approach allows libraries to optimize resource allocation, ensuring that in-demand materials are readily available. Additionally, predictive analytics can identify potential equipment failures and schedule preventive maintenance, minimizing downtime and ensuring smooth library operations. By analyzing usage patterns, AI algorithms can provide insights into resource utilization, enabling libraries to optimize their collections, allocate budgets more effectively, and tailor their services to meet the needs of their users (Chiancone, 2023)..

Accessibility for Patrons with Disabilities

AI presents exciting possibilities for enhancing library accessibility for patrons with disabilities. Text-to-speech conversion tools powered by AI can allow visually impaired users to access ebooks and digital resources through audio formats. Additionally, AI-powered captioning can transcribe video lectures or presentations, making them accessible for users with hearing impairments. These advancements promote inclusivity and create a more welcoming environment for all library users.

Example Use Cases of AI in Libraries

Libraries worldwide are exploring innovative ways to enhance their services and operations. One such innovation that is gaining traction is the integration of Artificial Intelligence (AI) into library systems. In this article, we will explore some real-world examples of how AI is being harnessed in libraries, demonstrating the potential of this technology in transforming the library landscape.

Library of Congress

Machine learning is used by the Library of Congress to store digital data. In order to facilitate access and use, machine learning algorithms help to classify and organize digital materials.

Stanford University Libraries

In 2018 the SUL Artificial Intelligence Studio was set up by Stanford University Libraries with a view to promoting projects where applications of AI can help staff process information more effectively and enable collections to be discovered and accessible for researchers.

University of Rhode Island

In 2018, the University of Rhode Island opened an artificial intelligence lab in its Main Library to give students and faculty a chance to do research, as well as examine how these emerging technologies are affecting society, ethics, economics, or art.

Stanford University Libraries

In demonstrating the potential of artificial intelligence for the digitisation and preservation of historical records, the University Library used speech recognition software to transcribe audio cassettes from the collection of the late poet Allen Ginsberg (Chiancone, 2023).

According to Murphy (2015), space constraints and the accessibility of information resources for users are being exploited by robotics technology. An example is the giant robotic storage and retrieval systems that Sydney University of Technology has acquired. The system, designed as robotic cranes underneath the library, tend to thousands of closely packed bins of books. Robotic cranes are utilised for the storage and retrieval of materials from an Online Book Catalogue that users can use on their own.

The China-Singapore Friendship Library, which officially opened in November 2018, has successively launched smart applications such as welcoming robots and service robots, Nanjing University Library: It is a smart book inventory robot based on UHF RFID and can efficiently inventory, autonomously find books and autonomously charge.

Since its formal opening in November 2018, the China-Singapore Friendship Library has included a number of intelligent initiatives, including service and welcome robots. Nanjing University Library: It is an efficient book inventory robot that uses UHF RFID technology to locate books on its own and charge itself (Li and Wang, 2021).

Using high-density automated shelf technology, BookBot, the robotic book delivery system at North Carolina State University's Hunter Library, can hold up to 2 million books and deliver any item within five minutes of a user clicking on the online catalogue. (Kushins, 2018).

At the Johns Hopkins University Library in the United States, the innovative Work Robotics Project (CAPM) automatically retrieves books from the shelves and transports them to a scanning station outside the bookshelf. (Choudhury S, Lorie M, Fitzpatrick E, et al., 2019). In addition, LIB-100B, the book loss prevention intelligent terminal of the Library of Southwest University of China, the Automatic Access Center (ARC) of the Villard Merlot Library, and the AVG of the Humboldt University Library in Germany, are bold innovations of intelligent warehouse management of libraries, and also the future development direction of intelligent warehouse management of libraries (Yu et al., 2019).

Challenges and Considerations

Despite its transformative potential, the adoption of AI in libraries poses several challenges and ethical considerations, including:

- **Privacy and Data Security:** AI systems may collect and process sensitive user data, raising concerns regarding privacy, data protection, and cybersecurity.
- **Bias and Fairness:** AI algorithms may perpetuate biases present in training data, leading to unfair treatment and discrimination in resource recommendations and user interactions.
- **Transparency and Accountability:** The opacity of AI decision-making processes raises questions regarding transparency, interpretability, and accountability, necessitating greater transparency and algorithmic accountability mechanisms.
- **Digital Divide:** Unequal access to AI-enabled technologies may exacerbate existing disparities in information access and digital literacy skills, widening the digital divide among library users.

This section critically examines these challenges and proposes strategies for mitigating risks and upholding ethical principles in the adoption and deployment of AI in libraries.

Future Trends and Prospects

Looking ahead, this section identifies emerging trends and future prospects in the application of AI in libraries, including:

Advancements in AI Technologies: Continued advancements in AI technologies, such as deep learning, reinforcement learning, and natural language understanding, are expected to further augment the capabilities of AI systems in libraries.

Integration of Augmented Reality (AR) and Virtual Reality (VR): The integration of AR and VR technologies with AI holds promise for creating immersive and interactive library experiences, enabling virtual tours, collaborative learning environments, and enhanced information visualization.

Ethical AI Frameworks: The development and adoption of ethical AI frameworks and guidelines tailored to the library context will be crucial for ensuring responsible and equitable use of AI technologies in libraries.

Collaborative Partnerships: Collaboration among libraries, technology vendors, policymakers, and researchers will drive innovation and best practices in the application of AI in libraries, fostering knowledge sharing and capacity building.

This section concludes with reflections on the transformative potential of AI in shaping the future of libraries and the imperative of embracing ethical principles and inclusive practices in harnessing AI for the betterment of library services and society at large.

Conclusion

In conclusion, this paper underscores the transformative impact of AI on libraries, from enhancing access and efficiency to enriching user experiences and advancing knowledge discovery. It highlights the myriad opportunities afforded by AI technologies while acknowledging the challenges and ethical considerations inherent in their adoption. By critically examining current applications, assessing their impact, and envisioning future trends, this research contributes to a deeper understanding of the role of AI in shaping the future of libraries as vibrant hubs of knowledge and innovation.

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ENHANCING RESEARCH WITH AI: TOOLS FOR IMPROVED EFFICIENCY AND ACCURACY

Vidya Vinod[1], Dr. R. Jeyshankar[2] & Dr. Seeja. K. R[3]

Introduction

Artificial intelligence (AI) is increasingly recognized as a pivotal tool in various academic and professional fields, profoundly transforming research methodologies and practices. This study explores the integration of AI technologies in research, emphasizing their potential to enhance and streamline the research process. By concentrating on ten critical areas such as literature search and citation management, research topic exploration and hypothesis generation, document summarization, data analysis, data visualization, mind mapping, ethics and bias detection, writing assistance, plagiarism checking, and search engines. This investigation underscores the capacity of AI to augment productivity and accuracy in research activities.

The incorporation of AI in research methodologies not only facilitates the efficient handling of vast datasets and complex analyses but also enables the generation of novel insights and hypotheses. AI tools provide robust support in managing and analyzing data, identifying patterns, and automating routine tasks, thus freeing researchers to focus on more creative and strategic aspects of their work. Furthermore, AI enhances the quality and reliability of research outputs by providing advanced tools for data visualization, ethical analysis, and bias detection, ensuring that research processes adhere to high standards of integrity and ethical considerations.

By leveraging AI technologies, researchers can significantly improve their workflows, increase the precision of their analyses, and address complex research questions with greater efficacy. The integration of AI into research practices promotes innovation and contributes to the development of more rigorous, unbiased, and ethically sound research outcomes. This study highlights the transformative potential of AI in research, advocating for its broader adoption to advance academic and scientific inquiry.

The 10 key areas where AI tools are considered in this study are

1. Literature Search and Citation Management
2. Research Topic Exploration and Hypothesis Generation

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3. Document Summarizer
4. AI Tools for Data Analyzing
5. AI Tools for Data Visualization
6. Mind Mapping Tools
7. Ethics and Bias Detection
8. Writing Assistance
9. Plagiarism Checking
10. Search Engine

Literature Search and Citation Management

Literature searches and managing citations can be daunting tasks, but with the introduction of AI tools which help in Literature Search and Citation Management there is no need of endless search for related articles and documents for the research. AI-powered tools can help researchers find relevant academic papers, scholarly articles, and even analyse citations to identify the most impactful sources. Consider a technology that makes research paper recommendations depending on your topic and facilitates the easy organisation of your references. AI can help researchers quickly gather and summarize relevant literature on a topic, saving time and providing a comprehensive overview of existing knowledge.

Some popular examples are

Mendeley: This free reference manager offers a one-stop shop for your research needs. Mendeley helps you search for academic papers across various databases and even integrates with some library catalogues. It allows you to import and organize PDFs, add notes and annotations, and collaborate with colleagues. Plus, Mendeley boasts a powerful citation management feature that automatically formats your bibliography in various academic styles (Mendeley - Reference Management Software, n.d.).

Zotero: Another free and popular option, Zotero is a reference manager that seamlessly integrates with your web browser. With Zotero's browser extension, you can easily add references to your library from online databases, websites, and even PDFs. Similar to Mendeley, Zotero allows you to organize your research, add notes, and collaborate with others. It also integrates with popular word processing software for effortless in-text citation and bibliography creation (Zotero | Your Personal Research Assistant, n.d.).

EndNote, Semantic Scholar,Enango Read, Connected Papers, Scite, Scispace, Scholarcy, Consensus, Research Rabbit, Elicit, and Papers, are other examples of AI tools for Literature search and Citation Management.These are just a few examples, and there are many other literature search and citation management tools available. Some universities and colleges might even offer free licenses to specific software for their students and faculty. Consider factors like cost, features, ease of use, and your specific needs when choosing the right tool for your research endeavours.

Research Topic Exploration and Hypothesis Generation

AI can help researchers generate new hypotheses based on existing data and knowledge, providing valuable insights and potentially leading to new discoveries. AI tools can analyze vast amounts of information to suggest relevant topics, identify potential research gaps, and even suggest hypotheses to explore.

Lexalytics: This AI-powered tool analyzes vast amounts of text data, including research papers, articles, and news sources. It can identify emerging trends, relationships between concepts, and potential research gaps. By analyzing this information, Lexalytics Semantify can suggest relevant research topics and even highlight potential areas where new knowledge could be discoveredLund and Lund (2022).

Enago: Bhosale and Bhosale (2023) mentioned that The Enago app is a useful resource for investigating research topics and formulating hypotheses. Its collection of academic papers and materials serves as a starting point, giving you background information on possible subjects. You can find interesting questions and possible knowledge gaps by studying the research that has already been done. This helps you distill a wide field into a targeted and influential research focus. It also inspires the creation of a focused research question and supports the preliminary steps of topic selection.

Document Summariser

AI can assist in designing experiments by suggesting variables to test, sample sizes, and other parameters, helping researchers optimize their experimental designs.

Gist AI: Gist AI is still in the early stages of development. It's an AI tool that aims to be the best information processor available. It aims to capture the core of any type of content, including written pieces, movies, and even complicated data sets, going beyond simple text summaries (GIST AI - Free Web,YouTube,PDF Summarizer. Powered by ChatGPT., n.d.).

Sharly AI and Gimme Summary AI are other popular examples of Document Summarizer AI tools (Future Tools - Gimme Summary AI, n.d.).

Data Analyzer

AI can assist in collecting, organizing, and analyzing large datasets, enabling researchers to identify patterns, trends, and insights that may not be apparent through manual analysis. AI-powered tools can create visualizations of research data, making it easier for researchers to interpret and communicate their findings. AI can crunch vast amounts of data and present it in clear, insightful visualizations.

Microsoft Azure Machine Learning: This cloud-based platform offers a powerful suite of AI tools for data analysis. It allows you to import and clean data, build and train machine learning models, and leverage AI features like anomaly detection and automated insights generation (Microsoft Machine Learning Studio (Classic), n.d.).

KNIME: This open-source option provides a user-friendly interface for various data science tasks (Home | KNIME, n.d.).

RapidMineris also an important example (Machine Learning and RapidMiner Tutorials | Altair Engineering Inc. Academy, n.d.).

AI tools For Data Visualization

Julius AI: Without any need for human assistance, Julius, an AI-powered data science assistant, can do first-of-its-kind analysis on structured data sources. An intelligent data analyst tool called Julius AI can easily and intuitively read, analyze, and visualize complex data. Users don't need to be highly knowledgeable about programming; Julius takes ordinary language instructions and converts them into the necessary Python code (Julius AI | Your AI Data Analyst, n.d.).

Tableau, Power BI and Sisense are other examples of AI tools for Data Visualization.

Mind Mapping Tools

Mind mapping is a widely used tool for idea organization and brainstorming that is being revolutionized by AI. These artificial intelligence (AI) enhanced mind mapping tools do more than just make visual maps. They can assist you in brainstorming more efficiently by using artificial intelligence to propose fresh concepts linked to your main idea. Some even have the ability to create mind maps automatically from an initial idea or sentence, which can save you time and inspire new ideas. This frees you up to concentrate on connecting and developing concepts instead of falling down in their original genesis.

XMind: XMIND LTD, a Hong Kong-registered firm, developed the mind mapping and brainstorming program xmind, which was initially made available in 2007. The program can be used to organize complex information, depict concepts, make ideas easier to understand, and foster teamwork. Mind maps, logic charts, organization charts, brace maps, timelines, fishbone diagrams, tree tables, and matrix are all supported by Xmind. Businesses and students typically utilize it for presentations, learning aids, meeting minutes, knowledge management, and other purposes. The application provides multiple modes for seamless workflow and distraction-free entry. All systems, including Windows, macOS, Linux, iOS/iPadOS, Android, and Web, are currently able to use it (Xmind Ltd., n.d.).

Mindmeister: With the help of the online mind mapping tool MindMeister, users may share, visualize, and display their ideas over the cloud. Students can utilize MindMeister, an online collaborative knowledge-based mind mapping application, to comprehend and draw connections between concepts, ideas, and data. Users can gather information and ideas about a certain topic by using mind maps (MindMeister, n.d.).

Lucid Chart: Using the online diagramming tool Lucidchart, users may visually interact while creating, editing, and sharing charts and diagrams to enhance systems, procedures, and organizational structures(Intelligent Diagramming | LucidChart, n.d.).

GitMind, FreeMind, Mindomo, Miro are other examples of AI tools available for mind mapping.

Ethics and Bias Detection

AI can help researchers detect potential ethical issues and biases in their research, ensuring that their work is conducted ethically and produces reliable results. With the ever-growing sea of information online, verifying sources is crucial. AI tools can analyze the credibility of sources, identify potential bias, and help researchers ensure the accuracy of their findings. In today's information age, navigating the sea of online content and verifying its accuracy can be a challenge.

ClaimBuster: This online tool leverages AI to analyze the text of a claim and identify potential red flags. It searches for similar claims online and highlights whether they've been fact-checked by established organizations. ClaimBuster also monitors political debates and news outlets, relying on its algorithms to flag potentially misleading statements for further verification. (ClaimBuster, n.d.)

Vero by NewsGuard: This browser extension by NewsGuard uses a combination of human expertise and AI to assess the credibility of websites and news sources. It assigns trustworthiness ratings based on factors like editorial transparency, adherence to journalistic ethics, and the source's history of publishing misinformation. With Vero installed, you'll see a visual indicator next to website links in search results and on social media, giving you a quick sense of the source's reliability. (NewsGuard - Transparent Reliability Ratings for News and Information Sources, 2024)

Polyfact by Poynter Institute and Twaddle by Meedan are another examples of apps which are used for credibility checking by the researcchers.

Writing Assistance

Grammarly: A widely used tool, Grammarly goes beyond basic grammar and spell check. It offers suggestions for improving clarity, style, and sentence structure. Additionally, Grammarly can identify potential plagiarism and suggest rephrasings to ensure originality. (Grammarly: Free AI Writing Assistance, n.d.)

ProWritingAid: This comprehensive platform offers a variety of features for writers, including grammar checking, style suggestions, and a thesaurus for vocabulary building. ProWritingAid also analyzes your writing for overused words and cliches, helping you achieve a more polished and original style.

QuillBot: This AI tool focuses on rephrasing and paraphrasing. You can input your text, and QuillBot will offer various suggestions for restructuring sentences and finding alternative wording while maintaining the original meaning. This can be helpful for avoiding plagiarism and adding variety to your writing.

Plagiarism Checking

Artificial intelligence (AI) plagiarism detectors are evolving into more advanced writing tools. These checkers compare your text with enormous databases of internal and external resources and web information using algorithms. They are able to recognize text that has been paraphrased, duplicated phrases, and possibly even content produced by other AI. This keeps accidental plagiarism at bay and guarantees the uniqueness of your work. These AI technologies can be very helpful for scholars, students, and content creators, but they shouldn't be used in place of correct citation.

Turnitin: A widely used tool in academic institutions, Turnitin checks submitted work against a massive database of online sources and student papers. It highlights potential plagiarism matches and provides originality reports, allowing instructors to identify areas where students might have improperly cited sources (What Is Turnitin? | Technology Enhanced Learning Team, n.d.).

Copyleaks: This plagiarism checker offers a variety of features, including the ability to scan multiple languages and identify paraphrased content. Copyleaks also integrates with various learning management systems, making it accessible for educators to use within their online courses (Copyleaks, n.d.)

Unicheck: This AI-powered tool utilizes advanced algorithms to detect plagiarism, including identifying paraphrased content and analyzing writing style similarities. Unicheck also offers features like similarity reports and anonymous plagiarism checks for self-review (Unicheck, n.d.).

These are only a few instances of how artificial intelligence is transforming research projects and classroom instruction. We can anticipate the emergence of even more potent tools as AI technology advances, which will eventually enable researchers and educators to reach unprecedented success levels.

Search Engine: Artificial intelligence

(AI)-powered search engines use artificial intelligence to interpret the meaning behind a search query, in contrast to traditional search engines that focus on keywords. This is made possible by methods such as natural language processing, which enables them to understand your words and even take ambiguity into consideration. What was the outcome? Even for difficult-to-answer or poorly written queries, AI search engines can produce more pertinent outcomes. In order to tailor your search experience and provide you with even more useful information, they can also learn from your previous searches and preferences.

Perplexity: With their app, Perplexity provides an artificial intelligence-powered, sophisticated search experience in the huge world of internet knowledge, now available straight to your mobile device. This program goes beyond standard keyword searches by allowing you to ask questions in plain English, much like you would ask a smart friend. Accuracy is given priority by Perplexity, which gathers data from reliable sources and

includes citations for each response. Users are empowered to assess the information provided and confidence is fostered by this transparency. Perplexity's comprehension expands when users engage with the app and pose follow-up queries, producing responses that are more and more pertinent. Moreover, Perplexity can handle a variety of formats in addition to text, which enhances comprehension of the subject. These features are enhanced with the Perplexity AI smartphone app. In addition to supporting several languages, it offers voice search for easy hands-free exploration and opens up knowledge discovery to a larger audience. The app also lets you store and exchange questions and answers, which promotes network collaboration and ongoing education. Students and researchers alike may now browse and fully utilize the potential of online knowledge in an organized and entertaining way thanks to this AI-powered search tool. You may download the Perplexity AI mobile app for free on iOS and Android smartphones (Garn, 2024).

Bing AI: Microsoft's Bing search engine and Copilot is also an example of Search Engine. With the use of state-of-the-art AI, Copilot develops graphics based on your descriptions, arranges texts creatively, and does a variety of other activities. Bing customizes your search results. With the help of this formidable pair from Microsoft, you can create more, save time, and browse the web more effectively and entertainingly.

Conclusion

While there are many uses for research support, this paper only covers a small number of AI technologies in detail. It is essential to realize that artificial intelligence (AI) tools should be used in conjunction with critical thinking. Although these tools can help spark ideas and point toward possible research directions, it is ultimately up to the researcher to assess the suggestions, focus the study's objectives, and formulate well-defined hypotheses based on their understanding.

By offering sophisticated capabilities in literature search, citation management, hypothesis generation, document summarization, data analysis, data visualization, mind mapping, ethics and bias detection, writing support, plagiarism checking, and search optimization, artificial intelligence (AI) tools can improve the efficiency and accuracy of research. Nonetheless, scientists need to evaluate these instruments' results thoroughly and carefully incorporate them into their research.

Researchers can increase the efficiency of their processes, enhance the calibre of their outputs, and more successfully tackle challenging research problems by utilizing AI technologies. However, the cornerstone of sound research is the investigator's critical and analytical abilities, guaranteeing that artificial intelligence augments, not substitutes, the rigorousness of the study methodology.

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ADVANCEMENTS AND CHALLENGES IN SCHOLARLY PUBLISHING WITHIN ARTIFICIAL INTELLIGENCE ECOSYSTEMS

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Introduction

The revolutionary impact of AI on academic research and the changes scenario in research methodology, ethical considerations, and changing norms are highlighted in this article. Peer review is facing issues due to the surge of paper submissions brought about by the rapid growth of scientific research. Generative AI technologies have become useful remedies for these problems. Scholarly communication is changing as a result of the incorporation of Artificial Intelligence (AI) into academic publishing. The steps of manuscript evaluation and peer review, editing, data analysis, and visualization are all being improved by AI technologies. Artificial intelligence (AI) makes ordinary jobs more accurate and efficient, which could hasten the publication of research findings.

The creation of advanced technologies for automated manuscript screening, plagiarism detection, and reviewer selection are some of the major developments in AI-driven academic publishing. Furthermore, document quality is increasing as a result of AI-powered language processing tools that improve grammar and style. AI is also essential for data analysis, helping to decipher complicated information, produce sophisticated visualizations that enhance study findings, and more. However, there are important ethical issues raised by the use of AI in academic publishing. Critical concerns that must be addressed include issues like algorithmic bias, accountability, transparency, and the ramifications for authorship and intellectual property. Preserving the integrity of the academic publication process requires that artificial intelligence (AI) systems are equitable, accountable, and transparent.

This work offers a thorough analysis of the situation of artificial intelligence (AI) in academic publishing, looking at both the advantages and disadvantages. In order to maximize the advantages of AI while minimizing any potential ethical hazards, it emphasizes the significance of continual research and cooperation among academics,

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publishers, and AI specialists. AI will play a more and bigger part in determining the direction of academic publishing as it develops, thus innovation and ethical governance must coexist in harmony.

Researchers are using these AI-powered tools more frequently to help them at different phases of the academic research writing process. By expanding on their original concepts, generative AI tools help writers produce first drafts and offer insightful recommendations for enhancing the content that has already been written. Generative AI technologies provide academics with a new method for generating ideas, broadening the breadth of research writing and stimulating creative thought processes with its contextual understanding and human-like answers. The field of academic research writing has surely changed as a result of the broad use of generative AI techniques.

Among the most popular AI tools for researchers is ChatGPT. Additional AI platforms with particular functions that greatly aid the research process include ChatPDF, which makes document annotation easier, Scite.ai, which helps with citation analysis, and Elicit, which aids in creating research questions. However, there are significant obstacles for researchers to overcome in order to succeed in this fiercely competitive setting. They need to put their findings into compelling, fact-based research publications that get recognition and inspire future generations of researchers if they are to succeed in their professions. Publishers struggle to handle a large number of manuscript submissions at the same time while upholding the standard and reliability of published research. (Carobene et al., 2024)

Objectives

Objectives of the study are:

1. To Study the quickly developing field of academic research aided by AI, including its advantages and disadvantages.
2. To look into the developments and difficulties in academic publishing in ecosystems centered around artificial intelligence.
3. To investigate moral issues such as accountability and intellectual property rights.
4. To stress how crucial it is to strike a balance between ethical governance and innovation when using AI into academic publication procedures.

Scope of the Study

With a focus on AI's involvement in producing academic articles, this paper attempts to explore the rapidly evolving field of AI-supported academic research. This analysis goes beyond the specifics of how AI can help with writing and research; it also takes into account more general issues including the future path of AI in academia, its ethical ramifications, and its impact on traditional academic publication standards.

Table 1: Artificial Intelligence (AI) benefits as well as drawbacks for scientific publications. Aspect of scientific Benefits of AI tools publishing	
Paper Drafting	• Encouraging the arrangement and expression of concepts. • Reducing the amount of time needed to create excellent content. • Offering timely assistance to promote the genesis and development of ideas. • Researching preliminary topics, summarizing publications, and identifying important details in scholarly works • Text optimization through word choice suggestions for enhancement. • Helping to modify manuscripts in accordance with different publications' requirements to increase the possibility of acceptance
Data analysis and Interpretation.	• AI analyzes big datasets quickly to find trends and patterns. • By lowering human error, it increases the precision of data interpretation. • AI makes predictions based on past data, which makes the process of developing hypotheses easier.
Peers Review	• Increases the effectiveness of paper evaluation. • Assists in discovering problems with ethics, integrity, or quality. • Maintains content integrity and aids in the identification of plagiarism.
Ethical implications and Plagiarism.	• Provides resources for identifying plagiarism. • Encourages open disclosure and moral writing.
Education and professional development:	• May improve young professionals' educational experiences. • Makes writing faster possible, which increases the quantity of written materials produced.
Appreciation of reviewer contributions:	• Reviewers may be able to maintain scientific integrity with the help of AI tools • They can assist in handling the increasing number of submitted papers.
Draw Backs of AI Tools	
Paper Drafting	• Promotes discussions about authorship attribution. • May generate erroneous or absurd information (hallucinations). • Designed to please people, possibly disseminating false information and hiding mistakes. • Possibilities of plagiarism and intellectual property theft. • Reliance on AI could lead to an increase in the quantity of inferior scientific publications. • AI could cause the system of scientific publications to collapse. • May suggest incorrect or erroneous sources. • Sentences produced by AI could be illogical and syntactically inconsistent.
Data analysis and Interpretations	• Data and algorithms utilized have a significant impact on the quality of AI interpretations; these tools may be biased by design. • Improper interpretations of the data could result from needless analysis. • A researcher's ability to analyze data may suffer from an over-reliance on AI. • Inaccurate conclusions may arise from misinterpreting AI results in the absence of appropriate statistical context.
Peers Review	• The critical peer review process may be overshadowed by the ease of publication, leading to a relaxation of scientific norms. • Automation bias and deskilling could result from AI. • An over-reliance on AI could lead to evaluations losing their legitimacy.

Ethical implications and Plagiarism	• Preserving originality in content produced by AI presents challenges. • There is a chance that biases in the training data will be reinforced. • Possible legal problems include non-compliance with GDPR regulations and copyright infringement.
Education and professional Development	• Traditional learning pathways run the risk of being undermined. • It might lessen researchers' accountability and give rise to problems with intellectual property • It is concerning when hallucinations appear, such as false or absurd information. • The value of human reviewers' expertise could be diminished.
Recognition of Reviewers Contribution	• Complex writings generated by AI may put more time demands on reviewers. • Inadequate mechanisms of reward and recognition exist for reviewers.

Balancing Benefits and Challenges: AI as a co developer in Scientific Writing and Peer Review

AI in Manuscript Preparation

There is a lot of discussion and interest in how ChatGPT and other generative AI models affect academic research. From one perspective, these artificial intelligence (AI) technologies simplify the research process by helping scientists write articles, summarize literature, and perform initial data analysis. By providing ideas from diverse domains, they encourage interdisciplinary research and may even stimulate invention. However, there are several limitations to the benefits of AI in academic research. Researchers run the risk of becoming overly reliant on content produced by AI, which could impair their capacity for critical thought. If scientists only use artificial intelligence (AI) to generate ideas and analyze data, they may neglect critical competencies like developing hypotheses, designing experiments, and interpreting findings. This makes one consider how to balance human intellectual contributions to study with AI support.

The moral challenges surrounding research results generated by AI are important subjects. When artificial intelligence has a substantial impact on research, issues with authorship, credit, and intellectual property arise. Ensuring correct citation and attribution of research outputs aided by AI and determining who is legally entitled to them become essential for maintaining academic integrity and ethics. It’s critical to set up efficient detection and monitoring systems in light of the rise of generative AI in educational settings, like ChatGPT. In addition to preventing plagiarism, this upholds academic integrity. Since AI-generated material is so sophisticated, it is becoming harder to distinguish between human and AI labor, so educational institutions and publishers need to develop effective methods and resources for spotting content that has been supported by AI. This guarantees proper attribution, credit, and observance of moral principles.

Particularly in scientific writing, research, and enhancing the teaching-learning process, ChatGPT and related generative AI models have great promise for the field of education. However, these technologies come with constraints, moral quandaries, and challenges that demand careful thought. The future is being paved by human-AI

collaboration. While maintaining the core values of education and academic integrity, educators and institutions can take full advantage of AI's potential. As we proceed through this journey, we discover that integrating ChatGPT into education comes with both opportunities and responsibilities that will shape learning and research going forward. But using ChatGPT carelessly in academic research has its drawbacks. Unintentional plagiarism is a serious risk since researchers may unintentionally incorporate unattributed artificial intelligence (AI)-generated content in their work [8]. This raises ethical questions about research paper authorship in addition to endangering academic integrity. Effective techniques for identifying and monitoring ChatGPT use are essential in order to mitigate the hazards related to it in academic research. Publishers and educational institutions can use tools designed especially to detect plagiarism in AI-generated content. To guarantee adherence to correct attribution and ethical standards, these technologies should be smoothly integrated into the workflow of research and publication. Furthermore, open standards for authors on the use of generative AI should be established by academic journals and publishers. If AI was used in the research process, authors should be required to disclose it, and journals should be able to use AI-savvy peer reviewers to evaluate submitted publications for the level of AI involvement. (Khalil et al., 2023)

Peer Review and Quality Analysis

Due to its capacity for feature- and profile-based reviewer matching, which guarantees a fair selection of possible reviewers, NLP-driven AI is thought to play a particularly important role in peer review. The efficiency and efficacy of the peer review process can be greatly increased by AI techniques. Reviewers can benefit from their assistance by having automated screening of papers, potential problems with ethics, integrity, or quality flagged, and the ability for human specialists to examine manuscripts more constructively and concentrated. Through the identification of patterns in both phrases and data, AI can also assist editors and referees in avoiding plagiarism. In some situations, this speeds up the entire review period and helps with content refinement and ultimate publication quality.

This disparity has been further underlined by the COVID-19 pandemic, which has also brought attention to the urgent need for drug repurposing for novel treatments, underscoring the need to support and enhance the current review process. Because it can match reviewers based on attributes and profiles and provide a bias-free selection of potential revewers, NLP-driven AI is therefore very important in peer review.

Among the most well-known AI peer review tools, AIRA, StatCheck, StatReviewer, and Editorial Manager are mostly used in the scientific community. Even publishers with in-house workflow management and submission systems can utilize its AI-supported auto-analyzer tool to evaluate and fix references in submitted articles. Among them are Pubstrat, AuthorONE, and Penelope.ai, which aid in automated workflow management. (Cyranoski, 2019)

Content Discovery, Collection of Data and Analysis

It might be laborious and time-consuming to conduct literature searches and comprehend pertinent concepts in the early phases of research. Access to relevant literature is frequently impeded by pay walls and other restrictions for scholars. AI-driven technologies like as R Discovery offer personalized reading feeds, rapid access to vast academic article collections, and paper summaries in formats that are easy to consume. These developments give researchers a major edge through more accessibility by assisting them in staying up to date on pertinent subjects.

In scientific research, gathering and analyzing data is essential to developing and evaluating hypotheses. These days, a variety of AI-powered data analysis tools are available to researchers, freeing them from repetitive duties and enabling them to concentrate on higher-order cognitive functions. The quality and significance of scientific discoveries can be increased by using these tools, which can digitize handwritten documents, combine data from many sources, and extract insightful information from enormous datasets.

AI-driven writing aides can help with the first drafts of academic papers by offering recommendations for content optimization, style, and organization. They can also help with editing and proofreading to make sure the finished product is coherent and clear.

Researchers and scientists are under more pressure than ever to successfully lead or take part in fundraising efforts in addition to their primary research responsibilities on a global scale. In addition to the intense competition in the field and the sharp decline in proposal success rates, individual researchers and scientists are becoming more uncomfortable due to the complexity of funding instruments, the need to gain a comprehensive understanding of impact issues, and the need to align research priorities with broader national and transnational (such as EU-wide) policy aspects. In this study, we propose to enable the (semi-)automation of various steps in the application and proposal preparation processes through the use of transdisciplinary AI technologies.

Plagiarism and Citation Management

Ensuring authenticity and preventing plagiarism are critical issues in the field of AI-generated material. AI systems with sophisticated algorithms have shown to be unmatched in their ability to identify plagiarism by carefully comparing text to a wide range of previously published works. This feature is crucial for maintaining the veracity of scholarly and scientific discourse since it makes it possible to recognize text that has been subtly paraphrased and guarantees that the actual meaning of the original works is not diluted or misrepresented.

A solid scientific article must include references that are current, pertinent, and of the highest caliber. For researchers who are pressed for time, creating the references section and checking the quality of the in-text citations might be laborious tasks.

Applications of artificial intelligence (AI) are quite helpful in this regard and may even affect citation patterns.

Ethical Aspect of AI in Scientific Paper Writing

Responsibility Attribution: Attributing responsibility is essential when artificial intelligence (AI) is used in content creation. Deeply troubling considerations about culpability arise when AI-produced work has inaccuracies, mistakes, or unintended effects. Who is to blame—the AI developers or the human author, especially when there is misinformation or incorrect data interpretation? Strong accountability systems must be established in order to settle possible conflicts and protect the integrity of scientific research.

Rights to Intellectual Property: AI's influence on scientific writing raises serious issues with regard to intellectual property rights. Due to AI's lack of legal protection and rights, it is unclear who owns content created by AI, which could cause disagreements and impede scientific advancement. To safeguard the rights of human writers, AI developers, and other stakeholders, as well as to define ownership rules for content produced by AI, a more sophisticated legal framework is necessary.

Legal Difficulties: AI models developed using papers containing personal data or content protected by copyright may give rise to legal difficulties. Users may unintentionally violate copyright or the General Data Protection Regulation (GDPR) if they use AI outputs without properly verifying and adapting them.

Bias & Misrepresentation: When AI learns from preexisting data, it may reinforce and absorb ingrained biases, leading to skewed outcomes, inaccurate representations, and the reinforcement of negative stereotypes in the content that is produced. Preserving equity and impartiality in scientific research requires addressing these biases and guaranteeing fair and truthful depiction of many viewpoints.

Declaration of AI Use: Journal reviewers should make a declaration about their usage of generative AI tools, just as authors must do with their submitted publications. According to **Chawla, 2020**, predatory journals demand exorbitant article-processing costs without offering expected publishing services like peer review or quality checks. For this reason, this declaration is especially pertinent when addressing the issues these journals introduce. Reviewers assist determine which journals are trustworthy and which are predatory by candidly disclosing when they utilize artificial intelligence (AI) methods. By being transparent, this pledge helps to protect predatory journals from unintentional support and strengthens the legitimacy of the review process. Furthermore, as predatory journals have weak peer review procedures, the revelation encourages closer examination and responsibility. Explicit statement protects against manipulation and encourages transparency in publishing decisions for researchers by exposing misleading claims of AI utilization by predatory journals.

Limitations of our Approach

Our method does not attempt to replace human reviewers with AI, nor does it address every facet of the peer review process. Nonetheless, it implies that AI technologies could logically support or even replace some aspects of quality assessment and peer review. These elements could include formatting checks, readability evaluations, and more traditional checks like plagiarism detection. In contrast, we do not anticipate that AI will make a major contribution to procedures that demand a high level of domain expertise and mental work, at least not in the near future. We are looking into a semi-automated quality review process where artificial intelligence (AI) helps make decisions instead of controlling outcomes all by itself. Among the numerous factors that will influence how realistic this is will be the type of study output and how it is presented. The disciplinary rules are one important factor in this. diverse disciplines are likely to have somewhat diverse needs when it comes to how AI assessment tools should be created and used for research results.

Our method does not cover every facet of the peer review procedure, nor does it seek to substitute AI for human reviewers. Nonetheless, it implies that AI technologies could logically support or even replace some aspects of quality assessment and peer review. These elements could include formatting checks, readability evaluations, and standard tests like plagiarism detection. In contrast, at least not in the near future, we do not envision AI significantly improving processes that call for a high level of domain expertise and mental effort.

There are many advantages to using AI-powered tools in scientific research and publication, but there are drawbacks as well that need to be considered. Maintaining accuracy and precision in the produced product while maintaining quality control is a major difficulty. Furthermore, the necessity to address fairness and biases present in the training data is highlighted by the possibility of bias in AI models. It is important to carefully handle ethical issues pertaining to ownership, intellectual property rights, plagiarism, fraud, and manipulation. Adversarial assaults and other security threats emphasize the need for strong security measures to prevent manipulation and abuse of AI systems. To tackle these obstacles, coordinated efforts are needed to improve the resilience and dependability of AI-powered systems. Artificial intelligence (AI) has the ability to advance scientific research and open up new vistas for innovation and knowledge for the good of society through responsible deployment and smart integration.

Conclusions

Integrity specialists need to work together to create precise norms and criteria for the application of AI in content creation as its significance in science research continues to expand. There will always be paper mills, in spite of all attempts. Therefore, in order to assess submissions prior to publication, publishers should continuously invest in and implement the finest technical solutions available. There should be extensive efforts to create other strategies to stop the expansion of paper mills in addition to this one.

As artificial intelligence (AI) grows more pervasive in scientific research, its potential to assist researchers and improve the sharing of scientific knowledge is becoming increasingly apparent. Researchers can overcome obstacles to accessibility, advance their technical proficiency, effectively manage data, and maintain research integrity by utilizing cutting-edge AI technologies. In the end, this will enable them to carry out significant research and increase scientific understanding.

In summary, the application of AI in academics offers a challenging but exciting new area. It has the power to transform research methodologies, democratize the sharing of knowledge, and promote international cooperation. All academic community stakeholders must work together to ethically and effectively exploit AI's potential in order to successfully navigate this frontier and ensure that in the future, knowledge-seeking is enhanced rather than undermined by AI.

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EVALUATION OF OUTCOMES AND IMPACTS OF AI TOOLS IN ACADEMIC LIBRARIES

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Introduction

Users are becoming more and more reliant on AI, which reduces the necessity for libraries and librarians to provide information. AI is already being incorporated by libraries into a variety of services, including technical help and reference services, which improve user access to information (Al-Aamri and Osman, 2022). With the help of artificial intelligence (AI), libraries can forecast user requirements and preferences as well as make customized reading material recommendations to specific patrons based on their interests, browsing history, and borrowing patterns. Simply said, the tool is made to enhance the experience and expertise of librarians, who remain essential to the library's operations. AI's impact on library services may be evaluated by performance, quality, relevance, diversity, accessibility, usability, and patron satisfaction. Evaluation of AI systems requires an understanding of their training sets, evaluation metrics, possible biases, and technological foundations.

Benefits of AI tools in Libraries

Application of AI tools enhances the usability and accessibility of library resources effectively.AI systems is able to suggest pertinent books, articles, or other resources by analyzing user behavior and preferences. These systems ability to offer customized recommendations can increase user happiness and engagement. Automating tasks like text summarization, categorization, and abstracting are all possible using NLP (Natural Language Processing) technology. AI-driven chatbots and virtual assistants can be used by libraries to direct users to the information and services they need, answer frequently asked questions (FAQ), and offer immediate assistance to users. To better understand user requirements and preferences, librarians can employ AI-powered text analysis tools to glean insights from vast amounts of text data, including user reviews, comments, and social media mentions. By automatically classifying, tagging, and organizing digital assets, artificial intelligence (AI) can help with the preservation and curation of digital collections. This could increase accessibility. By using models based on user trends and patterns, libraries can better allocate resources, improve collection

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development strategies, and forecast demand for specific materials.

AI can assist construct websites more accessible to people with disabilities by producing alternative text for images automatically, offering audio descriptions, or making websites more compatible with screen readers.AI-powered tools can improve cyber security measures within libraries. Libraries can use these technologies to create interactive storytelling sessions, virtual tours of their locations, and immersive learning experiences. Artificial Intelligence can automate the process of digitizing content, including producing metadata for digital collections, scanning and OCR printed materials, and transforming analog resources into digital formats.

In addition, ChatGPT and other AI technologies can improve cataloging, metadata generation, search and discovery, and reference services all of which can promote academic research and librarianship.

Objectives of this study

1. To assess the frequency of AI utilization
- To find the effectiveness of AI tools in library services
- To examine the accessibility of AI technology in academic libraries
- To find the accuracy and reliability of the results generated by AI tools
- To identify the types of AI technologies often used by students
- To find the AI literacy skill among students
- To examine the user experience and satisfaction
- To find the problems in the use of AI technology

Literature review

AI contributes to the development of question-answering systems that can provide answers to complex queries, utilizing efficient methods for storing and retrieving information, ultimately creating a more effective oracle for information retrieval (Kaushal and Shukla, 1996). AI plays a crucial role in personalized recommendations by enhancing the accuracy, transparency, and fairness of recommender systems across various domains.

AI plays a crucial role in streamlining information retrieval by leveraging advanced techniques to handle vast amounts of unstructured data efficiently. It aids in automating the process of acquiring knowledge and retrieving information based on business requirements (Rodrigo, 2019). AI techniques, such as machine learning, are instrumental in enhancing information retrieval systems by accounting for uncertainty and imprecision inherent in human cognition and knowledge management (Mohand et al, 2020).

AI significantly enhances search capabilities in library databases through various technologies like natural language processing, machine learning, and data mining. These technologies enable functions such as improved OCR, knowledge mapping, and enhanced search ability (Harry and Pence, 2022). AI tools like ChatGPT are rapidly evolving,

producing coherent content at superhuman speeds, prompting librarians to adapt to these accessible technologies and adjust practices accordingly (Andrew and Suvodeep, 2022).

AI technology has revolutionized library cataloging systems by enhancing efficiency, accuracy, and user experience. Various machine learning techniques like KNearest neighbour, Bayesian networks, fuzzy logic, support vector machines, clustering, and classification algorithms have been employed to support reference services, indexing, abstracting, information retrieval, cataloguing, classification, and collection management in libraries (Sapna et al.2023).

The integration of AI in libraries has led to improved accuracy and efficiency in data management, enhanced user experience, and cost savings ultimately shaping library management operations positively (2023). Artificial Intelligence (AI) technology has significantly impacted libraries by revolutionizing services and operations. AI has enabled the development of smart library systems for tasks like classifying, indexing, and data retrieval, although only a few have been fully integrated into library operations (2023).

The integration of AI technology in libraries is reshaping the future of information services. AI-powered systems like ChatGPT are being explored as potential complements to traditional libraries in higher education, offering customized information support (Shubhraj yotsna and Sreeramana, 2023).

AI technology enables libraries to enhance user services by identifying reader's interests and reading habits, providing personalized recommendations based on individual preferences and activity history (Xiao and Zhang, 2023).). The integration of AI in library management enhances accuracy, efficiency, and user experience, driven by technological advances and cost Savings (Sapna, 2023).Artificial Intelligence (AI) technology has significantly impacted libraries by enhancing services and operations (Sianturi, 2024)

Methodology

Research Design Quantitative Methodology

This study employs a quantitative approach, which aims to quantify and measure variables to analyze patterns, trends, and relationships among them. This method involves the collection of numerical data, which can be analyzed statistically to draw conclusions.

Structured Questionnaire Design

A structured questionnaire is developed based on the objectives outlined in the study. It consists of pre-defined questions with fixed response options, allowing for systematic data collection and analysis. The questionnaire is designed to gather data relevant to the research objectives, ensuring that the study addresses specific research questions effectively.

Survey Distribution

The survey is distributed to 250 students encompassing Undergraduate (UG), Postgraduate (PG), and Research Scholars (Ph.D) enrolled at Ambedkar Law University and Government Law Colleges in Tamil Nadu. Distribution of the questionnaire is facilitated through a Google Form link, leveraging online technology for efficient data collection. Google Forms provide a user-friendly interface for respondents to complete the survey electronically.

Sample Size and Analysis

Out of the 250 distributed questionnaires, 200 responses are collected and analyzed. The sample size of 200 respondents represents a substantial portion of the target population, enhancing the reliability and validity of the findings. The analysis of the responses involves organizing, summarizing, and interpreting the collected data to address the research objectives.

Limitations of this study

While the conducted study aimed to provide insights into the perceptions and opinions of law students in Tamil Nadu through a quantitative method employing a structured questionnaire, several limitations were encountered throughout the research process. These limitations may impact the transferability and validity of the findings. The study utilized convenience sampling, distributing the questionnaire link to students within the Law University and Government Law Colleges of Tamil Nadu. This sampling method may introduce bias as it may not adequately represent the diverse perspectives within the broader population of law students in the region. The responses collected through the Google Form link may be subject to response bias. Respondents may provide socially desirable responses or exhibit response tendencies such as acquiescence bias, where they agree with statements regardless of their true beliefs. The findings of the study are limited to the sample population of 200 respondents from Undergraduate, Post Graduate and Research Scholars in Tamil Nadu. Although 200 out of 250 responses were analyzed, the response rate of 80% raises questions about potential non-response bias. Differences between respondents and non-respondents could introduce systematic errors and affect the representativeness of the findings.

Results and Analysis

Table.1. provides information on the gender and qualification distribution of respondents along with their respective percentages and counts.

Table.1

Gender and Qualification of Respondents	%	No. of Respondents
Male	64.5%	129
Female	35.5%	71
UG Students	68.5	137
PG Students	27%	54
Research Scholars	4.5%	9

Among 200 respondents 64.5% of the respondents are male, which accounts for 129 individuals. and 35.5% of the respondents are female, totaling 71 individuals. It explores the gender distribution of the population.

In the context of Educational Qualification of respondents, Undergraduate (UG) students constitute the majority, with 68.5% of respondents, which amounts to 137 individuals and Postgraduate (PG) students represent 27% of respondents, accounting for 54 individuals. Research scholars make up the smallest group, comprising 4.5% of respondents, which is 9 individuals.

Overall, the above table gives insights into the gender and qualification composition of the respondent pool, showing a higher representation of males and undergraduate students compared to females and postgraduate students or research scholars.

Table.2. presents data on different variables of Awareness, Frequency, Satisfaction, Helpfulness, Navigation, Accessibility, Accuracy and Reliability measured at three levels (High, Medium, Low) with corresponding percentages and frequencies.

Table-2

Categories	High	Medium	Low	High	Medium	Low
	%	%	%			
Awareness	51%	45.5%	3.5%	102	91	7
Frequency	34%	50%	16%	68	100	32
AI literacy Skill	20.5%	67.5%	12%	41	135	24
Satisfaction	54%	30.5%	15.5%	108	61	31
Helpfulness	57.5%	32.5%	10%	115	65	20
Navigation	51.5%	38%	10.5%	103	76	21
Accessibility	20.5%	49%	30.5%	41	98	61
Accuracy and Reliability	15.5%	68%	16.5%	31	136	33

Awareness

The highest percentage of respondents falls under the High category (51%), indicating that a majority of respondents have a high level of awareness. The Medium

category follows with 45.5%, while only 3.5% fall under the Low category. In terms of frequencies, there are 102 respondents in the High category, 91 in the Medium category and 7 in the Low category.

Frequency

The highest percentage of respondents falls under the Medium category (50%), indicating that the majority of respondents have a medium frequency of interaction. This is followed by 34% in the High category and 16% in the Low category. In terms of frequencies, there are 100 respondents in the Medium category, 68 in the High category and 32 in the Low category.

AI Literacy Skill

The highest percentage of respondents falls under the Medium category (67.5%), indicating that the majority of respondents have a medium AI skills. This is followed by 20.5% in the High category and 12% in the Low category. In terms of frequencies, there are 135 respondents in the Medium category, 41 in the High category and 24 in the Low category.

Satisfaction

The highest percentage of respondents falls under the High category (54%), indicating that a majority of respondents are highly satisfied. This is followed by 30.5% in the Medium category and 15.5% in the Low category. In terms of frequencies, there are 108 respondents in the High category, 61 in the Medium category and 31 in the Low category.

Helpfulness

The highest percentage of respondents falls under the High category (57.5%), indicating that a majority of respondents find the AI technology helpful. This is followed by 32.5% in the Medium category and 10% in the Low category. In terms of frequencies, there are 115 respondents in the High category, 65 in the Medium category and 20 in the Low category.

Navigation

The highest percentage of respondents falls under the High category (51.5%), indicating that a majority of respondents find the navigation of the AI technology easy. This is followed by 38% in the Medium category and 10.5% in the Low category. In terms of frequencies, there are 103 respondents in the High category, 76 in the Medium category and 21 in the Low category.

Accessibility

The highest percentage of respondents falls under the Medium category (49%), indicating that almost half of the respondents perceive the AI technology to be moderately accessible. This is followed by 20.5% in the High category and 30.5% in the

Low category. In terms of frequencies, there are 98 respondents in the Medium category, 41 in the High category, and 61 in the Low category.

Accuracy and Reliability

The highest percentage of respondents falls under the Medium category (68%), indicating that almost half of the respondents find Accuracy and Reliability of AI technology to be moderately accessible. This is followed by 16.5% in the Low category and 15.5% in the High category. In terms of frequencies, there are 136 respondents in the Medium category, 33 respondents in the Low category and 31 in the High category.

Overall Table-2 provides insights into respondents' perceptions and experiences with AI technology across different dimensions. It highlights varying levels of awareness, frequency of interaction, satisfaction, perceived helpfulness, ease of navigation, accessibility, Accuracy and reliability.

Figure.1. presents data on the popularity of various AI tools and services among respondents. Each tool is listed along with the corresponding number of respondents who reported using it.

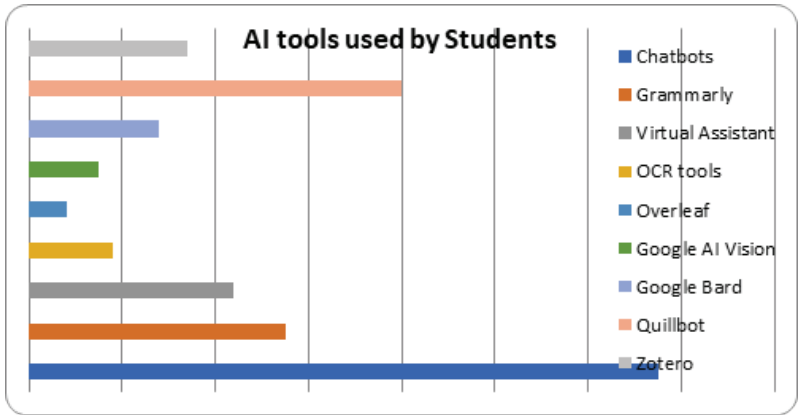


Figure .1.

Chatbots is the most commonly used AI tool among respondents, with 135 (67.5%) respondents reporting its usage. Like Grammarly is the second most commonly used tool, with 55(27.5%) respondents reporting its usage. It is a popular tool for grammar checking and proof reading. Virtual Assistants are AI-powered software programs designed to assist users with various tasks, such as scheduling appointments, answering questions, or performing searches and it is used by 44 (22%) respondents. OCR tools are used to convert scanned documents or images containing text into editable and searchable text files. It is used by 18 (9%) respondents. Overleaf is used by 8 respondents. Overleaf is a collaborative online LaTeX editor commonly used for writing scientific and technicaldocuments. Google AI Vision is a cloud-based machine learning platform that provides various image recognition and analysis capabilities and used by 15 respondents. Google Bard is a tool for generating poetry and other creative

writing using artificial intelligence, used by 28 respondents. Quillbot is an AI-powered paraphrasing tool that helps users rewrite and rephrase sentences or paragraphs. It is used by 80 respondents. Zotero is reference management software that helps users collect, organize, cite, and share research sources and is used by 34 respondents.

Overall, Figure.1 provides insights into the usage patterns of various AI tools and services among respondents. It indicates that chatbots, Grammarly, and Quillbot are among the most commonly used tools, while others such as OCR tools and Overleaf have lower levels of usage among respondents. These usage patterns may reflect the perceived usefulness, accessibility, and familiarity of different AI tools and services among the surveyed population.

An open-ended question regarding common complaints about AI would likely aim to solicit qualitative feedback from respondents without providing predefined answer choices. Major aim of this type of question is allowing respondents to freely express their opinions, experiences, and concerns about AI without being constrained by predetermined options. Respondents express various complaints regarding AI technologies such as issues with accuracy, reliability, privacy, bias, user interface complexity, job displacement and ethical considerations.

Suggestions

Present study explores AI application and its benefits in academic libraries through quantitative research. To optimize the advantages of AI technologies while resolving any constraints or difficulties that may arise, continual assessment and research are therefore required. It needs research in durability, reliability, algorithmic bias, AI literacy, data security, user privacy, ethical concerns and **copyright.** By focusing on these areas, libraries can continue to evolve and provide enhanced services to their communities.

Conclusion

Through a comprehensive investigation encompassing various objectives, this study sheds light on the multifaceted landscape of AI utilization in academic libraries. The findings reveal the frequency of AI implementation, indicating its growing prevalence in library services. Moreover, the effectiveness of AI tools in enhancing library services is underscored, highlighting their potential to streamline processes and improve user experiences. However, challenges related to accessibility, accuracy, and reliability of AI technologies is identified, suggesting the need for continued advancements and quality assurance measures. Furthermore, an examination of user experience and satisfaction offers valuable feedback for optimizing AI systems. Overall, this study contributes to the ongoing discourse on AI adoption in libraries, offering insights to enhance its efficacy and accessibility while mitigating challenges for stakeholders.

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IMPLEMENTATION OF RADIO FREQUENCY IDENTIFICATION (RFID) TECHNOLOGY IN ACADEMIC LIBRARIES - A CASE STUDY OF STELLA MARIS COLLEGE LIBRARY

Dr. M. Mahalakshmi[1]

Introduction

The Library is the key information resource for learning and research in the Higher Educational Institutions which should provide both print and electronic resources for all members of the Institution. The Library should aim to be a dynamic agent for educational change and innovation in partnership with the academic faculty. The Libraries should offer onsite training sessions for the students and faculty. The open access system with a combination of online and offline information resources should provide a holistic and comprehensive service.

The Library should be committed to using technology in efficient and innovative ways which can include implementation of RFID technology to strive excellence in the 21st century. This technology helps librarians reduces the precious staff time spent scanning barcodes while charging and discharging library items. RFID is a combination of radio - frequency-based technology and microchip technology.

Objectives of The Study

- To understand how RFID technology works.
- To be aware of the advantages of RFID technology
- To know how RFID can be used to manage academic Libraries.
- To understand the different components of RFID that may be used in Academic Libraries
- To assess if libraries should install an RFID system
- To be aware of conducting the Inventory using the RFID Scanner

Features of Rfid System

- Identification of the thefts in the Library.
- It speeds up the handling time.
- Proficiency to quickly scan and 'read' item numbers displayed on shelves without having to handle each item physically.

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- More successful integration with automated library item handling systems than standard
- Barcodes
- Users can develop the ability to self-manage the regular check-in and checkout of the library items.
- Performs synchronized reading of more than one item.
- Reading does not require a direct line of sight to the text.
- Can trigger an alarm upon detecting a non-issued library item book being passed through the security gate.
- Having the ability to find specific library items among the shelves.

Stella Maris College

An inspired leadership, a highly qualified, dedicated staff and a vibrant student body accord Stella Maris College (Autonomous) a premier position on the educational map of the country. Founded by the Society of the Franciscan Missionaries of Mary on 15 August 1947, the College, a Catholic minority institution affiliated to the University of Madras, reaches out to a diverse student population. Located in a verdant campus at the heart of the city of Chennai, the College is proud of its rich ecosphere and is easily accessible by road, rail and air. The College is governed by a Management Committee. The statutory bodies of the College are the Governing Body, the Academic Council, the Boards of Studies and the Finance Committee. The IQAC initiates and implements quality enhancement and assurance measures for all constituencies of the College. Interventions like academic audit, energy audit, green cover assessment etc. equip us to meet academic and social challenges.

Stella Maris College Library

The college takes pride in its ever-expanding collection of books, journals and e-resources of the fully-automated library. The library provides access to e-resources such as EBSCO, Indiastat, AEA Journals, Sage online Journals, NLIST, and SWAYAM courses. The library also holds DSpace, a digital repository of question papers, syllabi and course schedules made accessible via the college website. The Library building also houses the Stellarchives – the College archives.

The Library is a two-storied building with a carpet area of 1560 sq. and has separate collection for undergraduate and postgraduate students with 16 departments having their own departmental collections The Library has a collection of 1,16,367 books, 8853 journals (Print and Online) and 1745 theses, 4219 back volumes and 854 CDROMs subscribes to 12 newspapers in English, Tamil and Hindi is Wi-Fi enabled, maintains three servers and has about 60 computers and is open from 7.30 a.m. to 6.00 p.m. (Monday – Saturday) . The Library is fully automated using the library management software eBLIS (electronic Bosco Library Information Software) along with the implementation of RFID Technology for all the Library operations.

Library Management Software

All academic libraries should be automated using any Library Management Software which may be built In-House or using the commercially available ones. The Library Management Software must be user-friendly software designed to take care of all the administrative and management functions of the Library. The software should organize and manage the information of books, articles, journals, and CDROMs most economically and effectively.

Technology seems to be changing our world – seemingly on the hour – and libraries and their needs are no exception. Implementation of RFID Technology in the library would take the library to the next level facilitating 21st-century learning. RFID technology has the ability to speed up library services and streamline time-consuming operations such as check-in, check-out, sorting, stock management, and theft detection systems. RFID-based systems move beyond security to become tracking systems that combine security with more efficient tracing of library materials throughout the library.

As RFID is a combination of radio -frequency-based technology and microchip technology the information on microchips in the tags affixed to library items is read using radio frequency technology, regardless of item orientation or alignment. The RFID security gates at the library exit can be as wide as three to four feet because the tags can be read at a distance of up to two feet by each of the two parallel exit gate sensors.

RFID Benefits - Stock management

Operations such as managing books on the shelves, identifying missing & mis-shelved items are simplified and taking inventory will be possible in a lesser time.

Improved user services

- Spending minimal time on circulation operations allows library staff to support users more effectively. Staff shortages or financial crunch will not affect the routine user services. Users will spend less time waiting in check-out lines by using Self Check in - Check out systems.
- Users find what they are looking for quickly & easily
- Use of book drops & return kiosk for returning library material, allows for flexible timings

Security

- Library item identification and security bit are combined into a single tag, thereby
- removing the need to attach an additional security strip
- Less time needed for library operations
- Implementing RFID will considerably decrease the amount of time required to issue, receive, transport, sort and shelve library items.

Effectual Inventory management

- Inventory management can be done using a handheld scanner without having to close the library and is at least 20 times quicker than the existing barcode based system
- Taking inventory using a RFID scanner does not require physical deshelving & shelving of library items.

Library Management in SMC Using RFID Technology

RFID (Radio Frequency Identification) The RFID Technology was implemented in SMC Library in September 2018 to further upgrade the existing automation process, allowing improved services for library users especially in self-checkout, which reduces the time required to perform circulation operations.

An RFID library management system consists of books, each attached with an RFID tag, RFID reader, computer network, and software. Hence SMC Library adopting RFID technology for Library Automation started in December 2017 and the facility was inaugurated in September 2018. All the operations and services of the SMC Library have been automated using RFID. RFID technology used in SMC Library has been integrated with the existing Library Management system which eases the Circulation processes, Inventory management and for theft detection. With the adoption of RFID Technology in SMC Library there has been no theft and the very existence of the security gates at the Library Entrance has made the users to be more anxious and timorous. Radio Frequency IDentification uses wireless radio communication to uniquely recognize objects and is one of the fastest-growing automatic data collection technologies. The SMC Library has introduced self-service "check-in" and "checkout" by use of the Self-Kiosk machine that helps easy charging and discharging of library items. The security gates at the entrance trigger an alarm if a user walks away without getting the items issued against their name. A Dropbox has been made available outside the Library in which the college community can drop their borrowed items anytime without having to come to the Library.

Advantages of Implementing RFID In SMC

- Fastest, easiest, most efficient way to track, locate & manage library items.
- Efficient circulation management.
- Automatic Check-in and Check-out.
- Library inventory tracking in minutes instead of hours.
- Multiple books are read simultaneously.
- The unique ID of the RFID tag prevents counterfeiting.

Components of RFID

Tags

The heart of the RFID system is the RFID tag, which can be fixed inside a book's back cover. This tag is equipped with a programmable chip and an antenna. Each paper-thin tag contains an engraved antenna and a microchip with a capacity of at least 64 bits.

Staff Station

It has a multi-protocol antenna-reader system specially designed for library circulation desk applications. With a read range up to 25 cm it can be used for entry of new books or new members or for transactions at the circulation desk.

Self-check-in / check-out Kiosk

Self-check-in / check-out kiosk primarily for self-issue and return of books in the Library. With its inbuilt screen and printer, users can view and print transaction-related information such as a number of books issued, outstanding fines (if any) etc. Customized information can also be printed on the transaction slip.

Security Gates

Security gates are an anti-theft system used by libraries. It plays a critical role in identifying un-borrowed or improperly checked-out library items. Theft detection is an integral attribute of the chip within the RFID tag which performs both the item identification and antitheft function.

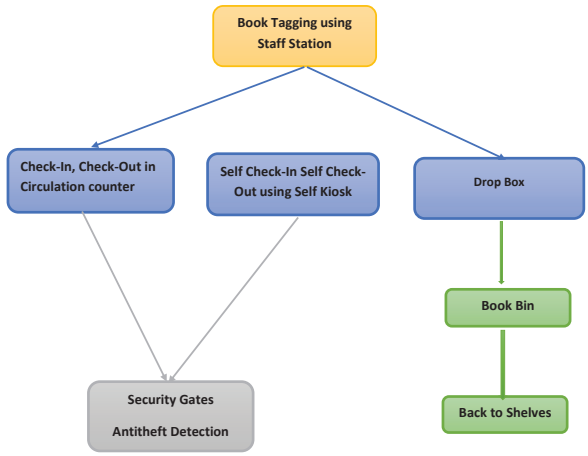
Inventory Scanner

Inventory and shelf reading can be carried out with a portable Scanner. The scanner transmits identification number to the server, which in turn sends it to library management software and the response is returned in real time. Alternatively, information may be downloaded with library management software for inventory control. Shelf Management system makes it easier for the library staff to locate and identify the items on the shelves.

Role of The Librarian In Implementing RFID Technology

The implementation of RFID technology is a big challenge for the Librarians. This technology makes it possible to deliver considerably better services to users, particularly by deployment of self-check kiosks which helps self- check-in and self-checkout. It also makes it possible to make enhanced use of professionally trained staff and it may minimize the risk of repetitive work among library personnel. However, the Librarian has to assess the available manpower, financial resources, and vendor implications before moving ahead with the implementation of RFID technology. The librarian should also check if the current library management software is RFID compatible if not go for RFID-compatible software which should also ease the Migration of data once the RFID technology is implemented. The other major hurdle for the Librarian will be to convince the Management of the Institution as to why and how implementation of RFID in their libraries will benefit the stakeholders as it involves a huge cost.

A Diagramatic Representation of Library Management In Smc Using RFID Technology



Conclusion

The use of RFID technology in library security is not only a developing tendency, but it is also a technology that is more, competent and convenient. The conservative bar code on books in the libraries is being regularly replaced with this technology. Academic libraries face increasing challenges in managing the assets of their collection and maintaining or improving service levels to users. Over the past few years, libraries have grown their services from simply offering books and journals to now adding multi-media items such as videos, CDs and DVDs and are becoming digital libraries by adding computers to access the Internet as another source of information for its users. Throughout this growth in the library collection, there are also growing worries about the security of the library assets and maintaining or improving service levels to the users. For the concerns that libraries face each day, implementation of RFID technology is a great boon which is also the road ahead for the 21st Century for the libraries of any kind.

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UTILIZATION OF EMERGING TECHNOLOGIES IN LIBRARY SERVICES AT THE TECHNICAL CAMPUS OF KARAIKUDI INSTITUTE OF TECHNOLOGY & KARAIKUDI INSTITUTE OF MANAGEMENT (KIT & KIM): A CASE STUDY

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Introduction

The KIT & KIM are known for its cutting-edge, innovative uses of technology and user services. The library on our campus is well-equipped and offers books and journals in all fields and subjects. The KIT & KIM Technical Campus was founded with the intention of offering top-notch higher education that meets criteria set by other countries. The Institutions continually look for and implement novel approaches to raise the standard of higher education delivered on the KIT & KIM campus, foster value-based education, and mould our students into effective competitors in the corporate world. Today, the KIT & KIM Library continue its legacy of offering cutting-edge services that are specifically suited to our users' requirements.

What is library Innovative Technology?

Libraries are constructed with distinctive architecture, cutting-edge designs, and open areas to entice patrons to peruse through racks, engage with other readers, and unleash their creative sides, transforming libraries into social spheres. I want to first define innovation in detail so that you can grasp what "technological innovation" is. Every business aspires to innovate, but doing so frequently today necessitates the use of technology. Technological innovation refers to a new or improved product or procedure that incorporates advanced technological features. When new products or processes are introduced to the market, they are considered technologically implemented product innovations. If a business can benefit from a new technique or product, it is considered innovative.

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Review of Literature

Avdeeva (2010). The RSL is a one-of-a-kind repository of doctoral and candidate dissertations that have been successfully defended in the USA since 1944 on subjects other than medicine and pharmacy. To guarantee the preservation and accessibility of the valuable series, the state library of DDL Russian introduced in 2003. Virtual library established the Reading Rooms across the Commonwealth of Russia of Independent States to provide readers with access to the DDL's resources. DDL website offers access to both the catalogue and the search engine. Unauthorized copying is prevented while copyright-included files can be viewed using the certified application DefView. The Open Digital Library (ODL) project exists under the context of the DDL.

Barathi, Loganathan, & Raja (2017). It emphasizes the importance of staying up-to-date with new technologies to remain competitive in a rapidly evolving environment. The essay delves into how technological advancements have improved knowledge management and library services. It also discusses the need to balance the adoption of new technologies with available resources to enhance offerings for library patrons. By providing an overview of implementing and utilizing emerging technologies in libraries, this study contributes to the literature on virtual library management.

Emezie (2018). The focus of libraries today is on offering new and improved services and procedures. The introduction of digital environments has brought about changes in how libraries operate. A survey conducted was descriptive study, and a questionnaire was used in the data collection methods. The findings showed that there has been a significant increase in library use, visibility, and utilization of resources such as databases. Users also reported improved access to the online public access catalog (OPAC) and helpful staff. The study also found that there has been an increase in progressive offerings and practices within the library, including increased visibility, patronage, and reliance on the library for research. Longer opening hours and a larger social media following were also noted. However, the examination also identified some challenges that hindered the implementation of effective progressive proposals and methods.

Rajan, Esmail, & Musthafa (2022). This essay explores the advancements and obstacles in transforming academic libraries into centers for technology-enhanced learning. As the age changes, so do the skills that are critical for productivity, study, and virtual reformation. A library employee should be technologically savvy in order to tackle modern-day problems involving computers, databases, and new media while providing great customer service. Obviously, with the most promising and expanding programmes of virtual platforms, libraries' role in educational studies underwent a significant alteration in the twenty-first century. Paradoxically, the development of the era has lowered interest in examining culture.

Tiwari (2016). This paper begins with the fundamental differences between the services provided by the library's physical structures and its cutting-edge Web 2.0 services. Once more, the three carrier concerns innovative libraries that make up the precise data relating to the five specific innovation selections have received critical attention. The goal of the

paper is to expand new libraries and improve the existing libraries with superior and revolutionary offerings that can satisfy library customers' needs. It compares, contrasts, and integrates those five revolutionary picks. This essay also attempts to examine how libraries' cutting-edge offerings might achieve the goals set forth in their five guiding principles.

Objectives of the Study

- To identify the how often Library innovative services are utilized in KIT & KIM.
- To analyze the utilizing Library innovative services in KIT & KIM.
- To Examine the Problems the challenges encountered with the Library innovative services used in KIT & KIM.

Statement of the problem

The focus of examine the "Utilization of emerging technologies in library services at the Technical Campus of Karaikudi Institute of Technology & Karaikudi Institute of Management (KIT & KIM)". This research will be conducted as a case study.

Methodology

A survey was created to collect original information and distributed to 200 individuals. Out of these, 138 questionnaires were completed and returned, while 62 were not received. This resulted in 69% of the response rate. This study focused on the sample using in simple random sampling method. Afterwards, computerized data processing techniques were employed to analyze the data using descriptive statistical methods.

Scope and limitation of the Study

Emerging Technological in Library Innovative Services at (KIT & KIM) Technical Campus. The objective of the survey was evaluating the purpose of the study, frequency of access, benefits, and problems faced by users of Library Innovative Services. A total of 138 BE students from various engineering disciplines participated in the survey, including CSE, ECE, EEE, ME, and CE. Data was collected through a questionnaire.

Summary of the survey results:

- Sample Size: 200
- Returned questionnaires: 138
- Non-returned questionnaires: 62
- Response rate: 69%

Data Analysis & Interpretation

Table: 1 Gender wise distribution

S. No	Gender	Frequency	Percent
1	Male	116	84.1

2	Female	22	15.9
Total		138	100.0

Analysis of data revealed that it is found from the above table that majority 116 (84.1%) are “Female” respondents and only 22(15.9%) “Male” respondents participated in the study on Library Innovative Services used in KIT and KIM colleges.(Table 1)

Table: 2 Nativity wise distributions

S. No	Nativity	Frequency	Percent
1	Rural	58	42.0
2	Urban	80	58.0
	Total	138	100.0

The data in this table indicates that 80 (58%) were from urban areas of the respondents, while 58(42%) were from rural areas of the respondents.(Table 2)

Table: 3 Age wise distribution

S. No	Age	Frequency	Percent
1	18-20	34	24.6
2	21-23	33	23.9
3	24-26	38	27.5
4	Above 26	33	23.9
Total		138	100.00

The majority of the respondents 38 (27.5%), fall into the “24-26” age group, 34 (24.6%) in the “18-20” the respondents in age group, and 33 (23.9%) in the “21-23 and above 26” age group. These respondents were used in the study on Library Innovative Services at KIT and KIM colleges.(Table 3)

Table: 4 Year wise distributions

S. No	Year Wise	Frequency	Percent
1	1 - Year	34	24.6
2	2 - Years	25	18.1
3	3 - Years	46	33.3
4	4 - Years	33	23.9
	Total	138	100.0

According to the table4, the majority of respondents, 46 (33.3%), used library innovation services for a period of 3 years. This was followed by 34 (24.6%) respondents who used the services for 1 year, 33 (23.9%) respondents who used them for 4 years, and 25 (18.1%) respondents who used them for 2 years. These usage patterns were observed among students at KIT and KIM colleges.

Table: 5 Frequency of accessing wise distributions

S. No	Frequency of accessing	Frequency	Percent
1	Daily	10	7.2
2	Two to Three times in a week	37	26.8
3	Weekly	27	19.6
4	Monthly	38	27.5
5	Only when require	26	18.8
	Total	138	100.0

According to the table 5, the majority of respondents, 38 (27.5%), used library innovation services on a monthly basis. This was followed by 37 (26.8%) of respondents who used the services two to three times a week, 27 (19.6%) who used them weekly, 26 (18.8%) who used them only when required, and 10 (7.2%) of students who accessed Library Innovative Services in KIT and KIM colleges on a daily basis

Table: 6Qualification wise distributions

S. No	Qualification wise distributions	Frequency	Percent
1	BE - Computer Science and Engineering	19	13.8
2	BE - Electronics and Communication Engineering	21	15.2
3	BE - Electrical and Electronics Engineering	35	25.4
4	BE - Mechanical Engineering	26	18.8
5	BE - Civil Engineering	37	26.8
	Total	138	100.0

According to the table 6, the majority of respondents, 37 (26.8%), utilized library innovation services in the BE- Civil Engineering course. This was followed by 35 (25.4%) of respondents who used these services in the BE- Electrical and Electronics Engineering course. Additionally, 26 (18.8%) respondents used the services in the BE-Mechanical Engineering course, while 21 (15.2%) used them in the Electronics and Communication Engineering course. Lastly, 19 (13.8%) students in the BE- Computer Science and Engineering courses utilized library innovation services in KIT and KIM colleges.

Table: 7 Frequency of Using Innovative Tools

S. No	Frequency of Using Innovative Tools	Frequency	Percent
1	Ask a Librarian	1	0.7
2	E-mail	25	18.1
3	Frequently ask question	12	8.7

4	Library Blog	33	23.9
5	Library Websites	11	8.0
6	Online Public Access Catalogue	18	13.0
7	Radio Broadcasting	20	14.5
8	Social media	18	13.0
	Total	138	100.0

According to the table 7, the majority of respondents, 33 (23.9%), utilized Library Blog for library innovation services. This was followed by 25 (18.1%) respondents who used E-mail, 20 (14.5%) who used Radio Broadcasting, 18 (13.0%) who used Social Media and Online Public Access Catalogue, 12 (8.7%) who used Frequently Asked Questions, 11 (8.0%) who used Library Websites, and 1 (0.7%) who asked a librarian for help with Library Innovative Services at KIT and KIM colleges.

Library Innovative Services with respect to Department

The ANOVA test was conducted in order to determine whether there is significant difference in problems faced while Library Innovative Services with respect to Department.

Null Hypothesis: There is no significant difference in Library Innovative Services with respect to Department

Table No.8 ANOVA test: Library Innovative Services with respect to Department

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
1.Circulation Services	Between Groups	1.213	4	.303	.408	.803
	Within Groups	98.932	133	.744		
	Total	100.145	137			
2.Current Awareness services	Between Groups	3.828	4	.957	.745	.563
	Within Groups	170.752	133	1.284		
	Total	174.580	137			
3.E-mail Services	Between Groups	7.318	4	1.829	2.600	.039
	Within Groups	93.588	133	.704		
	Total	100.906	137			
4.Inter Library Loan	Between Groups	22.214	4	5.553	7.273	.000
	Within Groups	101.562	133	.764		
	Total	123.775	137			
5.Internet Services	Between Groups	2.930	4	.732	.545	.703
	Within Groups	178.607	133	1.343		
	Total	181.536	137			
6.Reference Services	Between Groups	7.723	4	1.931	1.110	.355
	Within Groups	231.378	133	1.740		
	Total	239.101	137			

7.Selective Dissemination of Information	Between Groups	7.076	4	1.769	1.878	.118
	Within Groups	125.243	133	.942		
	Total	132.319	137			
8.OPAC / Web OPAC	Between Groups	32.052	4	8.013	7.727	.000
	Within Groups	137.919	133	1.037		
	Total	169.971	137			

The greater than estimated significance value is 0.05 for all the items meaning, the null hypothesis is accepted i.e. there is no significant difference in items 1, 2, 5, 6, 7 Library Innovative Services with respect to Department.

But, for the item 3, 4, 8 the less than estimated significance value is 0.05 meaning, the null hypothesis is rejected i.e. there is significant difference in Library Innovative Services with respect to Department.(Table 8)

Benefits of using Library innovative services with respect to qualification

The ANOVA test was conducted in order to determine whether there is significant difference in Benefits of using Library innovative services with respect to qualification.

Null Hypothesis: There is no significant difference in Benefits of using Library innovative services with respect to qualification.

Table: 9 ANOVA test- Benefits of using Library innovative services with respect to qualification

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Improved patronage	Between Groups	17.547	3	5.849	4.663	.004
	Within Groups	168.076	134	1.254		
	Total	185.623	137			
Open access to ETDs	Between Groups	18.828	3	6.276	5.777	.001
	Within Groups	145.577	134	1.086		
	Total	164.406	137			
Constant electricity	Between Groups	11.768	3	3.923	2.529	.060
	Within Groups	207.834	134	1.551		
	Total	219.601	137			
Expanded reading spaces	Between Groups	6.442	3	2.147	1.850	.141
	Within Groups	155.529	134	1.161		
	Total	161.971	137			
Access to OPAC	Between Groups	11.710	3	3.903	2.221	.089
	Within Groups	235.507	134	1.758		
	Total	247.217	137			

The greater than estimated significance value is 0.05 for all the items meaning, the null hypothesis is accepted i.e. there is no significant difference in these items 1, 2 Benefits of using Library innovative services with respect to qualification.(Table 9) But, for the item 3, 4, 5 the less than estimated significance value is

0.05 meaning, the null hypothesis is rejected i.e. there is significant difference in Benefits of using Library innovative services with respect to qualification.

Problems of using Library innovative services with respect to Departments

The ANOVA test was conducted in order to determine whether there is significant difference in problems faced while using Library innovative services with respect to Departments.

Null Hypothesis: There is no significant difference in problems faced while using Library innovative services with respect to Departments.

Table: 10 ANOVA test- problems faced while using Library innovative services with respect to Departments.

ANOVA						
		Sum of Squares	df	Mean Square	F	.Sig
Low speed of.1 internet services	Between Groups	11.930	4	2.983	2.409	052.
	Within Groups	164.650	133	1.238		
	Total	176.580	137			
Lack of knowledge.2 about advanced searching techniques	Between Groups	24.937	4	6.234	6.936	000.
	Within Groups	119.534	133	899.		
	Total	144.471	137			
Limited access.3 problems	Between Groups	2.346	4	587.	465.	761.
	Within Groups	167.632	133	1.260		
	Total	169.978	137			
Lack of.4 training	Between Groups	18.136	4	4.534	4.887	001.
	Within Groups	123.400	133	928.		
	Total	141.536	137			
Poor.5 infrastructure	Between Groups	15.567	4	3.892	4.837	001.
	Within Groups	107.013	133	805.		
	Total	122.580	137			

The greater than estimated significance value is 0.05 for all the items meaning, the null hypothesis is accepted i.e. there is no significant difference in items 1, 3problems faced while using Library innovative services with respect to Departments.(Table 10) But, for the item 2, 4, 5 the less than estimated significance value is 0.05 meaning, the null hypothesis is rejected i.e. there is significant difference in problems faced while using Library innovative services with respect to Departments.

Conclusion

Cutting-edge services and practices are the key technology in modern libraries. The shift to the digital age has transformed libraries, leading to a technological revolution in their operations. As a result, the KIT & KIM library has embraced this change by adopting new approaches. This includes implementing new services and practices, which are detailed in this paper. The library continues to offer a variety of spaces to cater to

various needs and engage with patrons. Despite commendable efforts by the KIT & KIM library, there are still obstacles to overcome in implementing innovative services and practices.

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USE OF ELECTRONIC RESOURCES THROUGH MOBILE TECHNOLOGY IN ACADEMIC LIBRARIES

Dr. N. Geetha[1] & Dr. S. Kothainayaki[2]

Introduction

The Libraries have adopted new technologies to assist in their objective of providing patrons with effective and efficient services, as well as timely access to needed information. Implementation of Information and Communication Technologies has changed the way people access and communicate information. It has created a new service environment in every sphere of activities and have pushed conventional boundaries of the entire organisation especially in libraries and information centres. The technology, in combination with communication and information tool facilitates in generation, acquisition, storage, organisation, searching, retrieval and transformation of information using electronic means. These electronic information sources, used initially to transport textual information, today transports other form of information such as images, videos and audios. These electronic sources, initially served for specialized clients, now accessed by a wide range of users, ranging from computer specialists, discipline experts, laymen including the notice computer users at all levels.

In the age of information communication technology, the academic libraries have changed its services and housekeeping operations for providing access to its collection. Academic Libraries are deeply interested in channels for dissemination of information, such as mobile phones, telephone lines and cellular networks and internet. Application of mobile technology to provide library and information services are a significant step in this direction. The traditional library services are now moving to mobile library information services. Mobile technologies have made communication and information access very convenient and timely to users. The adoption of mobile technology alters the traditional relationships between libraries and their users and introduces novel challenges to reader privacy. According to Mohan Lal Vishwakarma, Shyam Lal Maurya and Shivani Govil (2013), there is the shift from' d-learning' (distance learning) to 'e-learning' and now from 'e-learning' to 'm-learning' will be the next big wave, which will reform education in India. The Internet and World Wide Web (www) have made it possible for university teachers, researchers, and students to locate what they need from the library. Like most of the service institutions, academic libraries need to engage in marketing their products and services. From a marketing communications perspective, the challenge to most

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libraries is to attract users to the library and to retain them. Mobile phones and e-mail are important tools to facilitate prompt handling and response to the stream of users questions from within and out of the library user community.

Review of Literature

Haridasan and Khan (2009) stated that the term "eresources," short for "electronic resources," refers to data and materials that are stored electronically and accessible via networks and systems. Modern information access and retrieval systems are incredibly dependent on e-resources.

Kwafoa, Anhwere & Manu (2019) emphasised that the accessibility of electronic resources in academic libraries has completely changed how information is accessed, saved and shared in addition to having access to a wealth of digital materials, libraries now also have the creative capacity to increase access, sharing, and publishing in academic activities. Hindagolla (2021) also emphasise with the global digital revolution, the landscape of academic libraries has significantly transformed. Traditional physical resources, such as printed books and journals,

According to Nazi, Ghasempour, & Asgari (2014), the new mobile phone technology can support a lot of library services such as searching in library OPAC, current awareness, book loan/reserve, database accessing and reference services. Elahi, (2014) states that the Mobile devices and applications provide access to information in the comfort of people's homes and offices, using their cell phones or personal digital assistants. Nazi et al., (2014) emhasised that, the use of mobile technology in the library provides library services beyond the location and library barriers, offer simplicity in usage, reduced cost of acquiring PCs and high influence cost coefficient.

Palumbo (2014) insists that, the library and information professionals work with students as part of information literacy classes, at service desks, and in cyberspace, thus it is important to realize that for students, the mobile device will increasingly become an instrument for the creation of digital content and not just a device for accessing the content. Therefore, library services have become accessible from any point since mobile devices provide easy access to library materials and promote efficiency. Shukla and Mishra (2011) had emphasised that, the electronic collection as the collection of information which can be accessed only by the use of electronic gadgets.

Electronic Resources

E-resources is an electronic document is the result of integrating classical book structure or rather the familiar concept of a book, with features that can be provided within an electronic environment is referred to as electronic book, which is intended as an interactive document that can be composed and read on a computer. Electronic Resources play a significant role as information sources in Academic libraries. According to Uzuegbu, Chukwu and Ibegwam (2012), electronic databases are specialized records of related published information documents which are not available on Google or other

common search engines, especially in a full text. Ani and Ahiauzu states that ‘‘electronic resources are collection of electronic information sources (e-journals or eBooks) by publishers from various fields or disciplines and that some of these databases are provided free of charge to libraries in developing countries by their publishers or vendors, while others require some fees for subscription.” The very benefit of electronic information is it can be accessed by any tool that has the availability of the internet. It could be smart phones, laptops, tablets or any other electronic gadgets. Electronic resources comprised e-books; e-journals; electronic articles, theses and dissertations; repositories and online newspapers and databases.

Mobile Technology

Mobile technology is a type of technology in which a user utilizes a mobile phone to perform communications-related tasks, such as communicating with friends, relatives and others. It is used to send data from one system to another. Portable two-way communications systems, computing devices, and accompanying networking equipment make up mobile technology. “Mobile technology opens the door for a new kind of learning and performance support in the field, providing anytime and anywhere access to information, processes, and communication” (Meurant, 2010). “Devices such as smart phones, tablets, and e-book readers connect users to the world instantly, heightening access to information and enabling interactivity with other students. These mobile devices are now regarded as essential learning tools” (Traxler,2010). This age is a digital information age, where information can be easily accessed anywhere and anytime. Consequently, there are many fascinating areas of study that the use of Smart phones invites. Mobile technology also plays a crucial role in enhancing connectivity between library users and librarians. With the availability of real-time communication channels such as chatbots, instant messaging, and video conferencing, users can easily seek assistance, ask reference questions, and receive personalized support from librarians. This direct and immediate communication fosters a more interactive and responsive library experience. Users no longer need to rely solely on physical visits to the library or email correspondence. The library websites should transform themselves towards m-library websites either by creating a new m-website or creating mobile app or by transcoding the old one. Transcoding is a technology which takes a regular web site and reformats it for display on a tiny mobile screen. These transcoded Web pages are viewable by a wide range of mobile phones.

Library Services Through Mobile Technology

According to Thomas (2010) recent advancement in mobile tools and techniques provide handy, instantaneous access to information across boundaries of subject and discipline. Libraries are also engaged to adopting the advance technologies to provide their resources and services and the ongoing acquisition and archiving of digital content Thomas (2011). The following mobile initiatives have been implemented in academic library services to enhance user experience and access to resources.

Library Website: The Academic libraries have developed mobile enhanced library websites with user-friendly interface, ensuring easy navigation and efficient access to library services and resources.

Catalogues and User Management: The mobile applications provide users with access to library catalogues and user account management. The users can search the catalogue, renew materials, and can manage their library accounts easily through their mobile devices.

Notifications and Reminders: Mobile applications enable academic libraries to send push notifications and reminders to users, keeping them informed about new resources, upcoming events, due dates, and other important updates. These notifications serve as timely reminders and help users stay engaged with the library's offerings.

Digital Literacy and Accessibility: The successful implementation of mobile technology in academic libraries relies on the digital literacy skills of users. Libraries should provide training and support to ensure that all users can effectively utilize mobile technology for accessing library resources and services. Additionally, libraries need to ensure accessibility for users with disabilities by incorporating features such as screen readers and text-to speech capabilities. iv. User Adoption and Acceptance:

Mobile technology: Competition in mobile industry is increasing day by day. Every mobile company wants to provide best features in their mobiles. As a result, we see various mobile companies provide mobiles with different mobile operating systems.

Advantages of Mobile Technology In E-Resource Access

Accessibility: Easy access to E-resources anytime, anywhere and provide remote access to resources beyond library premises.

Integration: Integrating the mobile technology with existing library systems and services will help to streamline the access to E-resources.

Engagement: Offering personalised experiences, interactive features and collaborative tools with mobile application.

Inclusivity: Ensures inclusivity by incorporative accessibility features such as screen reader compatibility, text sizes and alternate navigation option to ensure equitable access for all the users.

Promotion: Mobile technology act as a platform for promoting electronic resources, library services and events to a wider user.

Convenience: Enhance user convenience by enabling seamless browsing, searching and easy retrieval of E-Resource.

Enhancing The Use of Electronic Resources Through Mobile Technology

The libraries are making a tremendous financial investment in electronic resources and use was high, limited attention was paid to ensuring consistent, reliable access to those resources. This resulted in a significant customer service gap (Resnick, T. et al, 2008). Libraries and e-resource aggregators should consistently do efforts to sum up the gap by acquiring the new technologies in proper way. It is obvious that users in digital libraries often expect a seamless, integrated, transparent network that allows them to link quickly and painlessly to documents they seek. They want easy access to full text and content providers such as aggregators are working with libraries and publishers to achieve this goal. However, the variety of aggregators in the digital environment causes some confusion to information professionals as well as to end users (Moghaddam, G. G. and Moballeghi, M., 2007). The use of mobile technology to provide the access to the e-resources anywhere may be more beneficial if it will be planned by the libraries and e-resource aggregators in collaborative way to cover the large number of users in least efforts.

Research scholars use much information from different journals provided by different vendors. Installation of many apps and mobile sites of different aggregators create several problems like specification issue, compatibility issue, connectivity issue, download issue, and authentication issue, etc. All these issues can be solved by the consistent coordination between the libraries and vendors. Librarians with experience in licensing and managing electronic resources are effective in rapidly diagnosing and remedying access problems (Resnick, T. et al, 2008). The dedicated mobile site is the significant way to provide the e-resources for mobile reading due to its simplicity, generality, familiarity, integrity, authenticity and usability. Research shows that all e-resources can be accessed through mobile phone technology, for example, e-journal, e-books, e-newspapers, and OPAC are accessible though MPT. However, if we look at how this technology has been approved and used to access library content, for example with regard to internet and off-campus usage, it worrying how little this technology has been utilized.

Considering tremendous and untenable influence mobile technology has impacted on all aspects of our life, it can be concluded that although the technology has been embraced in some library operations, its potential has not been fully utilized.

Features of mobile phone technology needed to access library services were evaluated against library services that the latter was capable to execute. These included: reference, lending, indexing and abstracting, current awareness, selective dissemination of information, interlibrary loaning ICT and special services. According to Canuel & Crichton (2011) Academic librarians are developing mobile content and services in the context of the wider information industry, and while librarians and university researchers are becoming more comfortable in using mobile technology for advanced research activities, library vendors and publishers are responding to that trend the mobile phone technology has come with positive changes and all aspects of life must embrace in

order to remain competitive and avoid extinction. As such, many information providers have customized their services to be disseminated through mobile phone technology such as introduction mobile library service, distance learning programmes, interlibrary lending, and library user interaction through phones. Kim et al., (2006) states that Increasing numbers of institutions of higher education offer courses using mobile phone technologies as alternative teaching and learning tools. As such, library services have to be made available through a similar platform to make teaching and learning success. Academic libraries are committed to providing access to electronic and print resources to support the research and curricula since effective and conscious utilization Information Communication Technology (ICT) applications results to the rise of e-resource access and utility.

Conclusion

To improve the usage of the electronic resources, the librarians may have to develop strategies for providing faultless access to the databases as the range and quality of e-resources increase (Olorunsola, 2011). Regarding the types of e-resources accessed and used in libraries, it was observed that they are changing each due to technological changes. Application of mobile technology in library services is the need of the hour. Interaction with the user community can be enhanced due to advancement in mobile technology. The patrons can access a wide range of electronic resources and library services and truly engage in learning activities using any mobile devices wherever and whenever they choose, not just at their desktop PCs. The impact of mobile technology implementation raised strong awareness amongst library staff for the need to acquire skills to realize the associated benefits. The academic institutions are marketing their product and services through mobile devices. The challenge of academic libraries is to create and compelling information services and to make digital content available in a way that user community will find not only acceptable, but tailored to their needs. The mobile revolution offers both challenges and opportunities for academic libraries. The mobile devices are capable and have require features to support access to reference services, checking in/out, indexing and abstracting, conducting current awareness to users, doing selective dissemination of information, executing interlibrary loaning and providing special services to special people. It is recommended to be improved because, as outlined above, mobile phone technology will not only improve communication between users and librarians but may also increase the usage of the library. There is also the possibility of such technology playing a role in increasing the research output of the University by providing quick, reliable and easy access to information**.**

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MOBILE TECHNOLOGY IN LIBRARIES: APPLICATIONS, SERVICES, BENEFITS AND DRAWBACKS

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Introduction

Libraries have been experimenting with new technologies in order to give their patrons faster and more effective access to a variety of information resources in recent years. Technology has made it possible for libraries to provide their patrons with better solutions, which has enhanced productivity, efficiency, and quality of library services. Information technology accessibility promotes information flow, creativity, and effective management. Mobile devices have grown in significance, especially in developing nations, as communication and computing technologies have progressed. The combination of two digital technologies-computers and mobile phones-has led to the creation of mobile learning resources. Libraries must adopt mobile technology in order to stay relevant in a mobile society because they are social institutions that link people with people and information with information. Therefore, in order to offer improved user services, libraries need to be ready to adjust to technological advancements and incorporate themselves into a mobile environment. The library develops a Smartphone app that lets users access and hold items, as well as get details about nearby library locations and hours. Users' mobile devices can also access digital collections via the digital library. Numerous benefits are provided by the mobile phone library, including location-based services, SMS, internet browsing, time-saving features, and personal assistance. Since most teachers and students now carry around laptops and cell phones, libraries can develop new services and provide instant access to information resources. Teachers in developing nations are ill-prepared to use mobile technology to improve teaching and learning opportunities, while students are increasingly using it for personal use.

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Libraries and Mobile Technology

There is no indication that the widespread use of mobile devices in today's society will alter. The majority of library patrons nowadays own smart phones, which they use for various purposes in addition to personal use. The "Libraries in Hand" trend in libraries is currently being brought about by mobile technology. In order to make sure they are interacting with users and offering Web content in the most suitable and efficient ways, librarians are attempting to ascertain how these devices are impacting information access. Mobile technology is the term for the technology used in cellular communication. In recent years, there has been a notable increase in mobile coding multiple accesses, mainly because wireless technology for wireless devices has advanced. On the other hand, a vast array of extra features is included in contemporary mobile phones, such as web browsers, video players, cameras, navigation systems, and more. Furthermore, cell phones or cellular phones are other terms that can be used to refer to mobile phones. In order to allow users to access the many where from anywhere, librarians will need to learn how to use these devices effectively. Thus, it is essential that librarians comprehend mobile devices and offer services via them. Libraries can only offer their patrons comprehensive services with the assistance of desktop computers and internet connectivity.

Opacs, Mobile Websites, and Applications

Applications, OPACs, and mobile websites are available for library use. The list of mobile applications, OPACs, and websites is as follows.

Developers For Android

It offers resources for developing Android apps & contains videos, tutorials, and a developer's guide.

Innovative Interfaces Or Airpac

It provides the Innovative Interfaces (III) library catalogue in a mobile format. Features include cover photos, the ability to request and renew items, and integration of library locations with Google Maps software, among other features. For pricing, get in touch with Innovative Interfaces.

Boopsie

Boopsie, which specializes in academic and public libraries as well as universities, offers mobile applications that work with any phone that can access the Web. For a quote, get in touch with the website.

Jqtouch

Matthew Leak, a freelance web designer and developer, describes how to make a website mobile-friendly.

Anywhere You Go, Library

Any library can use Library Anywhere as a mobile catalog. It consists of Android, Blackberry, and iPhone applications as well as mobile Web.

Mobiletuts+

Regardless of platform, it offers tutorials for all mobile developers. Building methods for mobile websites and apps are among the topics covered.

Mobilesitesgalore

It facilitates the creation of a mobile website in less than 60 minutes. Technical or programming expertise is not necessary.

Mofuse

With the MoFuse (short for Mobile Fusion) content management system, it is easier to create a mobile version of an already-existing website or blog.

Best Practices For Mobile Web 1.0

This document, which was produced by the World Wide Web Consortium (W3C), outlines best practices for creating mobile-friendly Web content.

Services Provided Through Mobile Technology

Cataloguing Service

Because it gives library users access to the information they need, this service is the center of the library. How many titles and copies of a specific material are available in the library, as well as the number of copies available, and how many users can search via mobile devices. Using this service, patrons of the library can request and renew materials on their own mobile device, as well as access their account information.

Alert Service Via Sms

The majority of libraries use Short Message Service for a number of purposes, such as sending out phone numbers and location updates, reminding patrons when materials need to be checked out, and informing people when materials are available.

Current Awareness Service

One type of service is the Current Awareness Service, which is based on articles from various new and recent e-journals. A variety of mobile devices can be used to make it available to users. On their mobile devices, they can access and search the same content.

Services For Instant Messaging For Reference

Instantaneous answers, including definitions and meanings, can be obtained through mobile devices by accessing digital libraries and the internet. Additionally,

libraries can make use of Google's free online instant messaging services. By providing convenient services to busy users, technologies like instant messaging, e-mail, and SMS text messaging are making it easier for libraries to remain relevant as information hubs. Mobile users may be provided with Ask-a-Librarian services, which allow them to text in their research questions from a distance.

Text Reference Service

If the library receives a high volume of enquiries that require brief responses, such as dictionary definitions, facts or service information then Librarians can provide instant answers, and links to articles/references in real time.

Opac For Smartphones

Libraries may provide their Smartphone catalog. With the assistance of software providers to create mobile-friendly WEBOPAC and M-OPAC systems, libraries are providing users with access to their online public access catalogues via mobile-friendly websites. For example, mobile application pilot programs offered by OCLC, World Cat, and LIB-MAN enable users to use an Android phone to access a web application that searches and finds books and other resources available in local libraries.

QR Codes On Mobiles

Often called "quick response" barcodes, QR codes are two-dimensional barcodes that can hold text, URLs, and other data. This process is called "mobile tagging" and can be encoded with any alphanumeric string. Data can be converted into a QR code using any QR generator—many of which can be downloaded for free. The generator takes user-inputted data and outputs a code that can be printed or displayed electronically. Any mobile camera phone with a QR reader—which is generally available for free online—can decode the code.

News and Events

Users can use mobile devices to get the most recent information about job openings, various academic competitions, library events, including orientation programs, stock checks, book recalls, lectures on particular subjects, and news about academic work, awards, etc. Users can also receive brief alerts in person about news and events at the library.

Distance Education, Online Learning, and Formal Education

When it comes to using their phones and different mobile applications, students are highly adaptable. By making information resources widely available, academic libraries can take advantage of the opportunity to pioneer the deployment of mobile library services to support formal education, distance learning, and research activities in an eLearning environment. Services provided by libraries should complement those offered by colleges and universities, the scientific community, and other clients they serve in terms of teaching and research.

Mobile-Friendly E-Resource Interfaces

Mobile phone accessible e-books (text and audio) are already being provided by some publishers. It provides access to a wide range of databases and digital resources, including mobile-friendly e-books, e-journals, Web databases, and dissertations, audio books, streaming music, movies, photos, and article databases. Users can either borrow mobile devices pre-loaded with these collections or download the collections directly from the library websites on their own devices. There is a vast selection of audio books that can be downloaded for free or with a subscription, and they can also be transferred to mobile devices. Multimedia messaging services (MMS) on mobile devices allow libraries to share audio, video, and photo content.

Library Virtual/ Audio Tours

Library Virtual and audio tours, as well as programs for instruction, induction, and orientation, have played a big role in drawing non-users to libraries and assisting those who are geographically dispersed or in remote locations. Mobile library tours are available to library patrons who lack the time or desire to attend an in-person workshop. It is possible to create audio and virtual library tours quite quickly and affordably, which could save staff time that would otherwise be spent assisting new users in getting to know the library and outlining its features. It is readily available for download on mobile devices as well as from the library website.

Availability of M-Technology For Library Services: Benefits

- Considering that mobile devices are far less expensive than laptops and personal computers, these are reasonably priced options.
- Delivery of multimedia content and specific choices.
- Assistance with continuous and situational learning
- The training expenses are decreasing.
- Possibly a more successful learning opportunity.
- It is adaptable, easy to use, and visually appealing.
- A diverse range of educational activities providing a mixed learning environment allowing students to study in different formats and ways.
- Very appealing and captivating user interfaces.
- Promotes active engagement between the student and the course content.
- Text messages (SMS) are a faster and easier way to share information with teachers and students than phone calls or emails.

Drawbacks of M-Technology For Library Services

- Important data may be lost due to discharged batteries, as they require frequent charging.
- Problems related to signal connectivity in mobile networks.
- There are certain professional tasks that can be challenging to finish.
- Handling small screens on mobile phones and horizontal screens on some handheld laptops can be difficult due to a lack of common platforms.

- Due to how quickly the market is evolving, devices frequently become outdated.
- Increased user numbers on wireless networks could lead to less efficient use of bandwidth.
- Students' eyes may strain if they look at their displays for extended periods of time.

Conclusion

Many organizations, including libraries and documentation centers, are heavily involved in the communication and dissemination of information in the modern era. Everyone needs a mobile phone as a tool for information communication. In the information age, people rely on their mobile phones to share ideas, information, facts, and dialogues. Libraries in particular use a variety of tools and methods to disseminate information to their user base. Additionally, libraries ought to be promoted. To expand the market and satisfy the need for mobile access to tailored facts and information anytime, anywhere, we must be prepared to take on this challenge. The most crucial tools for promptly handling and answering user inquiries from the community of library users are email and mobile devices. These days, a mobile device can play rich multimedia content, interact with cloud services, run sophisticated software, and facilitate sophisticated user interfaces. The mobile environment incorporates new hardware and technologies like media creation and capture tools, Wi-Fi, Bluetooth, multi-touch screens, text messaging smart phones, software apps, mobile websites, and global positioning systems.

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IMPLICATIONS OF CHAT GPT IN ACADEMIC LIBRARIES

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Introduction

ChatGPT is a chatbot and virtual assistant developed by OpenAI and launched on November 30, 2022. Based on large language models (LLMs), it enables users to refine and steer a conversation towards a desired length, format, style, level of detail, and language. Successive user prompts and replies are considered at each conversation stage as context. Chat GPT (Generative Pre-trained Transformer) a language model developed by OpenAI, a research organization co-founded by Elon Musk and other entrepreneurs, in 2020. Originally offered as a free research preview, OpenAI now runs ChatGPT on a freemium business model in light of the service's growing popularity. Users can access GPT-3.5 and GPT-4o (omni) while on its free tier. The "Plus," "Team," and "Enterprise" ChatGPT subscriptions offer extra capabilities like the ability to generate DALL-E 3 images and a higher GPT-4o use limit. It gained over 100 million users by January 2023, making it the fastest-growing consumer software application ever, and it helped boost OpenAI's worth to its current $86 billion. With the huge growth in the computer technology, the Natural Language Processing (NLP) now has become an self-dependent discipline. The NLP research and applications have advanced significantly in recent years, due to their development of large-scale language corpora and deep learning technologies.. The Generative Pre-Trained Transformer (GPT) is an innovative language processing AI that is designed to produce conversational text for a wide range of purposes. It allows users to fine-tune and direct a conversation towards a desired duration, format, style, level of information, and language based on large language models (LLMs). At every point of the interaction, the user's prompts and responses are taken into account as context. Because it has been trained on a vast amount of text data, it can understand and produce a wide variety of words. Its ability to generate natural-sounding information can be advantageous for a variety of applications, including linguistic transformation, summarization, and conversation generation.GPT (Generative Pre-Trained Transformer) is an innovative language processing AI which has been planned to provides text conversations for a varied purposes.

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Working of Chatgpt

In order to produce outputs that are coherent and human-like, ChatGPT uses a deep neural network topology made up of several layers of transformers that are specialized in processing sequential input, mainly natural language text. A sizable corpus of text data is used to train ChatGPT, allowing it to learn the relationships and patterns between words, phrases, and sentences. Refinement of the model is an iterative process that is carried out when it is exposed to further data. Following training, ChatGPT can be adjusted for particular jobs or uses, such as translating languages or creating content. ChatGPT workflow has involved several steps. A query or prompt is been entered by the user into the system, which is been processed subsequently by the model. The model generate a response using its comprehension of language patterns and associations, which is been forwarded to the user. The conversation can be further continued with more questions by the users. This approach is wholly trained through reinforcement learning, with human feedback being the main source of improvement. ChatGPT is based on particular GPT foundation models, namely GPT-3.5, GPT-4, and GPT-4o, that were fine-tuned to target conversational usage. The fine-tuning process leveraged supervised learning and reinforcement learning from human feedback (RLHF). Both approaches employed human trainers to improve model performance. In the case of supervised learning, the trainers played both sides: the user and the AI assistant. In the reinforcement learning stage, human trainers first ranked responses that the model had created in a previous conversation. These rankings were used to create "reward models" that were used to fine-tune the model further by using several iterations of proximal policy optimization.

SFT Model: Supervised Fine Tuning has been involved for training the model which necessitates the performance by collecting demonstration data.

RM Model: In this Reward Model, this step analysis the output of the Supervised Fine Tune model and gives points to users according to the desired or necessary outcomes..

SFT Model via PPO: To fine tune the SFT model policy reinforcement learning is engaged where it allows to upgrade the RM model. The optimised proximal policy optimisation model is called PPO.

Impact of ChatGPT - Cyber Security

Due to its ability to recognise and stop cyberattacks, ChatGPT has significantly advanced the field of cyber security. By examining the language used in the email, the language model can be utilised to identify phishing emails and differentiate between legitimate and fraudulent emails. In the same manner, ChatGPT can assist in the identification of malicious code by analysing the language used in the code. Furthermore, ChatGPT can help to secure the password since it can provide complicated, one-of-a-kind, and difficult-to-predict passwords.

Customer Support

By providing consumers with individualised support, ChatGPT has the potential to improve customer support services. It can be used to build virtual agents who provide clients with individualised support and guidance. These virtual agents can be trained to efficiently understand and respond to questions and concerns from customers. Moreover, ChatGPT can be used to create automated systems that quickly recognise and address possible consumer issues. It can be used, for instance, to create automated systems that can recognise and handle client problems on their behalf. With the use of this technology, intelligent customer support representatives that can provide clients with individualised guidance and services may be produced.

Health Care

By offering doctors and other healthcare workers individualised support, ChatGPT has the potential to improve healthcare services. It can be used to create automated systems that offer specialised direction and counsel to medical practitioners. For instance, ChatGPT can be used to develop intelligent health systems that provide tailored medical advice based on a patient's medical history. ChatGPT can also be used to create systems that identify possible health problems and provide prompt fixes. Better patient outcomes can also be achieved by developing virtual agents that provide patients with individualized health information and support. Chatbots have the potential to have a positive impact on the healthcare industry by facilitating direct patient connection and addressing patient privacy issues.

Software Development

Software developers have benefited greatly from ChatGPT's ability to include natural language processing (NLP) features into their programmes, which enhances their interactivity and user-friendliness. The rising use of NLP-based software is exemplified by the popularity of conversational interfaces, such as chatbots and virtual assistants. Thanks to ChatGPT, programmers can now construct more sophisticated chatbots that can comprehend user inquiries and reply in a way that is more human-like. Furthermore, this technology has opened up new opportunities for software development by making it simpler for developers to include AI and machine learning capabilities into their programmes. Consequently, ChatGPT has transformed software development, enhancing its intuitiveness, engagement, and efficacy. ChatGPT's effect on code is remarkable, and it is expected to replace platforms such as Stack Overflow in assisting software developers in their daily work at organizations.

Effect of Ai-Based Gpts On Higher Education Library - Increased Efficiency

Many library operations, including cataloguing, sorting, and searching, can be automated using AI-Based GPTs, which can boost productivity and save time for both

users and librarians. This enhances the entire library experience for patrons and allows the librarians to concentrate on more difficult assignments.

Improved Access to Information

Instant access to a wide range of global resources and information is possible for users of GPTs. Students and researchers may get the information they need swiftly without having to physically search through stacks of books or browse through digital libraries, which can considerably improve their research experience.

Personalized Recommendations

Based on a user's wishes and interests, GPTs may assess their search history and offer customised recommendations. Users may find new materials and information through this that they might not have found on their own.

Increased Collaboration

By offering a platform for knowledge and resource sharing, GPTs can help researchers and students collaborate more easily. This can support multidisciplinary research and learning and aid in the dismantling of silos.

Enhanced Accessibility

Based on the user's preferences and past searches, AI-Based GPTs can offer more individualised recommendations and search results, making it simpler for users to locate pertinent information fast. Furthermore, AI-Based GPTs can be trained to comprehend and react in a variety of languages, increasing non-native speakers' access to information.

Improved User Experience

With real-time personalised suggestion generation and question-asking capabilities, AI-Based GPTs can offer users a more engaged and captivating experience. This can improve patrons' overall library experiences and motivate more regular library use.

Greater Data Insights

Librarians may make better judgements regarding library resources and services by using AI-Based GPTs to analyse user data and provide insights into user behaviour and preferences.

Challenges to Privacy and Security

When using AI-Based GPTs, security and privacy issues may arise, especially if user data is being gathered and examined. Libraries must make sure that the proper security measures are in place to preserve user data security and privacy.

Challenges to Traditional Library Systems

Although GPTs have the potential to improve users' research experiences, they could potentially provide difficulties for established library systems. As GPTs advance in sophistication and ease of use, traditional library systems may find themselves more easy to replace.

The HE Library System might thus be greatly enhanced by AI-Based GPTs by improving user experience, accessibility, efficiency, and data insights. But before using AI-Based GPTs, librarians and library systems must carefully assess the risks and difficulties that could arise and put the right safeguards in place to lessen them.

Application of ChatGPT in Library Services:

Collection Development

By evaluating massive amounts of text and finding trends and patterns, ChatGPT could help libraries find new topics of interest and make sure that their collections are relevant and up to date.

Readers Advisory

By giving ChatGPT the ability to assess readers' reading habits, favourite authors, and genres, it may be used to provide personalised reading recommendations to library users.

Provides Accessibility to Disabled Patrons

It can be used to provide accessible services to clients who have disabilities. For example, ChatGPT can be used to offer audio descriptions of visual content or transcripts of videos.

Outreach and Communication

ChatGPT can help libraries engage with their patrons by providing timely responses to messages and comments on social media platforms.

Reference Services

One of the most apparent uses for ChatGPT in libraries is to offer reference services to users. For instance, a library might develop a chatbot that utilises ChatGPT to respond to frequently asked queries regarding the resources, services, and guidelines. This could lessen the amount of work that librarians have to do and increase the effectiveness and speed of the reference process.

Promotion and Participation

ChatGPT can be used to promote events and services and engage with library users. For example, a library might create a social media chatbot that interacts with users and notifies them of upcoming events and services using ChatGPT. Applications for ChatGPT include book clubs, author appearances, workshops, marketing for libraries,

cooperation and partnerships, user surveys and feedback, library programmes and events, community outreach, volunteerism and advisory, user-centered environments, and social media participation.

Information Literacy

A library might utilise ChatGPT to develop an interactive lesson or game that teaches users how to assess sources and carry out research.

Book Requirement

Additionally, it may determine the user's reading preferences and suggest books based on those preferences. This could be useful for those looking for new books to read or who aren't sure what to read next.

Catalogue Searching

The library's catalogue can be searched for books, articles, and other materials using ChatGPT. ChatGPT can interpret user queries using natural language processing and deliver relevant search results.

Personalised Reading Suggestions

Customers can receive tailored reading recommendations from ChatGPT based on their reading preferences and past reading experiences. Based on the books that users have already checked out and the answers they have provided to questionnaires regarding their reading interests, it can make book recommendations to them.

Language Transformation

It can be utilised to provide language translation services to clients. By connecting the chatbot with ChatGPT, users can interact with the library in their native tongues and get responses in the language of their choice. programme for translation.

Interactive Training

Interactive education about the goods and services provided by libraries can be given through ChatGPT. For example, it can instruct users on how to access databases of electronic journals and books.

Advantages of ChatGPT using library service

Books, journals, articles, and other resources on a wide range of subjects are available in libraries. ChatGPT is able to obtain this data by utilising library services, which can aid it in responding to user inquiries with greater precision and information.

Time-saving

ChatGPT may employ library resources to swiftly access pertinent and trustworthy sources rather of wasting a lot of time looking up information online.

24/7 support

Even on closed days, ChatGPT can offer library users round-the-clock assistance.

Quality information

Libraries are renowned for offering accurate information sourced from trustworthy sources. This can assist ChatGPT in avoiding giving users false or deceptive information.

Up-to-date information

Libraries add new material to their holdings on a regular basis, enabling ChatGPT to access the most recent findings and developments on a range of subjects.

Research Assistance

For more difficult inquiries or research projects, ChatGPT might benefit from the research support services provided by many libraries.

Collaborative Opportunities

Collaborative rooms in libraries are frequently available for people to work on projects together or share expertise. ChatGPT is able to provide the collaboration.

Multi-lingual support

Numerous libraries supply materials in several languages, which can aid ChatGPT in offering responses in several languages and growing its user base.

Access to specialized resources

Rare books, manuscripts, and archives are a few examples of the resources that are frequently found in libraries but are not easily accessible online. In order to provide ChatGPT with unique and specialised information, these resources can be extremely helpful.

Disadvantages of ChatGPT using library service

Reduced critical thinking

Using ChatGPT may cause one's capacity for critical thought to decline. This is due to the model's ability to provide information and answer questions quickly and easily, which may eliminate the need for people to perform independent critical thinking and problem-solving. Furthermore, people may believe false information without verifying it if the model's information is accurate and dependable.

Dependency on third-party services

The functionality and output of ChatGPT depend on other libraries and services, which could experience outages or have their APIs changed. ChatGPT's functioning can be impacted if any of these services go down or stop working.

Privacy and security concerns

The usage of third-party services by ChatGPT may give rise to privacy and security issues with data. If confidential data is supplied with ChatGPT, these outside services may process and store it, putting it at risk for security lapses or data breaches.

Limitations in customization

The degree to which ChatGPT can be modified or adapted to particular use cases may be constrained by its reliance on third-party services. Because of the limitations and restrictions imposed by the services it uses, ChatGPT might not always be able to provide the best or most pertinent answers to specific concerns.

Cost

It could be expensive to use some additional libraries and services, which would prevent smaller businesses or individuals from fully utilising ChatGPT.

Plagiarism

By presenting material produced by the model as their own, researchers may find it easier to commit plagiarism when using ChatGPT to generate content. AI-powered writing tools can reduce or eliminate plagiarism by paraphrasing content.

Conclusion

With its ability to produce text that sounds like human speech and respond to queries, ChatGPT has a major influence across many industries. With the advent of large language models (LLMs) such as ChatGPT, the use of task-specific datasets or fine-tuning to carry out language-related tasks. In the current quantity, data has been added in numerous languages and computer codes. Rather than surfing the internet, it has been trained on a vast amount of content, including books, websites, news pieces, scholarly articles, and other sources. With the help of its natural language processing (NLP) engine, ChatGPT can simulate human speech. However, academics are debating the moral ramifications of how pupils can misuse technology to avoid studying. Large amounts of text data produced by user interactions with library services can be analysed using ChatGPT. Through the identification of trends in user behaviour, preferences, and needs, more effective and personalised library services can be developed. All things considered, ChatGPT has the power to completely change how library services are provided and assessed. It can also significantly increase user involvement and satisfaction. To achieve a thorough and accurate understanding of user needs and preferences, it is crucial to remember that ChatGPT utilisation should be supplemented with other research methodologies.

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IMPLIMENTATION OF SELF - SERVICE SYSTEM IN UNIVERSITY CENTRAL LIBRARY, SRMIST: A TECHNICAL STUDY

Senthilkumar M K S[1]

Introduction

RFID, or radio frequency identification, is a technology that uses radio waves to allow devices to automatically recognize data stored in tags. An RFID tag has an antenna and a microchip to broadcast and receive data..

The functioning principle of RFID systems is based on the remote interchange of electromagnetic waves. Specifically, the reader transmits a signal at a specified frequency to one or more radio tags situated in its reading field and they also transmit a signal back. The chip is triggered by the electromagnetic field, which also feeds the label. Amplitude or phase modulation on the carrier frequency is produced by the chip in order to communicate the data stored in it. The reader converts this data into binary code after it has received it. In the opposite direction, the operation stays symmetrical.

The method of a radio frequency identification is consequently as follows:

- The reader emits energy by radio to activate the tag.
- It queries the tags nearby.
- It considers the responses provided and removes any repetitions or inconsistencies.
- At last, it sends the acquired results to the relevant applications.

RFID labels / tags

Radio frequency is used by RFID tags, a kind of tracking device, to locate, recognize, track, and connect with objects and people. RFID tags are essentially smart labels with the ability to hold a variety of data, including pages of information, brief descriptions, and serial numbers. There are 3 types are RFID tags available.

- Passive tags: These are gadgets that run solely on the power supplied by readers when they scan..
- Active tags: Powered by a battery, these gadgets can interact with the readers. Active tags have a longer reading range than passive tags..
- Semi-active tags: They only use their battery to record data; otherwise, they function as passive tags for communication.

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Spring boot Micro service

A Java-based framework called Spring Boot is available for free and is used to build micro services. It is made by Pivotal Team and is used to create production-ready, stand-alone spring applications. Additionally, it reduces the amount of boilerplate code-that is, code that needs to be written once and reused-as well as XML settings and annotations.

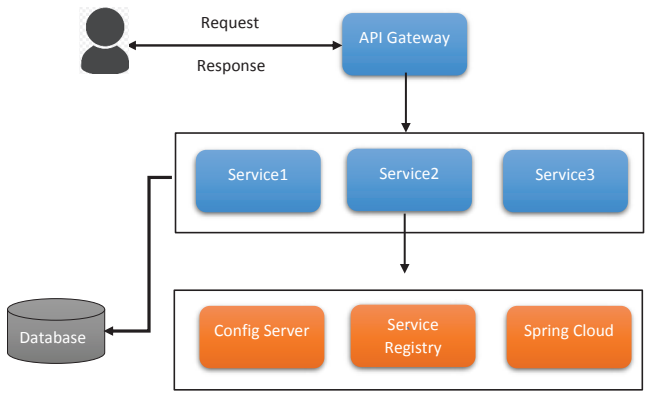
Microservices are an architectural and organizational approach to software development in which the software is composed of small independent services that communicate over well-defined APIs. The Micro Service architecture enables developers to create and implement services on their own. The lightweight model to enable business applications is achieved by each service having its own process when it is operating.

Advantages

By using microservice, we are having the following advantages –

- Scalability
- Enhance team productivity
- Minimum configuration
- Lesser production time
- Quicker deployment time

Micro service Architecture



Objective

The objective of this paper is as follows.

- To analyse the requirements in book transaction services using Kiosk terminal.
- To design the system and process for Kiosk book circulation
- To implement and maintain the Kiosk book circulation

Application of Using Kiosk in Libraries

The proof of the employment of modern technology in libraries may be found in the usage of digital libraries, RFID solutions, automated library systems, mobile technologies, and more. The libraries have now transitioned to self-service technologies in order to improve the effectiveness of its services. By using self-service technologies like as kiosks, library patrons can save time and energy while also significantly reducing the workload of staff members.

Advantages of using Kiosk in Libraries.

The following are some of the main advantages of using the kiosk.

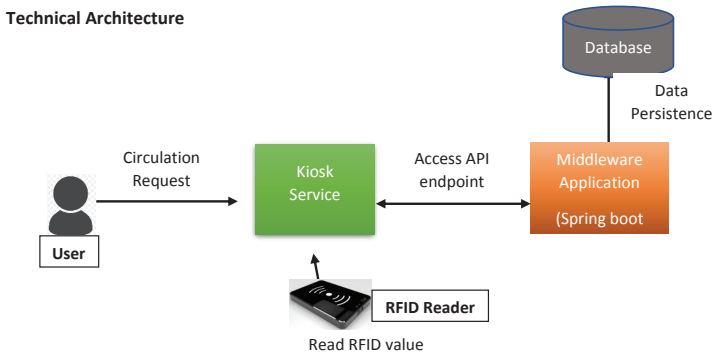
- It can be used to deliver information and perform a variety of library tasks simultaneously. such as self-automated registration and self-checkout, online library services, library maps, and catalogues.
- Since kiosks are self-service locations, they lessen the additional strain and workload on employees.
- It shortens wait times and lines at the service desks at libraries.
- The kiosk can offer information services around-the-clock.
- Even those library patrons who are not very tech savvy can use it.
- With written directions and illustrations, it makes the tractions quickly.
- A useful replacement for the reference desk.

Implementation Methodology

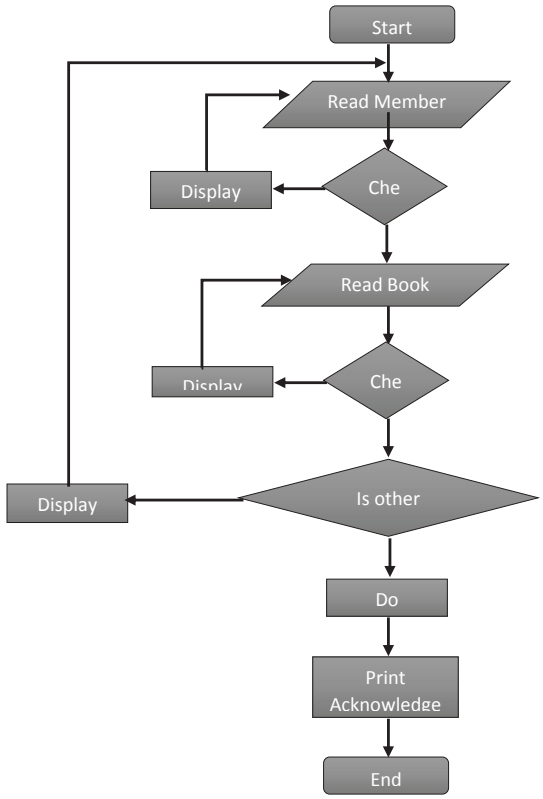
To implement the book circulation using kiosk machine, we need the following

Technical Requirements

- RFID tags
  - These tags are used to uniquely identify each book / item in the collection of the library.
- RFID Reader
  - The RFID readers are used to read / write the values on the RFID tags.
- Kiosk terminal
  - It is a portable device with inbuilt computer system and RFID reader connectivity. It provides the User Interface (UI) for the users to do the transaction requests to the middleware system.
- Middleware application
  - This is used to receive the transaction requests from the Kiosk terminal and executes the required commands to complete the transactions. Any one can access the services of this middleware application only after the authentication.
- Backend storage
  - The back-end storage is used to store the transaction data permanently in the disk for future references and transaction.
- RFID Security Gates
  - The RFID gates are the security gates to verify and secure the items that are taken away without proper transactions like check-out or renewal done.



Overall Process flow diagram



Process Implementation

Check Out

Pre-requisite

- The user should have registered as a member of the Library.
- The books should have fixed with RFID tag.

Step 1: The user needs to choose the operation “Issue” from the options shown.
Step 2: Place the books on the tray of the Kiosk terminal.
Step 3: Show the ID card near the place holder of the Reader in the specific location
Step 4: The details of the all the books placed on the tray will be displayed
Step 5: The member must verify the details and press confirm button to proceed.
Step 6: An acknowledgement slip with the details like book title, return date, etc., will be printed to the user.





Check In

Pre-requisite

- The user should have issued the books in his account.
- The books should have fixed with RFID tag.

Step 1: The user needs to choose the operation “Renew” from the options shown
Step 2: Place the books on the tray of the Kiosk terminal.
Step 3: The details of the all the books placed on the tray will be displayed
Step 4: The member must verify the details and press confirm button to proceed.
Step 5: An acknowledgement slip with the details like book title, new return date, etc., will be printed to the user.

Conclusion

The libraries in India are likewise gradually embracing the global technologies. Librarians now are thinking creatively. The moment has come to expand the library's outreach programs so that an increasing number of people can utilize the space. The kiosk based book transactions are successfully implemented in the Central Library of SRM Institute of Science and Technology. This kiosk terminal will also be used to extend the library services like OPAC, library announcements, New book arrivals, etc., to the users further.

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SECTION II

ARTIFICIAL INTELLIGENCE AND LIBRARIES

THE DETERMINATION AND BENEFITS OF ARTIFICIAL INTELLIGENCE-BASED UTILITY TOOLS FOR ACADEMIC RESEARCH– A STUDY

Dr. A. Bagavathi[1]

Introduction

The society is witnessing a shift and is moving towards the digital transformation with the rapid development along with the improvements and advancements of technology. The information age has created huge amount of data. (Apurva Gupta & Pratik Nihal, February 2021) The process of big data generation and their analytics are making a huge difference in many sectors of the society including research. On the other hand, this is a period of Artificial Intelligence (AI) advent and deep learning has revolutionized nearly all professional domains. (Danish Thanvi, 2024) As stated by Danish Thanvi "In the realm of research and data management, the integration of artificial intelligence (AI) tools has revolutionized the way professionals approach their work. These tools, trained on vast datasets, offer a myriad of capabilities that streamline processes, enhance productivity, and unlock new insights."

> *"When digital transformation is done right, it's like a caterpillar turning into a butterfly, but when done wrong, all you have is a really fast caterpillar."*
>
> – George Westerman.

Currently we can make the research process streamlined, more effective and more purposeful by automating a chunk of research process through AI. Understanding and exploiting the potential of AI and using its Tools / Application has great advantage and the benefits are huge and maximising the efficiency of the researcher.

The Need

It is imperative that Academic and Research Fraternity of higher education institutions should also change in accordance with the changing scenario. Understanding the very high potential of AI and the benefits arriving out of it is essential that Academic and Research Fraternity of higher education institutions should update themselves and gain knowledge on the developments. Hence it is essential to understand the following parameters of the Academic and Research Fraternity of higher education institutions.

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1. Awareness of AI.
2. Awareness of AI and its applications / tools that are useful for Academic and Research.
3. Having knowledge on the purpose of using AI and its applications / tools for Academic and research.
4. Having knowledge on the various benefits of using AI and its applications / tools for Academic and research and taking advantage of the same.

Objectives

The objective of the study is to

- To know the various AI applications and tools that are useful for Academic and Research applications.
- To know understand the Purpose of using AI tools / applications for Academic and Research applications.
- To know understand the Benefits of using AI tools / applications for Academic and Research applications.

AI Tools and Applications

Among the various AI Tools and application available and are used for Academic and Research applications (Xinyue Li, 2023) for this study we are going to discuss about only 7 AI tools / applications based on the piolet study.

AI Applications for Academic and Research

The seven AI Applications for Academic and Research are Word vice AI, ChatGPT, Research Rabbit, Scite, Open Read, Cohesive, Consensus, Lateral and EndNote.

The brief details of the above applications are as follows.

Wordvice AI - Overall Best AI for Researchers: The Wordvice AI Writing Assistant, powered by the most up-to-date AI technology, is a real-time, all-in-one text editor. This AI research tool aims to improve the overall quality of written work, making it more concise, clear, and impactful. Wordvice AI stands out for its focus on academic and research writing, catering to the writing needs of students, researchers, and professionals who require high-quality editing to meet the standards of academic journals, conferences, or professional publications. These features make it the best AI for researchers.

It features the free AI Proofreader, which fixes spelling, punctuation, and style errors and improves the clarity and flow of the text. It also provides suggestions and explanations to improve the writing. Additionally, Wordvice AI offers a suite of AI revision tools, including the free AI Paraphrasing Tool and AI Text Summarizer, to ensure originality and natural expressions. The AI Translator offers wide-ranging language support, extracting relevant information from non-English sources. The AI Plagiarism Checker allows researchers to analyze text and identify instances of plagiarism. Lastly, an AI Detector is available to check the percentage of writing generated by popular AI tools.

Wordvice AI is for free and by signing up to unlock its more sophisticated features through Wordvice AI Premium.

Key features

- Grammar and spelling check, style enhancements, and feedback on overall fluency
- Thesaurus-like feature that suggests alternatives to diversify the vocabulary
- Assists with citation format, academic tone, adherence to scholarly writing conventions.
- Plagiarism check that scans millions of academic articles to ensure originality in the work.

ChatGPT - The Original Popular Chatbot: Chat GPT the OpenAI chatbot released in November 2022, is designed to understand and generate human-like text, enabling engaging conversations and providing informative responses across various topics. But for using ChatGPT for research, it might require some playing around with prompts and fact-checking since although ChatGPT articles will provide ample information in response to the questions, it may sometimes be inaccurate.

ChatGPT can assist academic researchers in a variety of ways. It can answer specific questions related to the research topic. It can also assist in the initial stages of a literature review by suggesting key papers, authors, or trends (but remember that a comprehensive literature review using trusted scholarly sources needs to follow). The AI chatbot can then help to generate ideas on research questions, hypotheses, or experimental designs, offer simplified explanations for complex concepts, and correct the grammar and word choice of the manuscript.

Key features

- Quick information retrieval
- Literature review support
- Easy-to-use interface to assign many kinds of tasks.
- Idea generation and writing assistance.

ResearchRabbit: ResearchRabbit is an online “citation-based literature mapping tool”. It is an AI tool for researchers that allows to explore scientific papers quickly and efficiently. It is one of the most powerful discovery app ever built for researchers. It optimises the searching for references time with a simple concept: it start by using one or more papers (called seed papers), and the app will find more papers relevant to the topic of interest (which is dictated by the seed papers selected previously). The "Spotify for Papers" lets to create collections of papers and regularly recommends new literature, based on the personal interests. ResearchRabbit also visualizes networks of papers and co-authorships and lets to share the collections with colleagues to improve collaboration. ResearchRabbit is only one of the many literature mapping tools available online, some require to create an account and others don’t. ResearchRabbit is a free of charge application. While it might not be the best AI for research writing, it is certainly one of the best overall AI research tool.

Key features

- Create collections of relevant literature
- Receive recommendations based on your interests
- Visually explore connections between fields, authors, and camps
- Share collections with collaborators

Scite.AI: An extension of scite.ai is the Scite Reference Check bot. Scite.ai is a platform offering citation analysis, plagiarism detection, and literature review tools. The citation finder not only gives you real citations to actually published papers, but this AI research tool can also provide with exact numbers of publications that refute or corroborate a specific claim. It scans new article PDFs "for references to retracted papers". Which helps to provide accurate, credible references which the users can depend on by providing trustworthy citations to back up their article.

If ChatGPT is used to find citations, it may probably "hallucinate" and make up sources or generate text that is not based on factual information (a problem that even the best AI research tools fight with). But Scite.ai a more trustworthy AI academic research tool to fit the academic needs.

Key features

- Search citation statements
- Create dashboard
- Journal and institution metrics
- Interactive visualizations

OpenRead: It takes a lot of time to for collecting documents for literature review and take notes from it. OpenRead AI App can support you on your literature review. It can summarize articles, create graphs of related literature and get paywalled articles for free. It also has a chat option. It converts PDF-format scientific papers into interactive papers, utilizes advanced AI technology. In addition, it produces paragraph and overall paper summaries, allowing users to swiftly comprehend the main concepts without having to read the entire paper by employing AI algorithms. Moreover, OpenRead facilitates users to ask questions related to the paper without having to go through the laborious process of reading the entire paper. Along with these features, OpenRead boasts a powerful AI assistant named Oat, which assists users in tasks such as data analysis and other repetitive tasks, and also responds to any research-related inquiries. This can be used for developing novel programs, discussions, and activities in order to enrich reading experience.

Cohesive: Cohesive, an advanced AI tool designed for content edition that aims to simplify the content creation process. It revolutionizes the way you create and manage content. It is an AI editor which allows you to create, refine, edit and publish content in high quality. Create magical content with the most powerful AI editor. End ChatGPT prompt struggles. Create, refine, edit, and publish seamlessly with this tool. Use AI writer, AI image generator and AI voices. Its devices through words and expressions

which show relationship between part of text and ideas, such as cause and effect, time, addition, or comparison and contrast, in order to provide flow sequence. It is designed for marketers, copywriters, bloggers, and anyone who needs to create engaging and optimized content. It effortlessly edits text, images, and language translations to ensure that every word is precisely crafted to perfection

Consensus: Consensus is a search engine that uses AI that specializes in extracting and condensing scientific insights from peer-reviewed sources (Deepgram, 2024). It makes expert knowledge accessible to everybody and makes science more approachable. It leverages the AI responsibly and carefully with the aim to provide vetted, unbiased information. This provides and ensures the accuracy and credibility of the information/ knowledge sharing authoritatively.

Without needing keyword matches, it uses AI to search over 200 million scientific papers, summarizes results instantly using GPT-4 and other natural language models, in order to support findings, it brings out insightful quotes and evidence directly from studies and it also allows searching by natural language questions.

Key features

- Extensive coverage of peer-reviewed papers
- Trusted results cited to credible sources
- Instant summaries and analysis
- Intuitive searching by natural language
- Time savings for research and literature reviews
- Evidence to support work and decision making
- Easy access to expert insights

The Purpose of using AI Tools for Research

Among the various purposes of using AI Tools for Academic and Research the 7 purposes were identified based on the pilot study. They are AI tools to Generate Insight, AI tools are used for Automated Data Collection, Applied for Research Data Analysis AI is used for the purpose of improving the Effectiveness of research, AI used in order to improve the Efficiency of the research, use AI for the purpose of Visualization and use AI for the purpose of Task Prediction in research.

Benefits of Using AI Tools for Research

Among the various benefits of using AI tools for Academic and Research (Viswanath Venkatesh, Jan 2022) the below listed 11 benefits are listed based on the feedback of the pilot study.

1. Efficiency and Speed: AI tools can handle repetitive and data-intensive tasks in a fraction of the time it would take humans, freeing researchers to focus more on qualitative analysis.
2. Increased Accuracy: AI tools reduce the room for human error, significantly

improving the accuracy of the research outcomes.

3. Data Insights: AI algorithms are capable of sifting through vast amounts of data to draw meaningful conclusions, reveal trends, and provide valuable insights that might not be immediately obvious.
4. Simplify Complex Analysis: AI tools can simplify complex data analysis, making it more accessible to researchers without a deep background in data science.
5. Facilitate and Improved Collaborations: AI tools can facilitate better collaboration among research teams by automating and managing tasks, thereby improving productivity.
6. Cost Effective: Implementing AI tools for research may significantly lower costs in the long run by automating mundane tasks and improving overall productivity.
7. Capability Prediction: Some AI tools can forecast future trends based on past and current data, making predictions more accurate and allowing for more informed decisions.
8. Personalized Research: AI can pattern-match at a high speed, enabling more personalized and detailed research outputs.
9. Real-time Research: AI tools can conduct real-time research, providing up-to-the-moment data analysis.
10. Data Security: AI tools ensure the integrity and confidentiality of research data from potential security breaches.
11. Time Saving: using AI tools saves a lot of time,

Methodology

Research Design

In this study Quantitative research approach was adopted along with surveys and statistical analyses to achieve its objectives.

Sample Selection

The study applied random sampling, in order to select diverse participants, encompassing, Faculties, Research Scholars, Post Graduate Students Graduate Students and Library and Information Professionals across multiple institution, like Government and Private higher education institutions within Tamilnadu. A set of structured questioners was framed, and Google Form was used as survey instrument and circulated through e-mail & social media platforms like WhatsApp, Face book and LinkedIn to various respondents through network references. A total of 183 respondents have given their responses and the Distribution of Questioner and data collection details are shown in Table-1.

The responses were analysed and represented in the table and graphical forms using the MS excel.

Table-1
Questioner Distribution

Description	eMailed	eMail Bounced	Primary data	Response Not Received	Responded	Valid Questioners	Invalid Questioners
Users	450	54	396	176	220	183	37
%	100.00%	12.00%	88.00%	39.11%	48.89%	40.67%	8.22%

Data Analysis

Government and Private higher education Institutions like Government Universities, Private Universities, Government Colleges and Private Colleges within Tamilnadu of various fields have represented this study. The responses were scattered between 31% of respondents from private institutions and 69% from government institutions respectively (Ref. Table-3) among the various Higher Education Institutions within Tamilnadu comprising of Universities and Colleges. Each reply was critically studied to formulate the variables and Socio-demographic details such as Age Distribution, Gender Distribution, and User Type like Faculties, Research Scholars, Post Graduate Students Graduate Students and Library and Information Professionals are shown below along with the response of the respondents on the knowledge of the AI Tools / Applications among the Respondents are tabulated below.

From Table-2 Age distribution more than 68% of the respondents are below 30 years of age, followed by 30-35 year of age at 16% and the balance are in single digit percentage with 8%, 6%, 3% and 2% with 35-40 years, 40-45 years, 45-50 years and above 50 years respectively.

From Figure-2 Gender Distribution it is found that more than 54% are female and balance 46% are male. Regarding Distribution of User Type in Figure-2 it is understood that 30% are UG students closely followed by 28% of Library Professionals and with 18% and 14% of respondents comprising of PG students and Research Scholars respectively. Only 10% of the respondents are faculties.

Table-2

Age Distribution

Sl. No.	Age Range	Number
1	0-25	72
2	25-30	53
3	30-35	24
4	35-40	15
5	40-45	11
6	45-50	5
7	above 50	3
	Total	**183**

Figure-1

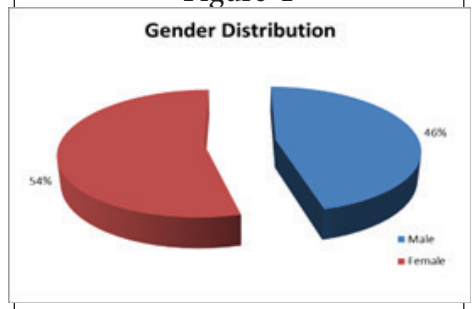
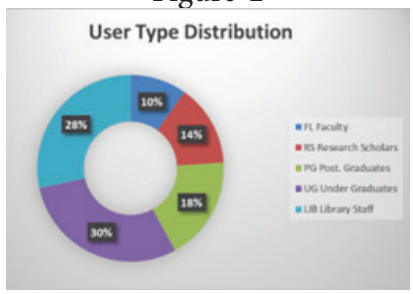


Table-3

Institution Type			
Sl No	Description	Responses	%
1	Government Institutions	111	61%
2	Private Institutions	72	39%
	Total	183	100%

Figure-2



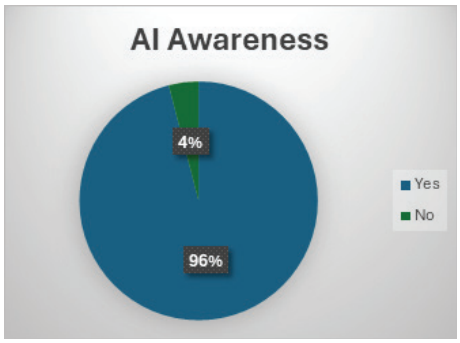


Figure-3

AI Awareness

From the study as referred in Figure-3 it is found that a good majority of 96% of the respondents have stated that they have Awareness that AI can be used for Academic and Research purposes and AI Tools and Applications are also available for using it for Academic and Research purposes and only 4% have stated negatively.

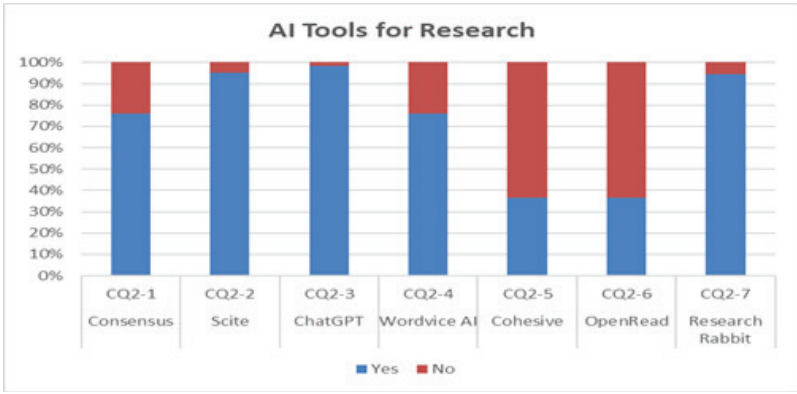


Figure-4

Among the various AI Applications and Tools that are useful for Academic and Research purposes 7 AI Tools and Applications are selected based on the pilot study. With

regard to awareness on AI Tools for Academic and Research it is found that 98% have awareness on ChatGPT, 95% have awareness on Scite and Research Rabbit respectively, 76% of the respondents each are having awareness on Consensus and Wordvice AI. The awareness is very poor on OpenRead and Cohesive with 37% each respectively.

Table-4

Purpose of Using AI Tools in Research				
Sl. No.	Description	Yes	No	Total No of Respondents
1	Automate Data Collection	157	26	**183**
2	Apply for Data Analysis	157	26	**183**
3	Very Effective	152	31	**183**
4	Very Efficient	140	43	**183**
5	Generate Insight	177	6	**183**
6	Visualization	68	115	**183**
7	Task Prediction	74	109	**183**

With regard to the Purpose of Using AI Applications / Tools for Academic and Research 7 purposes were identified based on the pilot study. Among the 7 purposes the response is that, more than 97% use AI tools to Generate Insight, 86% of the response states that AI tools are used for Automated Data Collection, and it is Applied for Research Data Analysis respectively, 83% use AI for the purpose of improving the Effectiveness of research and 77% use AI in order to improve the Efficiency of the research. Among the least responses are, only 37% of the respondents use it for the purpose of Visualization and 40% of the respondents use AI for the purpose of Task Prediction in research.

Table-5

Benefits of the AI Applications for Academic & Research				
Sl. No.	Description	Yes	No	Total No of Respondents
1	Efficiency and Speed	177	6	**183**
2	Increased Accuracy	177	6	**183**
3	Data Insight	177	6	**183**
4	Simplify Complex Analysis	157	26	**183**
5	Facilitate and Improve Collaboration	56	127	**183**
6	Cost Effectiveness	177	6	**183**
7	Capability of Prediction	139	44	**183**
8	Personalised Research	174	9	**183**
9	Realtime Research	180	3	**183**
10	Data Security	139	44	**183**
11	Time saving	177	6	**183**

Table-5 represents the response of the respondents on the benefits of AI applications for Academic & Research activities as preserved by them. Based on the pilot study the respondents have identified 11 benefits of AI in academic and research applications, which help to Accelerate the productivity in higher education institutions. From the responses it is found that AI helps to do Realtime Research got the highest positive response with more than 98% response, followed by 97% of the respondents respond that AI will improve Efficiency and Speed in research activity, AI helps to Increase Accuracy in research activity, AI provides Data Insight, using of AI helps in Saving Cost (Cost Effective) for doing research, and AI helps in Saving Time for doing research respectively. 95% of the respondents respond that AI helps to do Personalized Research and 86% of the respondents responded that one of the benefits of AI is that it helps to Simplify Complex Analysis. AI Benefits like Capability of Prediction and Data Security got a response of 76%. The lowest positive response received is that AI Facilitates and Improve Collaboration with 31% response.

Limitations of the Study

There are certain limitations which need to be acknowledged in the study with regard to the awareness of AI tools for research, the Benefits of using AI Tools for research and the Purpose of using AI Tools for research among the Faculties, Research Scholars, Post Graduate Students Graduate Students and Library and Information Professionals from Government run Higher Education Institutions and Private Higher Education Institutions comprising of multiple type of institutions, like Government Universities, Private Universities, Government Colleges and Private Colleges

Predominantly the study focused on the personals and professionals from Academic field like Faculties, Research Scholars, Post Graduate Students Graduate Students and Library and Information Professionals within Higher Education Institutions in Tamil Nadu. Extending the survey to encompass a wider range of Institutions other than Higher Education Institutions like Research Centres, Research labs, and other Research Institutions from both Government and Private organisations could provide a more comprehensive understanding of AI perceptions across diverse settings.

The research primarily concentrated on Higher Education Institutions in Tamilnadu, potentially limiting the generalisability of findings to other Higher Education Institutions in other geographical locations. Broader perspectives could be offered through a comparative study across various regions or international collaborations.

Since the study mainly reliance on a closed-ended survey, which might have constrained the depth of responses. For better and richer insights into nuanced opinions and experiences regarding AI Applications and Tools that are useful for Academic and Research purposes among the Academic and Research Fraternity, qualitative methodologies, such as interviews or focus group discussions, could have been tried.

Findings and Conclusion

- It is evident from the survey results that Academic and Research Fraternity of higher educational institutions in Tamilnadu have a strong awareness of AI Technologies.
- It also clearly states that they have very good awareness of the AI Applications and Tools that are useful for Academic and Research purposes and its potentials.
- The above result indicates the maturity in profession and capability of understanding and adopting trending technologies like AI among the Academic and Research Fraternity of higher educational institutions in Tamilnadu.
- The findings also indicates that Academic and Research Fraternity of higher educational institutions in Tamilnadu are already using AI Technologies its applications and tools. They are having sufficient awareness, and knowledge on the purpose of using it.
- Further the above findings reveals that the Academic and Research Fraternity of higher educational institutions in Tamilnadu are able to provide feedback on the benefits of using AI Application and Tools based on their experience in using it.
- The findings discloses that it is advantageous to use various AI Application and Tools depending upon the various Academic and Research purposes.
- The findings also exposes that the benefits of using AI Application and Tools in Academic and Research are plenty and Academic and Research Fraternity of higher educational institutions have to take advantage of it to take research to the next level.
- Understanding the advantage and importance as mentioned above it is recommended that higher educational institutions should focus on inculcating the necessary technical and soft skills related to AI applications / tools among the Academic and Research Fraternity.

The survey also highlights certain facts which requires improvement such as:

1. The deficiency in the awareness of certain potential AI application and the need to know about it even after understanding the advantage of it.
2. The deficiency in the awareness of certain purpose of using AI Applications like AI for the purpose of Visualization and AI for the purpose of Task Prediction in research and take advantage of it.
3. The absence of positive feedback that AI Facilitates and Improve Collaboration, which reflects that the knowledge on the above is low.

It also highlights that the above short comings need for having periodic awareness programs, seminars & conferences to the Academic and Research Fraternity, starting from Students, Scholars, Faculties to Library Professionals on this dynamic field which is developing rapidly.

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EMERGENCE OF GENERATIVE AI - METAMORPHOSING LIBRARIES FROM A THEORETICAL CONSTRUCT INTO AN IMMEDIATE REALITY

Dr. R. Deepalakshmi[1] & V Lakshmi[2]

Introduction

Artificial Intelligence (AI) has been around us for many years. When we unlock our mobile phones using face recognition, when we use voice activated services like Siri, when we go in Google and sometimes it seems like it's reading our thoughts and knowing exactly what we were thinking of, these products and services have very strong AI solutions behind them. "Making a machine in the way it is termed intelligent if it's human behavior" is how John McCarthy [1] defines artificial intelligence. Generative AI (GenAI) is the branch of AI that enables machines to learn patterns from vast datasets and then to autonomously produce new content based on those patterns [2]. Generative AI can be defined as a technology that (i) leverages deep learning models to (ii) generate human-like content (e.g., images, words) in response to (iii) complex and varied prompts (e.g., languages, instructions, questions) [3]. Due to GenAI's versatility and applicability across a wide range of industries, it has recently been a topic of research and inquisitiveness. This paper attempts to find the applications of GenAI in Indian libraries after reviewing the ways in which GenAI have been applied in library systems worldwide.

Exploring the field of GenAI reveals that the combination of human resourcefulness and AI innovation will revolutionize libraries. GenAI tools uncovers a mosaic of revolutionary instruments. Recent advances like transformers have unlocked a new notion called *attention* that enabled models to track the connections between words across pages, chapters and books rather than just in individual sentences. In May 2023, the Urban Libraries Council convened U.S. and Canadian library leaders for a CEO Roundtable focused on emerging technologies such as AI [4]. Association of College and Research Libraries (ACRL), the largest division of the American Library Association, announces the publication of 'The Rise of AI: Implications and Applications of Artificial Intelligence in Academic Libraries'. The book points out endless possibilities for librarians to utilize Machine Learning (ML) technologies and programs to classify, label, and organize information in an automated process.

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GenAI tools are ubiquitous. Just as Stephenson's book "Snowcrash" [5] had a virtual librarian character, many library administrators worldwide are embracing GenAI and reimagining libraries. The paper highlights few ideas and areas to explore.

Literature Survey

This study investigates the viewpoints of Indian library experts on the utilization of AI in libraries. The findings of this paper demonstrate that Indian library experts are by and large mindful of AI and its potential benefits in libraries. The author states that components such as clients' data protection, inadequate funds, staff skill and alignment with institutional goals are fundamental while writing integrating AI applications. In spite of the expanding selection of AI in libraries and the openings it presents, the trend is still in its early stages [6].

GenAI's impact is especially articulated in areas that are dependent on data preparing and dispersal, such as libraries, instructive frameworks, and research. The author in this study has investigated the potential of GenAI in different domains of library operations. He has dissected the critical focal points these tools offer, while also addressing its limitations and ethical considerations [7].

The paper offers an overview of the potential applications of Large Language Models (LLMs) and GenAI tools, mainly the GPT model and the ChatGPT interface, in the domain of library and information science (LIS). The author has showcased illustrations of conceivable applications and recognized the various restrictions of current LLMs, as well [8].

The article starts by examining the integration of AI advances such as Natural Language Processing, Machine Learning and Knowledge Graphs in library frameworks. It then looks at the benefits of AI and moral contemplations related to AI in libraries. The paper highlights the challenges and future bearings for AI usage, counting the requirement of preparing librarians and the significance of client acknowledgment [9].

This paper has given an in-depth examination of the innovation behind ChatGPT, Generative Pre-Trained Transformer (GPT). The paper gives a definition of key concepts related to ChatGPT. The paper moreover gives the output of an interview with ChatGPT on the theme of how AI and GPT will affect the scholarly world and libraries. It investigated the benefits of ChatGPT, as well as the moral contemplations. The paper has pointed out that ChatGPT has impressive control to progress the scholarly world and librarianship [10].

The study, to the to begin with provides a completely detailed endeavor to investigate the potential of a ChatGPT-based bot in scholastic libraries. The article depicts the development process, capabilities and confinements of the bot and gives directions into the future of AI-based chatbot innovation in this setting [11].

From the findings of this paper, it appears that AI is a dynamic innovation that can be utilized in library administrations; be that as it may, a few impediments like

lack of funds, the state of mind of librarians and specialized technical skills are a few deterrents that obstruct AI in library operations. The finding uncover that utilizing AI in library operations will quicken libraries operations [12].

The study investigated the viewpoints of students toward the utilization of ChatGPT, its potential benefits and drawbacks over conventional reference librarians. Out of the 54 understudies at Adeleke University studied, they have recognized the positives of ChatGPT such as its comfort and convenience, user-friendliness, broad information base, and easy accessibility. In spite of a few downsides such as failure to comprehend feelings, restrictions in replying complex questions, potential for giving erroneous answers, and hazard of obsolete data, the students still communicated their interest to look for reference help from ChatGPT, as well as from librarians. The research proposes that library organizations ought to grasp innovative GenAI tools to guarantee that students get convenient access to reference services [13].

The results of this research offers hints on the usage of AI in library administrations. The author states that AI can effectively be embraced in libraries, particularly for specialized administrative and technical tasks such as classification and cataloguing, library administration such as staffing and decision-making, referencing and information service and for information literacy. The study mentions that effective AI adoption is, still far from being obviously true, since there are numerous necessities that require to be met, so that it can be comprehensively embraced in libraries [14].

The author in the present study considers that libraries may see impacts on reference hones, collection improvement, and metadata creation and change. The study states that the innovation may bring efficiencies and esteem if embraced by libraries of different educational institutions [15].

Application of GenAI Worldwide

Comparing the adoption and perceptions of AI in libraries across different countries could facilitate insights, identifying contextual factors influencing AI implementation in diverse settings.

	Search technologies for digital libraries	Reference	Cataloguing	Utilising linked data in library systems	Easy access to information	Personal customization	Search box with automated suggestions	Microsoft Copilot	Chatbots	Azure OpenAI API Access
Massachusetts Institute of Technology (MIT)	✓ Project – SIMILE	✓								
Stanford										
University of Ohio									✓ Emma	

University of Rhode Island										
Adeleke University		✓								
University of Florida			✓ Alma and Primo VE Library Systems	✓	✓	✓	✓			
University of Wisconsin-Madison								✓ Login with UW-Madison NetID		
Gonzaga University	✓						✓		✓	
San Jose University, USA		✓							✓ Kingbot	
University of Nebraska-Lincoln, USA									✓ Pixel	
Hong Kong University of Science and Technology		✓						✓		✓
Zayed University, UAE									✓	
University of California-Irvine									✓ ANTswers	
University of Chicago			✓		✓ With library audio tour				✓	
George Mason University Libraries									✓ MOCA	
Florida Gulf Coast University Library									✓ Alethea	
Stony Brook University	✓		✓							

Swiss libraries									✓ Kornelia	
University of Technology Sydney										

Top research universities in the United States and Canada were considered for this study. The primary goal was to discover how libraries are responding to the AI change. The study found that while Stanford and MIT have engaged with AI, the University of Oklahoma and the University of Rhode Island have emerged as the leaders in involvement with AI [16].

1. The project, called SIMILE (Semantic Interoperability of Metadata and Information in unlike Environments), brings together researchers from the MIT Libraries Digital Library Research Group (DLRG) and the MIT Computer Science and Artificial Intelligence Lab (CSAIL) to create next-generation search technology for digital libraries using Semantic Web standards [17].

2. All Florida public colleges and universities upgraded their core library platforms to Alma and Primo VE library systems. The Primo VE discovery service allows better access and management of the library's print, electronic, and digital collections across all Florida institutions. It also helps in library cataloguing, provides improved, expanded, faster search capabilities in one simple search, and other functions such as automatic recommendations and search suggestions, virtual title browsing and citation trails. It provides an option for patrons to log in to save their research preferences, save their items in eShelf and easily export records to citation management systems. Alma provides a unified library services platform, acting as a central hub and connects library systems. It provides deep insights into library data, through linked open data, and AI [18].

3. As of February 2024, Microsoft Copilot is available to all University of Wisconsin–Madison students by logging in with their UW–Madison NetID at copilot.microsoft.com. Students can enjoy the same LLM access and data protections. Copilot is Microsoft's generative artificial intelligence (AI) platform. It uses multiple data models, including OpenAI's GPT-4, GPT-4 Turbo, and DALL-E 3, to generate written and visual content based on a prompt.

4. Librarians at Gonzaga University utilize a chatbot such as ChatGPT for crafting good search strings to improve search results, simplifying the research process. The chatbot allows users to find useful results through natural language searching [19].

5. The San Jose Public Library leverages AI tools for forecasting visitation volumes for budgeting and operational planning purposes. SJPL also has an AI program for children in the community, designed to teach children the basics of AI and practical of machine learning. Also, a small non-technical team, comprising of two library and information science, at San Jose State University's Dr. Martin Luther King Jr.

Library developed an AI chatbot, named Kingbot, that employs NLP and AI training for virtual reference services during non-staffed hours. This chatbot was developed using Google's free Dialogflow bot platform and low-cost publishing platform, Kommunicate, and was embedded in the library's website, with limited technical knowledge. It answers basic circulation and introductory reference questions and provides helpful links to libguides or other research resources. Patrons are able to access it through mobile devices as well [20].

6. As early as 2010, a chatbot named Pixel was implemented at the University of Nebraska-Lincoln that answers questions about the library and library resources. The chatbot was developed using Artificial Intelligence Mark-up Language (AIML) metadata. The chatbot answers questions from a variety of users from around the world, and provides a 24-hour, seven day a week service. It provides a playful interface, replaces complicated navigation systems and has the ability to refer questions to librarians. The majority of questions that Pixel can handle are directional or factual questions. It even proved to be practical to build [21].

7. GenAI Tools Available to HKUST Members are [22] –
   - HKUST ChatGPT Platform developed by ITSC and hosted on Microsoft Azure Cloud – HKUST ChatGPT Platform provides functionality similar to the public OpenAI ChatGPT, but with chat data protected and accessible only by the user.
   - Copilot (formerly Bing Chat) from Microsoft – a good alternative for traditional search engine. The Edge browser also allows users to open PDF file for the AI engine to digest. To work with sensitive or confidential data, HKUST members login to Copilot with their ITSC accounts to enable data protection.
   - Azure OpenAI API Access – Azure OpenAI API is a service hosted in Microsoft Azure cloud platform and allows you to access the advanced AI models.

8. A custom chatbot, named Aisha was developed for Zayed University Library (United Arab Emirates) using Python and the ChatGPT API. The chatbot provides quick and efficient reference and support services to students and faculty outside the library's regular operating hours [11].

9. The University of California–Irvine built its bot, ANTswers, in 2013. However, the bot was limited in its ability to learn from interactions.

10. The University of Chicago hosts a website that provides varied services such as cataloguing discipline wise, displaying links to various databases. It provides an option to chat with a librarian, allows users to login into their account. The website provides an audio tour of library.

11. The University's orientation chatbot, MOCA (Mason-Libraries' Orientation Conversational Agent), has two modelled experts: a staff member who's been with the university for more than 20 years and a student who considers herself an expert on trolling. The team built a taxonomy of trolling and is using machine learning to build on it to recognize and reject trolling. Also, the project has expanded into an

interactive 3D tour of GMU's Fenwick, Mason Square, and Mercer libraries with the conversational agent embedded as a tour guide [23].

12. Alethea, an AI-powered students' content engagement platform is created by Pangea. It facilitates meaningful engagement with academic texts, class readings, and assignments through personalized and adaptive guidance. With it, students at Florida Gulf Coast University have a companion at their side to get help 24/7 [24].
13. Libraries at Stony Brook University (SBU) hosts a website which allows its users to login into their library accounts. There is a dedicated suggestion box. It hosts links to various academic reserves such as books, and journals. It also has a link to SBU Catalog. It has a dedicated search engine allowing its patrons to easy access to advanced search [25].
14. A collaboration of a network of public libraries, a student group, and three SMEs develop a chatbot, Kornelia, in a cost-effective manner. Kornelia is the first Swiss library chatbot and that too to be implemented for a public library. A network of 21 public libraries in Berne - the Kornhausbibliotheken decided to implement a new information system: A chatbot hosted on the homepage which would answer the users 24/7. ASKademicus is the chatbot of the library of the Technische Universität Dortmund. Another chatbot named Stella, offered by the Bibliothekssystem University Hamburg is more focused on E-Learning and information retrieval and literacy. She was conceived to explain the access to databases and full text sources [26].
15. A library chatbot prototype, called Lib-bot, has been developed at the University of Technology Sydney (UTS). The chatbot is embedded into a student's online learning management system, allowing students log into their learning management system, providing each student's timetable. It provides a link to the library catalogue, where students can start by searching with a key word from their assignment. It also provides a guide, showing how to use the index in a book so that users can easily find what they're looking for. A student can open the pop-up chat window, enter a question and within a second, they are matched to the response the chatbot finds most accurate [27].

Applications of GenAI in Library Operations

By reviewing the use of AI and ML for libraries in the selected articles, the following themes have emerged where AI could be implemented in Indian library systems

1. Enhanced Search Capabilities – Allowing Natural Language Searching in library websites to introduce patrons to resources available in university libraries. Establishing a linked data network like 'Subjects – keywords – disciplines – authors'.
2. Translation and Transcription – Being able to access library services in other languages as well, thereby promoting inclusivity.

3. For administrative tasks – Asking GenAI tools for planning, marketing and distributing strategies, etc. GenAI can be also utilized in library security, user identification, and book title recognition.

4. Conversational agents (Chatbots) – A chatbot is a computer program designed to simulate conversation with human users, especially over the Internet [10]. Chatbots in libraries can guide users through vast resources, assist in research, and provide immediate help, thus extending the library's reach and accessibility. Powered by expert systems, having a dedicated search box where questions are asked by users in Natural Language. They create a user-friendly environment, where assistance is offered and questions are encouraged. They can aid navigating the library website. Even being able to answer follow-up questions. For updating email id and other personal details by patrons. The chatbots may provide interactive user interface elements, such as option buttons, media content, and links. Tools like ChatGPT are examples of conversational AI system.

5. Automated personalized recommendations - Elicitation based on Natura Language Understanding, wherein the patron's intent (mood/emotion/query) is mapped with his/her previous information seeking and understanding pattern, and accordingly library resources are suggested.

6. Utilising Linked Data to connect various systems such as Library systems, Research systems, Human Resource systems and other systems.

7. Enhanced Cataloguing – GenAI can take existing data from linked data network, extract it, create structural data from it to catalogue. It has the potential to streamline cataloguing processes by automating tasks such as digitization and metadata creation. Generative AI tool like ChatGPT's advanced algorithms are proficient at handling the complexities of library classification systems leading to a more efficient management of library resources, and dynamic updating of categories. Perplexity is also a language model that can assist with tasks such as cataloging and content classification.

8. The metadata interest group of the AI for Libraries, Archives and Museums asked ChatGPT to "Catalog a FOLIOJSON Instance for the book Pride and Prejudice by Jane Austin" (2023) [28].

9. An application like ChatGPT in digital library of university, fed with basic data pertaining to multiple disciplines to promote interdisciplinary research. Unlike traditional search engines, which search the internet without distinction of content sources or their levels of reliability, the library discovery process is grounded in reliable, trusted, scholarly content produced by trustworthy sources and validated by experienced librarians, having agreements with publishers.

10. Smart book chutes and Intelligent book shelves – The book chute is outfitted with Radio Frequency Identification (RFID) scanners precisely affixed at the top, near the opening of the book chute, where books are deposited. The scanner, once a book is placed inside, scans the book and sends information to the online catalogue that

the item has been returned to the library and an email is sent to the former borrower confirming the transaction and is listed as available to other library users. The book shelves will have preprogramed call numbers listings for each shelf, ensuring that each item is accurately reshelved. It is expected to reduce the workload of attending staff by 50%-75%.

11. Systematic reviews
12. For identifying and locating research materials Smart Shelving For feedback to students - Encourage users to undertake peer review utilising AI (i.e. ChatGPT) to prompt and formulate potential feedback responses upon their work.
13. Voice-to-text software – AI technologies can assist patrons by providing audio versions of books and text-to-speech capabilities for online resources.
14. Reference Services – NLP systems such as iAsk.Ai can assist with research and reference inquiries.
15. Content indexing for research libraries – Indexing provides an overview of the context in which the book, journal, or paper was originally thought up. GenAI can identify concepts and assign them corresponding keywords.
16. Data analysis for collection development – AI algorithms can analyze usage data such as circulation statistics, patron demographics and resource usage patterns, to generate insights into trends and preferences among patrons, helping librarians make informed decisions about which materials to acquire, weed out outdated or irrelevant resources, and how to organize the library's collection.
17. Classification of resource materials – GenAI tools can match documents with similar ones or connecting sections that are describing the same topics, solutions, or phenomena and classify them accordingly.
18. Optical Character Recognition Technique

Results and Discussions

Tools utilising GenAI

Many academic databases such as PubMed, EBSCOHost, Web of Science, UpToDate and Scopus (ScopusAI) are utilizing GenAI features. Providing these tools in library would enhance the research process of students. Many tools utilizing GenAI are constantly evolving and changing. Some of them are –

1. Google's Bidirectional Encoder Representation (BERT)
2. OpenAI's ChatGPT
3. Google's AlphaFold
4. Bing Chat – Uses GPT 4 (owned by Open.ai) and ties it in with the Bing search engine

Hugging Face Transformers – Caters to tasks such as text classification, information extraction, question answering, generation, translation, speech recognition. With support for over 100 languages, the library empowers GenAI professionals to navigate diverse linguistic landscapes effortlessly.

5. DallE – Text-image engine from OpenAI
6. Whisper – OpenAI's speech-to-text model
7. Grammarly
8. Gemini
9. Adobe
10. Midjourney
11. Canva
12. Claude 3
13. Co-pilot
14. Notebook LM – For systematic review
15. Perplexity
16. Scite.ai
17. Elicit – Combines LLMs with scholarly papers

Benefits of GenAI

1. Increases productivity significantly
2. 24/7 assistance – AI chatbots can provide round-the-clock assistance to patrons.
3. Improved search and discovery
4. It is convenient and convenience is key for patron services. Valuable for users who are unable to visit the library physically due to mobility concerns, or late at night.
5. Cost reduction – The GenAI tools, such as chatbots can either be hosted on a suitable cloud-based platform or any preferred server. As a result, there are no associated network overheads. It also reduces operational costs by reusing metadata and using GenAI to automate many of the things.
6. Better operational efficiency – By improving service effectiveness and reducing operational costs, libraries can magnify operational efficiency.

Limitations of GenAI

1. Safety
2. Accuracy - The machine is as smart as the data it was trained on. Large Language Models (LLMs) are trained on vast troves of data drawn from the Internet, plenty of which is not factually accurate. Since the model is simply trying to predict the next word in a sequence based on what it has seen, it may generate plausible-sounding text that has no grounding in reality.
3. Reliance on technology could be detrimental if the technology were to fail or become unavailable.
4. Privacy – When you are using the prompts in various open access GenAI tools, the information in the prompt becomes a part of the overall LLM. Sensitive student information or data can be leaked leading to potential hacking threats.

5. Quality of prompts – GenAI models' efficacy heavily relies on the quality of the prompts provided. The users' ability to frame questions effectively is crucial in obtaining accurate and relevant responses.
6. Biasness – The GenAI models have a tendency to reinforce and amplify any biases found in the data they are trained on.

Conclusion

Humans and technologies are a match made in Heaven. Together and united they stand tall. The author believes in leveraging the best of both worlds – technology's accuracy and speed with professionals' experience, expertise and judgement, working with and not against, the technology. The author is optimistic about GenAI. With the combination of GenAI, the future is bright and brimming with opportunities. We have to approach AI assistants cautiously, but with an open mind. The authors have studied various real-world applications of GenAI in library settings worldwide.

Librarians are constrained with providing these services 24h a day. – leaving a gap to fill by GenAI. However, extant literature confirms a low adoption rate by Indian university libraries in using AI to provide innovative alternative services, as this is missing in their strategic plan. Obstacles such as user privacy, funding, staff expertise, attitude of librarians, technical skills and alignment with institutional goals are some of the hurdles faced while implementing AI applications for library systems.

The paper seeks to develop next steps for integrating generative AI into Indian library operations.

Future Directions

1. Educate students, faculties and make them aware about the various GenAI technologies and their applications.
2. Have sustained conversations with students, faculties, and administration about what this technology means for library systems.
3. Libraries can create their own LLMs and GenAI tools in collaboration with third-party enterprises rather than allowing students to use open access tools like ChatGPT for privacy concerns.
4. Various GenAI tools that are to be applied to library should be fed with the content of that particular library.
5. All changes in library services, hours, and contact information must be updated in chatbot to maintain accurate responses.
6. If the chatbot goes off track, the library may offer immediately alternatives, such as a contact form.
7. In order to address the ethical problems surrounding GenAI, we suggest that institutions should recommit themselves to academic integrity and considerable effort needs to be put into understanding where existing policies are failing and new policies and procedures are clearly needed.
8. Combined educational efforts may also be needed between universities, and colleges to scale up these systems.

9. Promote research and innovation – As AI systems rely heavily on the data that is fed into them, it might be vital to support research and innovation in this field in order to encourage the responsible development and application of OpenAI. This can entail giving research projects money or other forms of support.
10. The GenAI tools should be developed over time regularly based on users' feedback.

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IMPACT OF ARTIFICIAL INTELLIGENCE ON FUTURE LIBRARIES

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Introduction

Intelligence, fundamentally, is the capacity to acquire, comprehend, and effectively utilize information and resources as needed. This concept has driven many to aspire to create technology that mimics human cognition. Human intelligence is characterized by our innate ability to learn, analyze, and adapt, which evolves over time due to various factors. Traditional measures of intelligence, such as the Intelligence Quotient (IQ), assess different aspects of cognitive functioning through standardized tests.

Artificial intelligence (AI) aims to replicate human-like cognition, enabling machines to perceive, understand, and respond to stimuli akin to humans. The essence of AI lies in imbuing machines with the ability to perform tasks predictably, assess their environment, and adjust their actions based on acquired knowledge. This notion is often criticized as anthropocentric, as it benchmarks machine intelligence against human capabilities.machines possess a unique capacity to recognize and establish connections across various levels of complexity, enabling them to accumulate knowledge and improve their performance over time without explicit programming. Consequently, modern computing devices commonly incorporate AI features, enhancing their functionality without overt acknowledgment.

AI pervades numerous facets of contemporary technology, including virtual assistants, language processing, autonomous vehicles, and pattern recognition systems. Unlike human cognition, which relies on nuanced reasoning, AI operates on algorithms capable of rapidly identifying patterns on a scale far beyond human capacity, underpinning its efficiency and effectiveness in diverse applications.

What is Artificial Intelligence

Artificial intelligence (AI) encompasses computer technologies designed to perform tasks requiring human-like cognitive abilities, such as speech recognition, decision-making, visual perception, language translation, and emotional analysis (Irizarry-Nones et al., 2017). Daiz (2024), defines AI as a methodology enabling organizations to

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strategize, acquire knowledge, problem-solve, execute tasks, and occasionally innovate. (Liu et al., 2018) describes AI as devices or cognitive technologies that emulate skills and advance the study of social intelligence in a professional manner. (Omame & Alex-Nmecha (2020), characterize AI as a branch of computer science focusing on machine learning, data analysis, and understanding of the environment through techniques like feature extraction, 3D perception, and simulation of visual processes. Additionally, AI encompasses speech recognition, natural language processing (NLP), and optimization algorithms, aiming for high levels of precision and efficiency. AI emphasizes non-algorithmic problem-solving and symbolic understanding, emphasizing the ability to connect concepts.

In the current era of information, the challenges of content discovery have become increasingly vital as global platforms grow in complexity and significance (Kumar S & Sheshadri, 2019). Three main categories of AI emerge: cognitive, connectionist, and symbolic. Symbolism involves replicating human cognitive abilities based on logical reasoning, while connectionism focuses on neural network structures and information processing. Behaviorism represents a computational approach to conceptual management. Fields such as critical thinking, text classification, machine learning, optimization programming, information theory, scientific visualization, transfer learning, and automation are prominent in AI research (Liu et al., 2018).

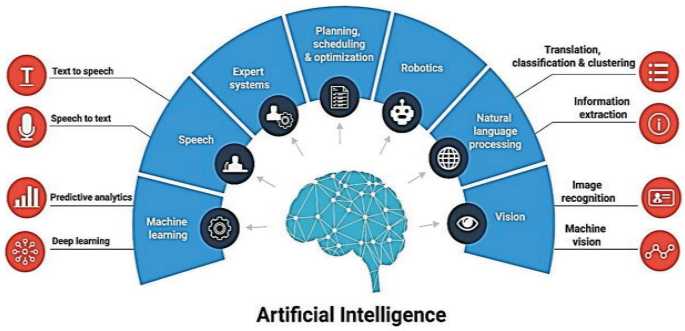


Figure 1: Artificial Intelligent Component Diagram (Kumar S & Sheshadri, 2019)

Importance of Artificial Intelligent

The broad implications and advancing capabilities of artificial intelligence have long been recognized as tools for societal upliftment. Utilizing these advanced tools doesn't necessarily require specialized expertise, as evidenced by the pervasive integration of machine learning across various sectors, significantly streamlining tasks and processes. This technological advancement greatly reduces the burden of labor, offering significant benefits to individuals and paving the way for industrialization.

Mechanical assistance provided by these technologies is a predictable outcome during their implementation, enhancing efficiency and accuracy in performing tasks. Beyond their relevance in daily activities, these applications and devices play a crucial

role in improving decision-making processes and positively impacting the environment. Moreover, the influence of artificial intelligence extends beyond specific professions, permeating various disciplines and contributing to their advancement.

Need for Artificial Intelligence

Artificial intelligence involves the replication of human activities by computer systems, encompassing traits like personality, interpretation, and knowledge. With the increasing workload faced by organizations daily, the demand for AI is on the rise. Implementing AI makes sense as it streamlines manual tasks, boosting efficiency while conserving organizational resources. Moreover, AI facilitates the recruitment of talented individuals for organizational advancement.

Modern organizations aim to automate routine tasks, anticipating that simple technologies will enable the systematization of administrative duties. As automation advances alongside digital technology, instant messenger platforms frequently serve as the gateway for AI applications, as commonly observed with reminders when accessing the internet.

Furthermore, within Strong Artificial Intelligence research, four types of resilient machines are identified. Bright Blue exemplifies one such resilient machine, often utilized in game boards, such as roulette, for decision-making. However, a limitation of such machines is their reliance on current parameters, hindering their adaptability for future scenarios. Nonetheless, this constraint can potentially be addressed in the near future.

Limited Memory: This form of AI is commonly utilized where there is sufficient data available. Many technologies rely on past experiences to inform their current actions, demonstrating an understanding of past occurrences and adjusting their behavior accordingly. A significant number of navigation applications, for instance, employ this type of AI to respond to situations such as traffic incidents based on past learning.

Theory of Mind: Another facet of AI involves the understanding of others' actions and motivations, enabling tasks to be carried out in accordance with the emotions and intentions of others. Currently, AI with this capability is lacking, and researchers are actively working to develop such systems.

Self-Awareness: Artificial intelligence systems are envisioned to possess self-awareness, much like humans. There is ongoing exploration into how algorithms can recognize their own subjective experiences, in addition to those of others.

Applications of Artificial Intelligence: In contemporary society, artificial intelligence finds applications across various domains, including healthcare, media, finance, and education, due to its ability to address complex issues effectively. AI is increasingly vital in enhancing the efficiency and speed of everyday tasks, contributing significantly to our lives.

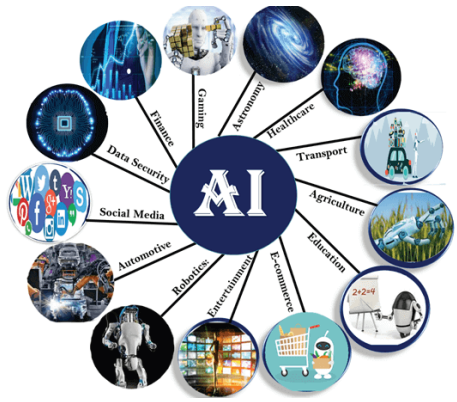


Figure 2 : Artificial Intelligence sectors

Artificial intelligence is applied in various areas

- **AI in Astronomy:** Artificial intelligence is adept at addressing complex issues within the realm of astronomy. It can assist in understanding the universe, its composition, and its functioning.
- AI in Healthcare: Over the past five to ten years, AI has increasingly benefited the medical industry and is projected to significantly impact healthcare. AI aids in more accurate and rapid disease diagnosis, assists doctors in assessments, and alerts them to changes in patients' conditions for timely intervention.
- AI in Gaming: AI is utilized in computer games, allowing AI-driven entities to participate in competitive games like chess, requiring substantial innovation and creativity from the machine.
- AI in Finance: Finance and AI industries are ideal partners. Technologies such as robotics, chatbots, responsive computing, algorithmic trading, and computer vision are employed in operational transactions in the financial sector.
- AI in Data Security: In today's technological landscape, cybersecurity is crucial due to the increasing prevalence of cyberattacks. AI assists in enhancing data security by identifying technical errors and vulnerabilities, exemplified by frameworks like AI2 and tools like the AEG bot.
- AI in Social Media: Social media platforms manage vast amounts of user data, necessitating effective organization and management. AI efficiently analyzes large volumes of data to identify relevant topics, trends, and user preferences.
- AI in Travel and Transport: The transportation industry increasingly relies on AI for various tasks, including route planning, accommodation booking, and customer service. AI-powered robots in the tourism sector interact with customers and provide prompt assistance in a lifelike manner.
- AI in Automotive Industry: Many automotive companies are leveraging AI to provide users with automated systems for improved efficiency. For instance, Tesla recently introduced the Tesla Bot, an advanced personal assistant. Various firms are continuously developing humanoid robots to enhance comfort and safety during transportation.

- AI in Robotics: Artificial intelligence plays a crucial role in automation, enabling machines to perform repetitive tasks autonomously. With AI support, robots can now accomplish tasks based on their own memory rather than pre-programmed instructions. Examples like Erica and Sophia demonstrate how AI enables robots to communicate and behave in lifelike ways.
- AI in Agriculture: Modern agriculture relies increasingly on AI for tasks such as autonomous harvesting, precision agriculture, and statistical modeling. AI implementation in farming can greatly benefit farmers by improving efficiency and productivity.
- AI in Entertainment: AI-based applications are already prevalent in our daily lives, integrating with entertainment streaming services like Netflix and Amazon. Many organizations use AI for content recommendation and programming, enhancing user experience.
- AI in E-commerce: The e-commerce sector benefits significantly from AI, which aids customers in finding products based on preferences like size, color, or brand. AI-driven recommendations contribute to the growth and efficiency of the e-commerce economy.
- AI in Education: AI facilitates tasks like classification and instructional support, allowing educators more time to focus on teaching. AI chatbots can interact with learners, and in the future, AI may serve as a readily available digital educator, accessible anytime and anywhere.
- **Advantages and Disadvantages of AI:** Artificial intelligence refers to programs with the ability to learn and understand, encompassing software that executes tasks traditionally performed by humans.

Advantages of Artificial Intelligence

- Reduction in Human Error: AI significantly reduces errors and enhances accuracy by relying on accumulated information and specific computations, leading to permanent error elimination.
- Zero Risks: AI technology enables the delegation of hazardous tasks to resilient robots, such as firefighting, space exploration, and oceanic exploration, ensuring precise work with improved reliability and permanence.
- 24x7 Availability: Unlike humans, AI can work continuously for long durations without interruptions, offering round-the-clock availability for completing challenging tasks efficiently and accurately.
- Digital Assistance: Technologically advanced companies use digital assistants to interact with consumers, providing tailored content and assistance. Chatbots, designed to mimic human interactions, offer seamless digital assistance.
- New Inventions: AI drives innovation across industries, facilitating breakthroughs like early detection of diseases such as prostate cancer through machine learning technology.
- Unbiased Decisions: AI operates impartially, making logical and pragmatic decisions devoid of emotional biases. This impartiality in decision-making fosters fairness and promotes informed decision-making.

- Perform Repetitive Jobs: AI streamlines and eliminates mundane tasks traditionally performed by humans, allowing individuals to focus on more creative and entrepreneurial endeavors.

Disadvantages of Artificial Intelligence

- High Costs: Developing AI technology involves significant expenses in terms of both time and resources. The latest equipment and software updates are necessary for AI systems to remain effective and competitive, contributing to high costs of implementation and maintenance.
- Lack of Creativity: AI faces limitations in thinking creatively and independently beyond predefined parameters. While AI can accumulate knowledge over time, it struggles to generate novel ideas or approaches. For instance, AI-generated content lacks the personalized touch found in human-authored works.
- Unemployment: The widespread adoption of AI technologies has led to concerns about job displacement and increased unemployment in certain sectors. Automation and robotic systems replacing human workers pose a threat to job security and livelihoods.
- Inducing Laziness: The automation of repetitive tasks by AI technologies may lead to a decline in human initiative and productivity. Overreliance on AI for routine tasks may discourage individuals from actively engaging in problem-solving and critical thinking.
- Ethical Concerns: AI lacks inherent ethical principles and may raise ethical dilemmas as it becomes increasingly sophisticated. Concerns arise regarding the potential misuse of AI and its impact on society, raising questions about accountability and responsibility.
- Lack of Emotional Intelligence: AI systems lack emotions and empathy, which are essential for human interactions and collaboration. While automation can streamline processes, it cannot replicate the emotional intelligence necessary for effective teamwork and communication.
- Stagnation: AI systems do not possess the capacity for self-improvement or learning in the same way as humans do. While they excel at repetitive tasks, they lack the ability to innovate or adapt beyond their programmed capabilities.

Because artificial intelligence possesses knowledge and experience, it stands as a technology beyond human creation. While AI excels at repetitive tasks, updates or modifications require manual intervention to adjust scripts. Despite its vast data storage capacity, AI lacks the nuanced reasoning capabilities of the human mind.

Benefits of Artificial Intelligence in Libraries: Artificial intelligence integrated into robots and software plays a crucial role in reducing human casualties in various scenarios, from confrontations to natural disasters. Moreover, in sectors like libraries, AI enhances efficiency and supports human labor. Experts utilize AI for tasks like identifying, cataloging, and indexing library materials, leveraging machine learning and optical recognition to accurately categorize bibliographic information. Natural

Language Processing resources in libraries aid international students in overcoming language barriers, facilitating research and decision-making processes in multilingual environments. Ultimately, AI optimizes library operations, reduces errors, and expedites tasks beyond human capabilities.AI applications are increasingly integrated into educational systems to facilitate distance learning, exams, and candidate selection for institutions worldwide. Future educational offerings are expected to leverage AI to enable students to engage in coursework remotely and receive personalized assessments regardless of their location.

In evaluating the benefits of AI in libraries

1. AI implementation can enhance researcher visibility and improve the quality of research for students and faculty.
2. Availability of resources and educational activities is greatly enhanced with AI, ensuring access to knowledge virtually around the clock.
3. Automation and electronic document management, along with innovations like autonomous book retrieval systems, optimize space utilization in libraries.
4. AI contributes to various library tasks such as image classification, acquisitions, circulation, and periodical management, improving overall performance.
5. AI minimizes operator errors in library operations, thereby enhancing the customer experience.
6. Utilization of AI reduces the time spent by librarians on various administrative tasks, leading to more efficient library services.
7. AI fosters enhanced user engagement and participation in library services, resulting in improved utilization of resources.

Conclusion

An initiative aimed at developing simulation tools for intelligence, particularly Artificial Intelligence, contends that various forms of intelligence, whether human or alien, can be defined by symbolic structures and purposeful actions that can be executed by digital computers. Scientists need not await a definitive answer on whether such theoretically constructed entities would unequivocally possess consciousness or merely simulate it. Nor should they wait for a hypothetical computer capable of replicating every facet of human intelligence.

Key components of general intelligence, such as problem-solving, judgment, reasoning, and expressive language, already exist as computer algorithms. In select fields, like virus detection in plant growth, automated systems rival expert human judgment. The primary challenge for AI lies in effectively conveying the everyday experience and expertise essential for tasks like engaging in detailed conversations or navigating crowded sidewalks.

These applications may operate on conventional parallel computing systems, or custom machines may need construction to accommodate the intricate understanding akin to the human mind.

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IMPACT OF ETHICAL ISSUES OF ARTIFICIAL INTELLIGENCE ON LIBRARIES: OPPORTUNITY AND CHALLENGES

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Introduction

Libraries have long been accepted as repository of knowledge and invaluable hub of information resources for dissemination of knowledge. Libraries are also considered as social institutions that serve the community of users with information for the benefit of knowledge usage in their academic and research activities. In order to streamline the information resources and disseminate knowledge among the user community, latest technologies are being adopted. Such adoption of emerging technologies has made complete transformation in structure and functioning of library services. There is a greater shift in the user behaviour and greater changes in the pattern of learning and research. The digital technology is primarily responsible for such a dynamic transformation of the library system and services. The recent years have witnessed a changing scenario of intelligent technology applications in libraries, such as Internet of Things, Big data, Cloud Computing, Virtual Reality and Artificial Intelligence (AI). Among all those new technologies, AI has a greater field of technological applications having computer engineering with linguistic and human reasoning implementations in library applications, functions, and activities. The application of AI has both pros and cons in library applications. One needs to be cautious in its applications. The library professionals need to emphasis the ethical issue of AI intervention in library functions and services. This paper is designed to focus various aspects of AI applications in libraries and whole gamut of ethical issues in library services.

Artificial Intelligence: Concept and Definitions

Artificial Intelligence sometimes called machine intelligence, is intelligence demonstrated by machines. In computer science AI research is defined as the study of intelligent agents, and device that perceives its environment and takes actions that maximize its chances of successfully achieving its goal. The term AI was first coined by John MC Cathy in 1956, but the journey to understand whether machines can honestly think began before that. In Vannevar Bush's seminal work, *As We May Think*, he

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proposed as system that amplifies people's own knowledge and understanding. AI is defined as intelligent performance expressed by artificial body (Tzanova, 2024). AI is associated with certain intelligent behaviour demonstrated by some computer systems through certain programmes. The definitions given by Joun Mc Cathy describes AI as the science and engineering of making intelligent machines. The term AI has same time scientific, technical, and social implications. AI is the technology that enables the computer and machines to stimulate human intelligence and problem solving capabilities. AI refers to computer systems capable of performing complex tasks that human can do with reasoning, machine decisions and solving problems. Today AI has involved a wide range of technologies that empower many of the services and goods we use every day – from apps that recommend TV shows to chatbots that provide computer support in real time.

AI Applications in Libraries

Academic libraries in universities and higher educational institutions are more concerned about the implementations of latest technologies in library functions and services. Library & information professionals are also very much eager to implement new technologies in information safeguarding organisational activities, access, collection and protection. Over the years, academic libraries have thought of implementing AI tools and processes. The present wave of AI tools, therein, is leaving libraries and library professionals scrambling to increase rate of changes across the institutions (ibid). Libraries can use AI for advance classification systems by applying their mind through precision search and recall efforts. They can analyse digital collections identifying subjects, and adding metadata with these technologies. Through search engines they can design and develop AI powered knowledge discovery tools. They can educate the users how to locate the information and interact with AI tools- other library operations such as circulations system, information retrieval, collection development, reference services, etc. which can be strengthened by AI. Chatbots monitored by AI are providing effective services to the users who need personalised services.

AI is the smart programme that continue to expand and impact user communities. Using AI tools, the increased accessibilities to born-digital materials by identifying sensitive information can be obtained. One of the advantages of AI in libraries is its ability to strengthen and enhance information retrieval process. While there are vast information resources available in libraries, AI algorithm can effectively provide users with need based and relevant results. This provision certainly helps in improving the user experience (Tally, 2016). Virtual Assistants applications of AI provides immediate support to library users. While answering basic inquiries AI guides users through databases or providing information on library events and services. Virtual Assistants can offer seamless and personalised experience that ensures the users feel empowered even in absence of librarians (Panda and Chakorborty, 2022) (Cordell, 2020). By implementing AI, libraries can empower users, enhance services and maintain the status of modern library in digital landscape. In all its operations and activities, the libraries must adopt ethical considerations of AI to continue a vital hubs of knowledge centre.

Ethical Approach of AI in Libraries

While AI presents immense opportunities for empowering library users, its implementation must be guided by strong ethical framework. Libraries must priorities privacy, transparency, fairness and inclusivity in their AI initiatives striving to create an environment that upholds ethical standard (Hodono-Wasu,2024). Once it is decided that AI is to be integrated into library systems, it is very important to consider the ethical implications and strive for inclusivity (Bradley, 2022).

O'Nell (2016) described the ethical approach of AI in library services is primarily privacy. While analysing vast amount of data for personalised services, ensuring of protection of important information is of paramount importance. Libraries must give priority to data collection and data security, user privacy and prevent unauthorised access and misuse of personal data (Smith, 1976).

AI implementation in libraries needs transparency and fairness (ibid..). It implies that how data are collected, used and the decision making process behind AI generated recommendations (Arlitsch, and Newell, 2017).) Removal of biasness is one of the important aspects of ethical considerations. By doing so, libraries can help to minimize bias and ensure that AI powered resources are accessible everyone, irrespective of their background and identity (ibid).

Equitable access to information should be practised so as to harness and enhance the user experience, expand knowledge, bridge digital divide. Through ethical implementations and considerations of AI technologies, libraries can truly empower all users and fulfil their expectations and information accessibility (Miao 2019)

Ethical Principles of AI in Libraries

The following are ethical principles that all organisations especially libraries need to adopt which implementing AI.

Unbiased Usage: While implementing AI in libraries the professionals must ensure that fairness in AI and machine learning system must be designed to treat fairness to all its users (Mishra, 2023). There should not be discriminatory practices and free from bias to its users. The system should be developed to provide services in an unbiased usage and regular evaluation may be made in an equitable manner and without discrimination.

Autonomy in Usage: User autonomy is the primary responsibility of the library in AI usage. Users may be given free hand to control over their personal information so as to enable them to make informed decisions about the usage of data. Necessary mechanism may be developed to provide the privacy policy of the library is using AI principles.

User Privacy: User privacy is a very significant aspect in AI usage in libraries. While collecting data and using personal information for genuine purposes, strong security measures may be adhered to so as to protect the data from unauthorised use and maintain user privacy.

Unwanted Human Error: There is a every possibility of human error in AI implementation in libraries. Library professionals may see that basic values and goods of libraries must be kept intact and human insight and wrong intervention may be avoided. Proper training of staff is very essential to maintain right use of machine learning system and avoiding further human oversight.

Transparent Usage: Transparency in AI usage is necessary to show how the system in working, usage of data type, and decisions are made. It greatly affects the trust of the user community and stakeholders upon the libraries. Transparent usage improves the credibility of the library and viability of AI implementation.

Accountability: Libraries must be accountable to their authority or library administrator as well as user community for right implementation of AI. It is imperative on the part of the librarian to develop clear, fair and proper policies so that there would not any procedural problems. Regular maintenance and evaluation of machine learning system may establish right functioning and the system gives a note of accountability in its usage (Ibid).

Ethical Benefits of AI in Libraries

Libraries in the digital age have witnessed a great transformation from repository of books to dynamic hub of knowledge and information. By the help of AI libraries have started to empower their users. The following are some of the real ethical benefits on AI implementation in libraries.

- The first and foremost benefit is the economic benefit that ensures higher level of efficiency and productivity. Once AI is implemented the cost of various activities are reduced so that libraries may enjoy saving in its usual expenditure.
- Improved information literacy is another important benefit of AI that empowers the users with more literacy in the digital world. AI helps the users to education how to use various digital activities so that they can able to do their information seeking and using activities in the digital environment.
- AI accelerates the process that the users in libraries to find and access information more quickly and accurately (ibid). Through latest technological usage the users used to develop the habit of accessing the systems and are accustomed with the trend so that they can use information faster without the help of library staff.
- AI through its tool of Chatbot and Virtual Assistants provides increased support to users to use information.
- Library can be able to improve its resource management activities through automation and other routine task propelled by the technologies of AI.
- By implementing AI, libraries can maintain privacy in processing user data so as to maintain the secrecy and protection of users' data and information and create an environment of safety and security.
- Personalised recommendations to the users can be more vibrant in the library environment.

Ethical Imperatives in higher Academic Institutions

Application of AI in higher academic institutions is now in vogue. May universities in developed countries have adopted the code of ethics and ethical guidance at different stages of research. Some universities have created their own recommendations that build upon their own histories as well as current AI thought leadership and they may serve as models for other universities. (Linder, 2020). In 2017, the MIT Media Lab and the Harvard Berkman-Llein Centre for Internet and Society launched the Ethics and Governance of AI initiative (Nayyar & Rodriguez,2022). Also, in the same year New York University founded the AI New Institute. In 2019, the Stanford University launched the Institute Human- Centred Artificial Intelligence aiming at to develop a hub for all faculties of the universities. The study of Sharma et al on AI implementation in higher educational institutions in India reveals that there is significant relationships between various factors, including AI self efficacy, behavioural intention to adopt AI adoption in higher education usefulness, perceived effectiveness and organisational support. The study finds that it can guide strategic planning and decision making related to the integration of Ai in higher education and contribute to the understanding of the potential benefits and challenges.

Conclusion

The latest trend of technological applications in libraries is artificial intelligence. To develop a modern library system and streamline the information resources and disseminate knowledge among the user community, latest technologies are being adopted. Artificial Intelligence is such a dynamic technology that is the order of the day for libraries in higher educational institutions. Such adoption of emerging technologies has made complete transformation in structure and functioning of library services. There are immense opportunities to empower the library users through such a novice technology of AI. Its implementation must be guided by strong ethical framework. Libraries must priorities privacy, transparency, fairness and inclusivity in their AI initiatives striving to create an environment that upholds ethical standard. Basing on the standards of ethical some principles need to be adopted so as to get some ethical benefits for the libraries. Higher educational institutions have started to develop and implement the ethical principles and considerations for their education, research and development.

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ARTIFICIAL INTELLIGENCE TRANSFORMS THE LIBRARY: ENHANCING SERVICES AND USER EXPERIENCE

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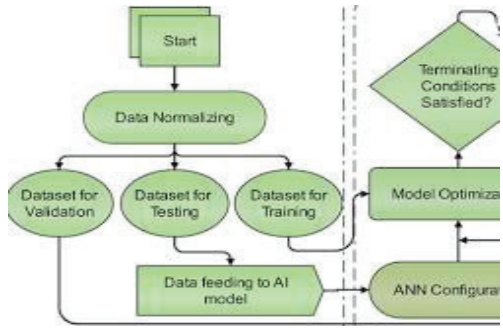
Introduction

The library, a cornerstone of knowledge and learning for centuries, is poised for a new era fueled by artificial intelligence (AI). This transformative technology promises to revolutionize the way libraries operate and serve their patrons. Imagine a library where finding the perfect book is effortless, where assistance is available 24/7, and where resources are tailored to your specific interests. This is the future envisioned by AI in libraries. In this paper, we will delve into the exciting possibilities AI presents, exploring how it can enhance services, personalize the user experience, and ultimately empower libraries to thrive in the digital age.

Concepts of Artificial Intelligence (AI)

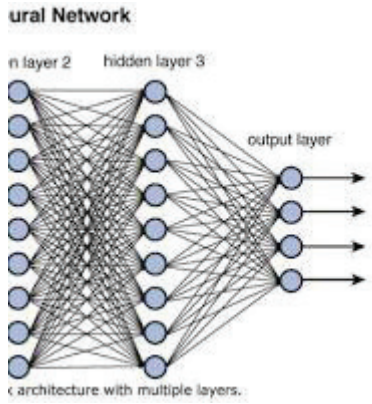
Artificial intelligence (AI) is a vast field encompassing various technologies and methodologies that enable machines to exhibit intelligent behavior. Here are some key concepts that underpin AI:

Machine Learning (ML): A core subfield of AI, machine learning allows computers to learn without explicit programming. ML algorithms can analyze data, identify patterns, and make predictions based on that data. For instance, a recommendation system on a streaming service learns your viewing habits to suggest similar movies or shows you might enjoy.



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Deep Learning: A powerful subset of machine learning inspired by the structure and function of the human brain. Deep learning uses artificial neural networks, layered algorithms loosely mimicking the interconnected neurons in the human brain, to process information and make complex decisions. Image and speech recognition are common applications of deep learning.



Natural Language Processing (NLP): This branch of AI deals with the interaction between computers and human language. NLP allows computers to understand, interpret, and generate human language. Speech recognition, text translation, and chatbots are all powered by NLP.



Computer Vision: Enables computers to extract information and understand the content of digital images and videos. Applications include facial recognition, medical image analysis, and self-driving cars.

Robotics: The field of engineering and science focused on the design,construction, operation, and application of robots. AI plays an increasingly crucial role in advancing robotics, particularly in areas like robot locomotion, manipulation, and decision-making.

These are just some of the fundamental concepts that form the foundation of artificial intelligence. As AI research continues to evolve, we can expect even more groundbreaking applications to emerge and transform various sectors, including libraries!

Application of Artificial Intelligence in Libraries

Libraries are embracing AI in exciting ways, transforming how they operate and serve patrons. Here's a breakdown of some key applications:

Enhanced User Experience

Personalized Recommendations: AI can analyze user borrowing history and preferences to suggest relevant books, articles, or resources. Imagine a virtual librarian recommending your next great read!

Smart Catalog Search: AI-powered search engines can understand natural language queries, making it easier for users to find what they need. No more struggling with complex search terms.

Chatbots and Virtual Assistants: AI-powered chatbots can answer basic questions, point users to resources, and even schedule appointments with librarians, all 24/7.

Streamlined Operations

Automated Tasks: AI can automate repetitive tasks like cataloging new books, managing overdue items, and generating reports. This frees up librarians' time for more interactive and specialized tasks.

Predictive Maintenance: AI can analyze data to predict equipment failures, allowing for proactive maintenance and preventing disruptions.

Data-Driven Decision Making: AI can analyze library usage data to identify trends and inform strategic decisions about resource allocation and service development.

Accessibility and Inclusion

Text-to-Speech and Speech Recognition: AI tools can convert text to audio for visually impaired users and convert spoken queries into text for users with speech disabilities.

Image Recognition and Description: AI can automatically describe images and videos, making them accessible to users with visual impairments.

Multilingual Support: AI-powered translation tools can assist users with limited English proficiency, ensuring everyone can access library resources.

By embracing AI thoughtfully and ethically, libraries can transform into dynamic hubs of knowledge and learning, accessible and engaging for all.

Artificial Intelligence and Virtual Libraries

Virtual libraries and artificial intelligence (AI) are a powerful combination with the potential to revolutionize access to information. Here's how they work together:

Virtual Libraries: Expanding Reach and Accessibility

Borderless Knowledge: Virtual libraries transcend physical limitations. They offer vast collections of digital resources (eBooks, audiobooks, articles, databases) accessible from anywhere with an internet connection. This is particularly beneficial for remote communities or individuals with mobility limitations.

24/7 Availability: Unlike traditional libraries with set hours, virtual libraries are always open. Users can access information and resources at their convenience, day or night.

Preservation and Digitization: AI can assist in the digitization of physical library collections, ensuring their long-term preservation and accessibility.

AI: The Intelligent Engine of Virtual Libraries

Enhanced Search and Discovery: AI-powered search engines can understand natural language queries, allowing users to find relevant resources more easily. Imagine asking "What are the best fantasy novels set in a post-apocalyptic world?" and getting a curated list of options.

Personalized Learning Paths: AI can analyze user data and recommend resources tailored to individual interests and learning goals. This personalized approach can significantly improve user engagement and learning outcomes.

Virtual Reference Assistance: AI-powered chatbots can provide basic reference assistance in virtual libraries. These chatbots can answer frequently asked questions, direct users to relevant resources, and even escalate complex queries to human librarians.

The Future of AI and Virtual Libraries

Immersive Learning Experiences: AI can power virtual reality (VR) and augmented reality (AR) applications in virtual libraries. Imagine exploring historical sites in VR or manipulating 3D models of objects while reading about them.

Multilingual Support and Accessibility: AI-powered translation tools can break down language barriers, allowing users from all over the world to access library resources in their native language. Additionally, AI can assist visually impaired users with text-to-speech and image recognition tools.

By harnessing the power of AI, virtual libraries can become even more dynamic and user-friendly, fostering a love of learning and ensuring information accessibility for all.

Virtual Reality and Artificial Intelligence in Libraries

Virtual reality (VR) and Artificial intelligence (AI) is a match made in innovation heaven for libraries. Here's how they work together to create a future-focused library experience:

Virtual Reality: Stepping into the Information

Immersive Learning: Imagine walking through the pyramids of Egypt or dissecting a virtual frog. VR, powered by AI, can create interactive and immersive learning experiences that bring information to life. This can be particularly engaging for students and researchers, boosting knowledge retention and sparking curiosity.

Virtual Field Trips: No passport needed! VR can transport users to historical sites, museums, or even the surface of Mars. This allows for exploration of locations and artifacts that might be inaccessible or too delicate for physical visits.

Accessibility for All: VR can be a powerful tool for inclusion. Users with physical limitations can explore virtual environments, overcoming mobility restrictions. Additionally, AI-powered language translation can make VR experiences multilingual, fostering global learning.

Artificial Intelligence: The Guiding Light in VR

Personalized Learning Paths: AI can personalize VR experiences based on user interests and learning goals. This ensures users get the most out of their virtual journeys, whether they're exploring a historical period or conducting a scientific experiment.

Interactive Storytelling: AI can create dynamic narratives within VR experiences. Imagine exploring a virtual library where historical figures come alive to tell their stories or where characters in a book react to your choices, creating a truly interactive experience.

Curated Content and Guidance: AI can curate VR experiences and recommend relevant resources based on user interests and progress within the virtual environment. This ensures users don't get lost in the vast amount of information and can find the most valuable content.

The Future Potential

Skill Development and Training: VR combined with AI can create realistic simulations for skill development and training. Imagine practicing surgery in a virtual environment or learning a new language through interactive conversations with VR characters.

Community Building: VR can create virtual spaces where users can collaborate and learn from each other. This can be particularly beneficial for geographically dispersed communities or those with limited access to physical libraries.

By thoughtfully combining VR and AI, libraries can become dynamic hubs of learning and exploration, offering unparalleled access to information and fostering a love of discovery for all.

The Benefits of Artificial Intelligence in Libraries

Artificial intelligence (AI) brings a treasure trove of benefits to libraries, transforming them from repositories of books into dynamic centers of learning and exploration. Here's a breakdown of the key advantages:

Enhanced User Experience

Personalized Recommendations: No more wandering the stacks aimlessly. AI can analyze borrowing history and preferences, suggesting books, articles, or resources that resonate with your interests.

Smart Search & Navigation: Forget complex search terms. AI-powered search engines understand natural language, allowing users to find what they need with ease. Imagine asking "what are the best fantasy novels set in a post-apocalyptic world?" and getting a curated list.

24/7 Virtual Assistance: AI-powered chatbots can answer basic questions, point users to resources, and even schedule appointments with librarians, all without needing a physical visit.

Streamlined Operations and Improved Efficiency

Automated Tasks: Say goodbye to tedious, repetitive tasks. AI can automate processes like cataloging new books, managing overdue items, and generating reports. This frees up librarians' time for more interactive and specialized work, like in-depth research assistance.

Predictive Maintenance: AI can analyze data to predict equipment failures, allowing for proactive maintenance and preventing disruptions in library services. Imagine avoiding a printer breakdown right before a big presentation!

Data-Driven Decision Making: AI can analyze library usage data to identify trends and inform strategic decisions. This allows libraries to optimize resource allocation, invest in popular collections, and develop services that cater to user needs.

Accessibility and Inclusion for All

Breaking Down Language Barriers: AI-powered translation tools can translate library resources into different languages, ensuring everyone can access information regardless of their native tongue.

Bridging the Digital Divide: AI tools like text-to-speech and image recognition can make libraries more accessible for users with visual impairments. This ensures everyone can enjoy the wealth of knowledge libraries offer.

The Future of Libraries: A Look Ahead By embracing AI, libraries can transform into:

Dynamic Learning Hubs: Personalized learning experiences, interactive VR exploration, and AI-powered recommendations will create a dynamic learning environment that caters to diverse interests and learning styles.

Community Centers: AI-powered virtual spaces can bridge geographical distances, fostering collaboration and knowledge sharing within communities, especially for geographically dispersed populations.

Centers for Innovation: AI can power cutting-edge technologies like VR experiences and interactive exhibits, sparking curiosity and igniting a love of learning in users of all ages.

Challenges and Considerations

Ethical Implementation: Libraries need to be mindful of potential biases in AI algorithms and ensure fair and inclusive recommendations for all users.

Human Connection: While AI offers immense benefits, human interaction remains irreplaceable. Librarians will continue to play a crucial role in providing expert guidance, fostering a positive library experience, and promoting critical thinking skills.

Data Privacy: Libraries must prioritize user data privacy and be transparent about how data is collected and used within AI applications.

Overall, AI presents a tremendous opportunity for libraries to remain relevant and thrive in the digital age. By embracing AI thoughtfully and ethically, libraries can transform into dynamic hubs of knowledge and learning, accessible and engaging for all.

The Future Library: A Hub of Knowledge Reimagined

The library of tomorrow is no longer a hushed sanctuary of towering shelves. It's a vibrant space buzzing with innovation, fueled by artificial intelligence (AI) and virtual reality (VR) to create an unparalleled learning experience. Let's delve into the exciting possibilities that await:

Personalized Learning Landscapes

AI-powered Recommendations: Gone are the days of aimlessly browsing. AI will analyze user data, suggesting books, articles, and resources tailored to individual interests. Imagine a virtual librarian curating a personalized reading list based on your past preferences.

Interactive Learning Experiences: VR breathes life into information. Imagine exploring ancient civilizations in VR, dissecting a virtual frog, or walking alongside historical figures. This immersive learning fosters deeper understanding and ignites curiosity.

Adaptive Learning Paths: AI personalizes VR experiences and suggests relevant resources based on user progress. This ensures users get the most out of their exploration, whether they're delving into a new language or conducting a scientific experiment.

Beyond the Walls: Accessibility for All

Virtual Libraries Shatter Geographical Barriers: Borderless knowledge becomes a reality. Virtual libraries with vast digital collections (eBooks, audiobooks, articles) are accessible from anywhere, anytime. This empowers remote communities and individuals with mobility limitations.

AI Bridges the Language Divide: Language translation tools powered by AI allow users from all over the world to access library resources in their native tongue. This fosters inclusivity and ensures everyone can participate in the global knowledge exchange.

AI for Accessibility: Text-to-speech and image recognition tools make libraries more inclusive for users with visual impairments. Everyone can enjoy the wealth of knowledge libraries offer, regardless of ability.

Community Hubs and Innovation Centers

VR Fosters Collaboration: Imagine virtual spaces where users from different locations can collaborate on projects, share ideas, and learn from each other. This fosters a sense of community, especially for geographically dispersed populations.

AI-powered Exhibits and Events: Cutting-edge technology creates interactive exhibits and events. Imagine a library hosting a VR exhibit where you can explore the human body or a presentation where historical figures come alive to answer your questions.

Skill Development and Training: VR combined with AI can create realistic simulations for skill development. Imagine practicing surgery in a virtual environment or learning a new language through interactive conversations with VR characters.

The future library is a dynamic ecosystem that transcends physical limitations. By embracing AI and VR thoughtfully, libraries can transform into essential hubs of knowledge, fostering a love of learning and empowering individuals to become active participants in the ever-evolving world of information.

Conclusion

In conclusion, artificial intelligence (AI) stands poised to revolutionize libraries, transforming them from static repositories of information into dynamic hubs of learning and exploration. From personalized recommendations and AI-powered search to streamlined operations and virtual assistants, AI offers a multitude of benefits that enhance user experience and empower libraries to serve their communities more effectively.

However, it's crucial to acknowledge the challenges of ethical implementation, ensuring human oversight, and bridging the digital divide. By embracing AI thoughtfully

and responsibly, libraries can step into the future as vital centers for innovation, fostering a love of learning and ensuring equitable access to knowledge for all. The future library, fuelled by AI, promises to be a place where information comes alive, sparking curiosity and igniting a passion for lifelong learning.

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AUGMENTING EDUCATION WITH AI: EXPLORING AI-POWERED TOOLS FOR CLASSROOM SUPPORT

Vidya Vinod[1], Dr. Seeja. K. R[2] & Dr. R. Jeyshankar[3]

Introduction

Artificial intelligence (AI) is rapidly transforming the education landscape, offering a plethora of tools and applications that enhance student learning and teacher effectiveness. Artificial Intelligence (AI) tools and applications encompass a wide range of technologies that simulate human intelligence processes.

These tools leverage algorithms and data to perform tasks that typically require human intelligence, such as visual perception, speech recognition, decision-making, and language translation. AI tools and apps have revolutionized industries by automating complex tasks, improving efficiency, and enabling innovation. Education is undergoing a transformation with the emergence of AI-powered tools. The use of AI tools for classroom assistance is an emerging area of research and application in the field of educational technology. These tools have evolved from simple applications to sophisticated platforms that can personalize learning, automate tasks, and provide real-time feedback. This shift is driven by the increasing availability of AI tools in the market, making them more accessible to educators and students alike. The result is a more engaging and effective learning experience for everyone.

The study's primary goal is to evaluate the two domains of education—classroom support for teachers and research support for students and researchers, where artificial intelligence (AI) might be applied to boost productivity. The two domains are separated into distinct verticals where AI techniques can be applied to improve outcomes and boost output. An effort has been made to learn about the Apps and AI technologies that are offered on the market for every need.

AI Tools for Classroom Assistance

One of the most promising applications of AI lies in its ability to revolutionize classroom assistance. This study delves into the various ways AI tools can be implemented to enhance both teaching and learning. By conducting an exploratory investigation, we

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aim to identify the diverse AI-powered apps currently available to support educators and students in the classroom. This research has the potential to unlock the true potential of AI in education, fostering a more enriching and effective learning environment for all.

Ten verticals of AI solutions for classroom aid according to their purpose have been listed.

1. Personalized Learning
2. Quiz Creator
3. Content Management and Lesson Planning
4. Test Preparation
5. Auto grading
6. Administrative Tasks
7. Engaging Learning Activities
8. Accessibility Tools
9. AI powered Assistants
10. Note Making

Personalized Learning

Personalized learning apps uses student data to create personalized learning paths, adapting to each student's pace and style of learning. This can help students stay engaged and motivated while addressing their specific learning needs. Personalized Learning Platforms are the champions of customization. Using student data and performance, they tailor learning paths by adjusting difficulty, content type, and pacing to each student's needs. Imagine a platform that curate's article, suggests practice problems, and adjusts the level of challenge based on a student's progress. They provide Adaptive Learning Engines: These AI-powered engines analyze student data, including performance on quizzes, assignments, and past learning activities. Based on this data, the engine adjusts the learning path for each student. The engine might increase the difficulty for students who excel and provide additional support for those who struggle. If a student struggles with a particular concept, the AI can adjust the difficulty by offering hints, providing scaffolding, or breaking down the challenge into smaller, more manageable steps.

EdApp: EdApp leverages AI to transform classrooms into dynamic learning hubs. By delivering bite-sized, engaging lessons (microlearning) and offering an AI assistant ("EdApp Create") to help teachers craft courses efficiently, EdApp streamlines lesson planning. It personalizes the learning journey for each student through AI-powered analysis, recommending additional materials or adjusting difficulty. Real-time feedback and gamification features further enhance engagement and motivation. EdApp's accessibility in multiple languages makes it a valuable tool for inclusive classrooms. Overall, EdApp acts as a versatile AI assistant, empowering educators and fostering a more effective learning experience for all.

Sololearn andAdaptemy are other examples of personalised learning platforms

AI tutors can answer student questions, identify knowledge gaps, and offer targeted feedback. Chatbots can provide 24/7 support, answer basic inquiries, and offer immediate access to information. In the classroom and beyond, AI tutors and Chatbots are virtual companions offering personalized learning support and readily available information.

Quiz Creator

Quizizz: Quizizz is a well-known program for creating quizzes. With the help of this intuitive platform, you can create interesting tests that have a variety of question types, such as multiple choice, true/false, polls, and even the addition of photos, in place of the conventional paper quizzes. With the ability to engage from any device, students may create a classroom competition featuring real-time leaderboards. Quizizz offers insightful information along with entertaining learning experiences. Instructors may monitor the advancement of their students and pinpoint areas that require further guidance, enabling them to tailor their lessons for the best possible learning results.

Quiz Maker,QuizGame, Quizgecko, SurveyMonkey, Fyrebox are some of the other examples of Quiz making apps available in the market.

Content Creator

AI can generate educational content, such as quizzes, worksheets, and lesson plans, based on curriculum requirements. This can save teachers time and provide additional resources to supplement their teaching.

Microsoft Copilot: As your virtual co-pilot, Microsoft Copilot is an AI-powered solution that was created to optimize workflows within the Microsoft 365 suite. It examines your work habits and writing style to provide recommendations and support in real-time for a variety of applications. Copilot can compose many types of material (such as emails and code), translate languages, create original text forms, and even analyze data in Excel spreadsheets. By integrating it with routine chores, users of all technical backgrounds will be able to work more productively and accomplish more within the Microsoft environment.Microsoft's Copilot will compose, edit, summarize, offer advice, and create alongside you. Concisely write first drafts, add material to already-existing papers, condense text, and revise sections or complete pages.

Canva: Canva gives teachers the tools they need to change their classrooms. A vast collection of pre-made templates for worksheets, info graphics, presentations, and more are available on this user-friendly design platform. These let students to work together on projects in real time, encouraging teamwork and communication, and teachers can use them to create compelling classes. Canva's versatility for a range of learning techniques is further enhanced by its support for explanation movies and social media graphics. With its extensive feature set and freemium business model, instructors and students may unleash their creativity and build a dynamic learning environment with ease.

Test Preparation

The way students study and get ready for tests is changing thanks to artificial intelligence (AI) tools. These technologies evaluate enormous volumes of data using complex algorithms to provide individualized study schedules that are catered to each student's specific learning requirements. Additionally, students can receive tailored support from AI-powered tutoring systems like Adaptemy, which can identify knowledge gaps and provide practice tasks that are specifically designed to help students reinforce their understanding of important ideas. These AI-powered solutions increase productivity while also improving learning results by giving students customized, adaptive study sessions that are tailored to their individual strengths and shortcomings.

Khan Academy: This platform provides practice problems and tailored learning materials for a variety of areas, such as physics, math, economics, and more. Its adaptive learning algorithm ensures focused preparation for standardized examinations such as the SAT and ACT by modifying the questions' difficulty level according to students' performance.

Auto grading

Automated Grading Systems: AI can handle the burden of grading multiple-choice questions, quizzes, and even short answer responses. This frees up valuable teacher time for providing more in-depth, personalized feedback.

Gradescope: Gradescope can be a lifesaver for teachers seeking to streamline the grading process. This AI-powered tool tackles the tedious task of grading multiple-choice, fill-in-the-blank, and short answer questions. Teachers simply upload answer sheets or quizzes, and Gradescope scans them, compares them to answer keys, and delivers instant results. This frees up valuable time for educators to focus on providing more personalized feedback on complex essays or projects. Gradescope even offers functionalities like rubric integration, allowing teachers to set specific criteria for partial credit. By automating the mundane, Gradescope empowers teachers to spend more time nurturing a dynamic learning environment.

Nearpod, AiGrading,Pearson Insignia, Xi'an Academ,Turnitin Gradescope, AutoGrader by Smart Sparrow are some of the other apps for AutoGrading. These AI tools can analyze short answer responses and open-ended tasks based on predefined rubrics. It assigns scores and provides feedback based on keywords, sentence structure, and adherence to the rubric criteria.

Administrative Tasks

AI can assist with administrative tasks, such as scheduling, attendance tracking, and resource management, allowing teachers to focus more on teaching.

Zapier: Zapier streamlines your workflow by automating monotonous operations and serving as the link between your most popular web apps. Consider automating the transfer of information from a filled-out Typeform form to a new lead in your CRM program,

or planning social media posts in response to updates from your project management application. Through "Zaps," user-created routines that link two or more apps, Zapier accomplishes this. With its extensive collection of compatible apps and intuitive UI, Zapier enables users—including those without any coding knowledge-to automate processes and greatly increase their productivity. Workato is a also a well-known user-friendly platform for connecting several apps in the business automation space.

Engaging Learning Activities

AI can be used to design game mechanics that are both fun and educational

Duolingo: This popular language learning app utilizes AI to personalize the learning path for users. Duolingo tailors the learning materials and exercises based on the user's progress, strengths, and weaknesses, making it an engaging way to learn a new language. McGraw-Hill Education and DreamBox Learning are other popular examples of AI tools available in the category of engaging learning activities.

Accessibility Tools

AI is breaking down barriers to learning. Text-to-speech tools can convert written content into audio, making learning materials accessible for students with visual impairments. Similarly, AI-powered captioning can improve the accessibility of lectures and presentations.AI is transforming classrooms into more inclusive spaces for all learners. Here are some examples of AI tools that empower students with disabilities or learning differences

Speechify: Speechify is a useful tool for people who have busy schedules or who have trouble seeing. Written resources, such as articles, documents, emails, and even ebooks, can be turned into natural-sounding audio with this text-to-speech software. With Speechify's extensive collection of AI-powered voices in many languages, consumers may personalize their listening experience. Speechify is a flexible tool for learning and consuming content, which is further reinforced by its easy connection with several platforms and dyslexia-friendly features. ChromeVox, Natural Reader, Dragon NaturallySpeaking, Otter.ai, Microsoft Teams Live Captions, are some of the other examples of AI enabled Accessibility tools.

AI-powered Assistants and Accommodations

Equation by MathWorks: This AI-powered tool assists students with math learning difficulties. Equation utilizes AI to recognize handwritten math expressions and equations. It can convert them into digital format, making them accessible for screen readers and other assistive technologies. Additionally, Equation can provide step-by-step solutions and explanations for various math problems.

Note Making

AI note-making tools are transforming how students arrange and combine knowledge for improved understanding and recall. These applications make use of

sophisticated algorithms to help students efficiently summarize, organize, and annotate their notes. Students can find and retrieve their notes more easily because to AI-driven features like word recognition, handwriting conversion, and automatic tagging that are available on platforms like Evernote and OneNote. Additionally, students can more easily connect similar ideas and concepts with the aid of AI-powered note-taking applications like Roam Research and Notion, which evaluate user input to create contextual suggestions. Note-making solutions enable students to improve learning results by streamlining their study process, improving organization, and ultimately utilizing AI to its most potential.

Conclusion

Integrating artificial intelligence (AI) into education is a big step toward improving the quality of teaching and learning. Artificial intelligence (AI)-powered solutions provide a multitude of advantages for educators and students, ranging from personalized learning platforms to quiz producers, content generators, and administrative helpers. Education may become more inclusive, efficient, and adaptive by utilizing AI technology, which can accommodate a variety of learning demands and learning styles. These technologies allow instructors to concentrate more on individualized education and feedback while also streamlining administrative responsibilities. Furthermore, AI accessibility tools ensure that every student has an equal chance to succeed by removing obstacles to learning. We are getting closer to creating a world in which all students may flourish in dynamic and stimulating learning settings as we investigate and embrace the potential of artificial intelligence in education.

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SECTION III

KNOWLEDGE ORGANIZATION AND TECHNOLOGY

ONTOLOGICAL BIBLIO REPRESENTATION IN KNOWLEDGE ORGANIZATION: A STUDY

M Krishnamurthy[1], Ananya. H V[2], & Yashaswini[3]

Introduction

For many years, ontologies have been an essential tool in semantic web development and knowledge representation. "An ontology is a formal specification of a shared conceptualization," claims Gruber (1993). In addition, ontology offers a formal, machine-readable language for describing complex systems that can be shared and used between domains and applications.Over the past few decades, the use of ontologies in knowledge representation has grown in renown, especially among sectors like biomedical research where precise representation and sharing of complex data and linkages between many ideas are essential (Musen, 2015).

The ontology of machine processing and information resource reasoning are crucial parts that allow for the Semantic Web. By revealing data in a machine-readable format, the semantic web vision of the World Wide Web enables automated processing and intelligent reasoning. (Berners-Lee et al., 2001).Ontology is used by the semantic web to create common terms for describing concepts and their interactions. This permits more complex reasoning as well as more precise and effective information retrieval and search. There are many different types of ontologies, ranging from very general to very specific. Some examples include:

Upper ontologies: these offer a basic framework for describing concepts and relationships and are frequently used as a starting point to create more specific ontologies. Domain ontologies: These are aimed at capturing the concepts and relationships crucial to a particular field or the subject area. Application ontologies: These are ontologies that are specific to a particular software application or system and are meant to facilitate integration and interoperability between the system's many components.

Ontologies are typically defined using a formal language, such as RDF or OWL, for easier machine processing and reasoning. Protégé, Top Braid Composer, and the Jena Semantic Web framework make up the various tools and frameworks available for developing, handling, and distributing ontologies.

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Methodology

The primary goal of this study is to create an information system based on ontology. The approach employed for the system's design, development, and testing is detailed. The food technology information service possesses a range of resources, including books, periodicals, theses, dissertations, and patents. The current investigation outlines the production, retrieval, and sources of food-related information. Consequently, the significance of these endeavors is to establish a knowledge representation system that encompasses the documents required for effective search techniques.

Ontology Building

Ontology development is necessary for information retrieval and searching the application of ontology will explain to build domain ontology in 3 approaches.

1. Manual-driven by domain experts
2. Automatic approach

Semi-automatic approach

To accomplish the food science ontology-building project, the process was guided by methontology, and it involved crucial phases such as definitions, information gathering, formulation, conceptualization, assessment, and application.

Ontology specification

- Task-1 Identify the purpose
- Task-2 Identify intended end users
- Task-3 Identify requirements
- Task-4 Group requirements
- Task-5 Validate the set of requirements
- Task-6 Extract terminology

Food science is one of the vital necessities of mankind hence the importance of food science and technology. The core subjects include food nomenclature, analysis, evaluation, properties, processing, milling, dehydration, irradiation, preservation, packaging, storage, spoilage, handling transportation, quality control, marketing, and food engineering.

Knowledge Acquisition

A pre-requisite for mapping domain knowledge is knowledge acquisition – the identification of concepts in the domain, the relation between the concepts, etc. This knowledge needs to be analyzed interpreted and represented in a machine-understandable form. The food ontology for this research was built based on a few existing vocabularies in the domain. The following vocabulary was used for knowledge acquisition.

1. Depth version of CC for food technology
2. Universal Decimal Classification or Knowledge organization system used in the library

3. AGROVOC: The FAO has developed a comprehensive controlled vocabulary, which partly covers the domain, known as AGROVOC.
4. IFIS Thesaurus: The International Food Information Service (IFIS) has developed a comprehensive thesaurus for use in food science.

Review of literature

A literature review's objective is to present the context and justification for the conducted study. Identifying the study question aids the researcher in formulating the problem within a broad context. The goal of a review on any topic is to assess a portion of the corpus of published information by summarising, categorizing, and comparing earlier research investigations, literature reviews, and theoretical works. Identification of the methodologies, strategies, and approaches used is also aided by a survey of the literature. A survey of the relevant literature offers fresh ideas for solving a particular issue. The knowledge representation and semantic web are the topics of this review of published research. Google Scholar, the National Digital Library of India, the Library and Information Science Abstract (LISA), the Library, Information Science and Technology Abstract (LISTA), Springer, and electronic books were used to find pertinent material. The Semantic Web and Knowledge Representation are the key focal points of the current work. The Knowledge Representation, Semantic Web, and Ontology search terms served as the foundation for the literature review.

Terzi Evimaria et al (2003) Modern Internet-based data management systems need to include a consistent representation of web data and resources to allow to interpret and precisely comprehend and interpret the data accurately, and to provide meaningful responses to user queries. Ontologies are expected to play a crucial role in the development of the Semantic Web, which aims to enhance the web's capabilities for knowledge representation and information processing. This article provides a detailed rundown of the different methods and languages used for Knowledge Representation (KR) that can serve as Semantic Web standards.

C. Brewster (2004) Ontologies are highly regarded as valuable tools for describing human knowledge and playing a crucial role in knowledge management, business-to-business applications, semantic web, and numerous other domains. They are often viewed as the ideal structure for modeling knowledge representation by various research communities. However, there has been limited discussion on the extent of knowledge that an ontology can accurately express. This study highlights the fascination with ontologies as artifacts for knowledge representation while questioning their limitations in effectively capturing the complexity of human knowledge.

Milton and Kazmierczak (2004) The authors developed qualitative techniques to assess data modeling languages conceptually using ontologies, such as conceptual comparison. They compared various ontological metadata modeling languages to a philosophical ontology, as an external reference. To better understand the fundamental features of data modeling languages, their approach was based on ontology. They began

with Chisholm's ontology and used their own techniques to analyze the grammar. The authors concluded that the data modeling languages they examined represent an ontology of common-sense realism because they found a substantial level of agreement between the data modeling languages and the central concept of Chisholm's ontology.

Wyssusek (2006) The paper examines the BWW ontology and its applications in the conceptual modelling context theory. It traces the evolution of conceptual modeling, emphasizing the quest for a theoretical basis. It then explores the shift from scientific ontology to ontology for conceptual modeling.

Fonseca (2007) the implementation of ontologies in information systems is a topic that requires careful consideration. The author provides guidance on how to effectively apply ontologies in IS by highlighting the distinctions between their development and utilization. In the context of information systems, ontologies are primarily used to model a specific domain.

J. Hendler and F Van Harmelen (2008) The World Wide Web has opened up new possibilities for the application of knowledge representation, as formal semantic descriptions of websites can help computational agents process information more effectively. Additionally, KR systems can leverage the naming conventions of the Web, which rely on Universal Resource Indicators, to prevent ambiguities in natural language and facilitate the connection of semantic content. These capabilities present KR with a wealth of new opportunities, while also challenging some of its long-held presumptions.

Knowledge Representation

A knowledge representation is a tool that allows an entity to reason about the world without taking action. It serves as a surrogate for the real world and is made up of ontological commitments that define how one should think about the world. It includes three parts: (1) The underlying idea of intelligent thinking as it is expressed in the representation; 2) The inference the representation permits; and 3) the premises that it suggests. This tool supports organizing the information so that the advised conclusions can be drawn more easily. It can be useful to recognize and acknowledge the numerous functions that knowledge representation conducts. (Randall Davis,1993)

Semantic Web

The Semantic Web is a proposed extension of the existing World Wide Web, built to give computer programs machine-interpretable metadata about data and information that has been published. This involves adding new data descriptors to the Web's existing content, allowing computers to interpret and understand the data in a way that is similar to how humans do, to achieve specific goals. The Semantic Web is envisioned as a way to make data more interconnected and easier to access and use, and to facilitate the development of more sophisticated intelligent systems and applications.

According to Tim Berners-Lee, the creator of the Semantic Web, the ultimate aim of this technology is to enable computers to efficiently manipulate information on our behalf. The term "semantic" refers to the ability of machines to understand and process data in the context of the Semantic Web, while "web" signifies a navigable environment of interconnected resources with unique identifiers in the form of URIs. The Semantic Web is designed to facilitate the exchange and integration of data across different applications and domains, with the ultimate goal of enabling machines to automate complex tasks and support more intelligent decision-making. (https://www.ontotext.com/knowledgehub/fundamentals/what-is-the-semantic-web/)

The classical hypertext web languages and techniques, which serve as the foundation for representing ontology-based semantic knowledge, are referred to as the bottom layer1.1:

- Reference mechanisms: A generalization of URI called Internationalized Resources Identifier (IRI) offers a way to specifically identify materials.
- Document exchange standards:
- XML provides the syntactic foundation for the Web, with support from Unicode and Uniform Resource Identifiers (URIs). Unicode enables the use of international characters in XML, while URIs are used in the Semantic Web as unique identifiers for concepts. XML can be viewed as a universal meta-language for defining markup, providing a standardized framework and a range of tools, including parsers, for exchanging data and metadata across different applications. However, XML does have some limitations:
- XML only provides syntactic interoperability; it does not offer any way to indicate how data is to be transmitted;
- It does not guarantee formal language.
    - between subclasses and sub-properties, as well as range and domain restrictions. However, RDF Schema has limitations when used on the web, so an ontology layer is often added on top of RDF/RDFS to enhance its capabilities.
    - Web Ontology Language (OWL) is an extension of RDFS that provides more complex constructs for defining the meaning of RDF statements. Its purpose is to capture richer semantics and formally specify the vocabulary used in web documents. OWL is based on description logic, which enables it to perform advanced reasoning tasks in knowledge representation.
    - A new ontology query language is required RDF Data Query Language (RDQL) Rather than using an XML query language, it is recommended to use the SPARQL Protocol and RDF Query Language (SPARQL) since XML is at a lower level of abstraction compared to RDF. If we were using an XML-based language to query RDF documents, this would cause issues. The specific data from RDF graphs are extracted using these query languages. (Padmavathi,2015)

Ontology

Ontology is a useful tool for expressing knowledge and relationships between ideas in a particular information domain. It enables semantic information conveyance and the organized mapping of information resources, which can enhance data interoperability. Ontologies offer several benefits, including the clear presentation of a field of knowledge and the provision of a hierarchical framework for explaining concepts and their relationships. Building a large ontology can involve connecting an existing ontology with other relevant ontologies to reuse and share knowledge domains and facilitate structured information understanding. (Irianto Liko Koten, 2020)

Biblio representation

As a first step the introduction of ontology has tested bibliography sources from the OCLC (http://classify.oclc.org/) to establish the ontology tools biblio and one web were Studied considering the data. Resource Description Framework (RDF), Dublin core, and FOAF (Friend of A Friend) semantically describe the authors. The use of the bibliography available in the OCLC to achieve our goal in semantic interoperability.

The above picture describes the food ontology class hierarchy to describe data property to disjoint class this information provides a richly linked module. Where thing at the first level in the hierarchy is the purpose of the project. the project food commodity as a set of classes, The book titled "The Very Hungry Caterpillar" was written and illustrated by Eric Carle. It has been published in 793 editions and has a total of 15,388 holdings. The OCLC Work Id for this book is 473583. For more information, you can visit the following link: http://classify.oclc.org/classify2/ClassifyDemo?owi=473583.

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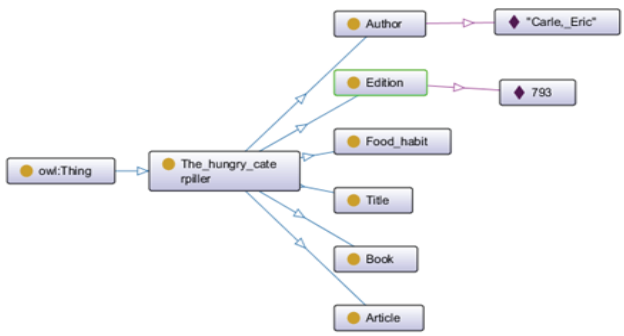


Figure: 1

The book "Green Eggs and Ham" was authored by Dr Seuss and co-translated by Jennifer Morrish Tunberg and Terence Tunberg, with the translation done by Aída E. Marcuse, and it has been published in 195 editions, with a total of 9679 holdings and an OCLC Work Id of 41159.

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http://classify.oclc.org/classify2/ClassifyDemo?owi=41159.
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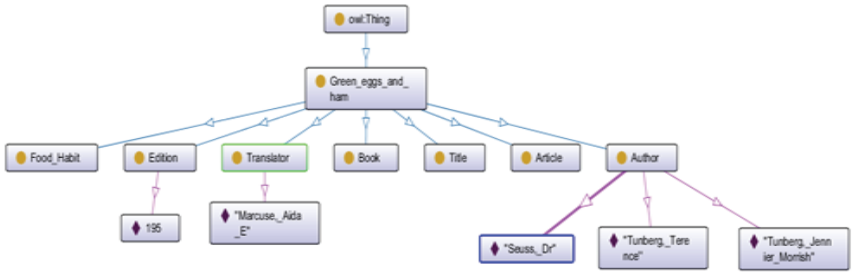


Figure:2

"A Child's Christmas in Wales" by Dylan Thomas, with illustrations by Trina Schart Hyman and Ellen Raskin, and additional illustrations by Fritz Eichenberg, has 161 editions and a total of 5457 holdings. The OCLC Work Id for this book is 375283, and the record link is http://classify.oclc.org/classify2/ClassifyDemo?owi=375283.

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http://classify.oclc.org/classify2/ClassifyDemo?owi=375283.
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  <rdf:type rdf:resource="&foaf;Person"/>
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  <foaf:family_name>Dylan</foaf:family_name>
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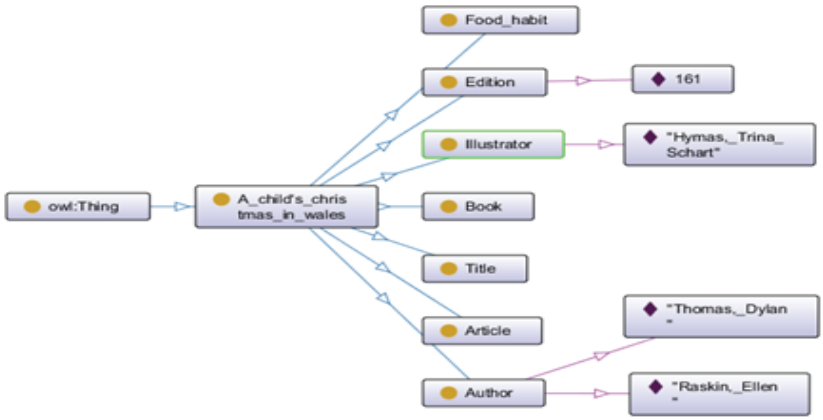


Figure: 3

"The book 'Rabbit Hill' by Robert Lawson (1892-1957), translated by Chen Shihong, has been published by Viking Press and printed by H. Wolff, Inc. There are 170 editions with a total of 5318 holdings, and its OCLC Work Id is 516096. You can find more information about this book at http://classify.oclc.org/classify2/ClassifyDemo?owi=516096."

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http://classify.oclc.org/classify2/ClassifyDemo?owi=516096.
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</owl:NamedIndividual>
```

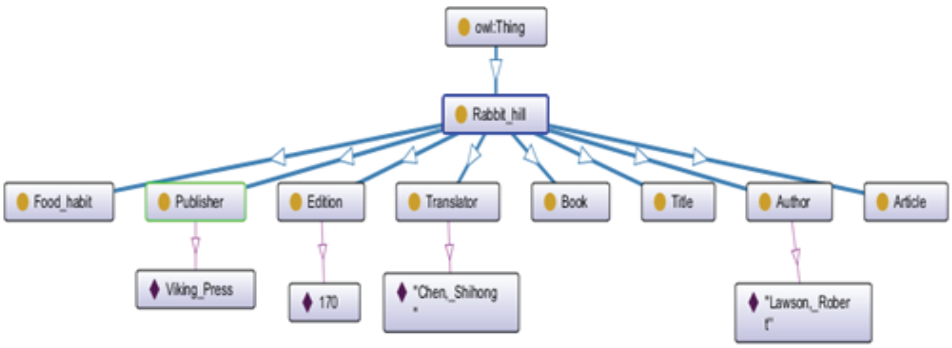


Figure:4

Classes

The main class of the title in the Dewey Decimal Classification system generally describes the subject of food commodities, which are grouped under agriculture. Food technology is then categorized into various sub-classes and facets. The classification of food terminology is divided into several groups, including the sub-class of CC. Additionally, the food class is considered a sub-class of things in this context. The author, title, and sub-class are further subdivided into additional levels. Figure 1 to 6 illustrates the hierarchical structure of the ontology, showcasing the sum of these levels. Furthermore, the classification system is divided into subclasses such as name, family, and resource.

Property

Property that is used in ontology means the characteristics that a class as the relationship with terminology. The OWL (ontology web language) as data on "The Very Hungry Caterpillar", "Green Eggs and Ham", "A Child's Christmas in Wales", "The Book 'Rabbit Hill'', 'Strega Nona: An Old Tale' and 'Strega Nona: An Old Tale' data describes green caterpillar data properties describe caterpillar define as a food example of data properties. It relates to all individuals explained in Figure No.1-6.

Applications in LIS

- Administration of Library: By utilizing these rapid IST advances, the administration of the library will continue to provide access to the following: Creating a database, classifying it, creating an index for it, and indexing the database.
- Library computerization aims to improve access to library services and reduce costs by minimizing human intervention. This involves automating two main categories of tasks: creating library databases and managing library housekeeping activities.
- The networking of libraries provides a user-friendly information search that is shared among all users. This is achieved through a common database maintained by the IST-based server, known as the Libraries and Information Centre. The purpose of this network is to improve the efficiency of information search
- A digital library provides electronic sources such as microfilms, photographs, audio and video tapes, optical discs, and print materials
- Technical Library: It encompasses editing, publishing, technical writing, and DTP systems; it provides digital Communication.

Conclusion

A brief examination of semantic retrieval and information representation for an ontology-based information system was undertaken. Filtering and knowledge-based information retrieval heavily rely on ontology. As a definition of a context. This paper provides parts of food ontology that could enhance information retrieval. Most of the data is obtainable in this context and on the internet. The document has been sought to be acquired from the OCLC document. This study strives to demonstrate the possibilities

of a recently developed protage tool. Which solved syntax because it can't concentrate entirely on semantics.

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APPLICATION OF METAVERSE IN MANUSCRIPT LIBRARIES: A CASE STUDY of MAHAMAHOPADHYAYA DR. U. V. SWAMINATHA IYER LIBRARY, CHENNAI

N. Kala[1] & K.Baskar[2]

Introduction

Human evolution has been facilitated by our ability to learn and adapt through a variety of effective communication modalities. Originally, they used gestures created by their body movement in addition to signs cut into the shape of symbols, drawings, and other images in sand and rocks. As a result, people started expressing their ideas, emotions, and thoughts through speech and writing. Information was recorded for future generations using writing instruments made of clay tablets, stone, metal, bark, bone, wood, ivory, conch, shell, cloth papyrus, palmleaf, bamboo, and related materials. A manuscript is a piece of writing that expresses the main idea and is mostly written by handAs a result, manuscripts on paper-known as paper manuscripts-and manuscripts on leaves-known as palm leaf manuscripts-developed. Subsequently, printing technology advanced, enabling the publication of concepts, ideas, and knowledge content in various editions and multiple copies. Photographs were used to illustrate images in instructional materials, initially in black and white and then, to increase impact, in color. It aided in a revolution by releasing books and non-books on paper, film, magnetic, and electronic media. The next most interesting evolution is the development of computers. We've entered a new, sophisticated, and advanced era of computer technology. Mainframes, Supercomputers, Minicomputers, Mobile Computers, and Personal Computers are all included. Technology advancement in ICT made possible by the Internet has improved electronic learning. The use of social media and mobile devices has made video education more purposeful, instructive, and informative. The newest technology for user-participated learning is a metaverse.

Across society, libraries are significant institutions. Over time, libraries' roles evolve from maintaining records to serving society's information needs in the Internet era. Global tech companies are beginning to invest in the Metaverse, the next iteration of the Internet. Virtual reality, augmented reality, real-time, and immersive experiences in public cyberspace are the main components of the metaverse. The Metaverse is still developing. It is expected to have a disruptive impact on business. This essay explores

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the potential functions of libraries in the Metaverse within the framework of the MSS library in Chennai.

Manuscript Libraries

India has the world's largest collection of manuscripts, primarily as a result of its rich literary heritage. Manuscripts containing the literary legacy of ancient India were kept alive in royal palaces, gurukulas, houses of learned individuals, and temples that support literature and the arts. Foreign invaders destroyed a number of significant manuscript libraries. Reputable libraries including the Dr. U.V. Swaminatha Iyer Library in Chennai, the Thanjavur Sarasvati Mahal Library in Thanjavur, and the Government Oriental Library in Thanjavur are home to the last known manuscripts in the forms of palm leaves, birch bark, and paper. There are 36 MSS libraries located in fourteen districts of Tamil Nadu which have been grouped under the following five categories based on the nature of management of the library.

- MSS Libraries governed by Tamil Nadu State Government
- MSS Libraries governed by Universities
- MSS Libraries governed by Autonomous Institutions
- MSS Libraries governed by Religious Institutions
- MSS Libraries governed by Private Institutions (Baskar, 2013).

For the purpose of the study in this paper only one MSS library namely Dr.U.V.Swaminatha Iyer Library has been considered.

Profile of Dr.U.V.Swaminatha Iyer Library

Dr. U.V. Swaminatha Iyer's name is well-known wherever Tamil is spoken and academic excellence is recognized. Thanks to his extensive knowledge, wealth of information, and exquisite style of thought and expression, Dr. U.V. Swaminatha Iyer was the only one who was able to unearth and edit the great Tamil classics. Manuscripts represent a treasure of immeasurable value that he was able to leave to the World of Tamil Scholarship at the time of his death. The devoted son of the venerated scholar, Sri. S. Kalyana Sundara Iyer, gave this priceless treasure as a gift to Srimati Rukmanidevi, President of Kalakshetra, the world-renowned international center of art and culture, in 1943.. The primary goal of this gesture was to ensure that Dr. U.V. Swaminatha Iyer's priceless and rare collections were kept whole, with their uniqueness and purity preserved, as well as to carry on her editorial work in the same manner. Therefore, in 1943, this library was founded under the name Dr. U.V. Swaminatha Iyer. The Library is officially recognized by the Societies Registration Act XXI of 1860 as a Charitable Literary Society. The Tamil Nadu government provides a maintenance grant to the library. Aside from printed books, it contains three types of collections with exceptional literary value and merit: notes of various kinds, paper manuscripts, and palm leaf manuscripts. The public can use the library to reference the information materials that are kept there. In the tradition of Dr. U.V. Swaminatha Iyer, the Library publishes books based on original manuscripts.

Acquisition in Dr.U.V.Swaminatha Iyer Library

The Library has 14 out of the 18 Sangam Literary Tamil works namely the Pattupattu and Ettu-ttokai. Quantum of Collections of the Library are given in Table 1

TABLE 1 Quantum of collections of Dr.U.V.Swaminatha Iyer Library

Sl. No.	Nature of collection	Physical Form of Collection						
		Bundles	Works	Registers	Loose entities	Total	Accessed	To be accessed
1	Palm Leaf	2173	-	-	-	2173	2149	24
2	Paper	-	-	855	-	855	855	-
3	Letters	-	-	-	3421	3421	3421	-
4	Notes on various kinds	-	-	26	-	26	26	-
5	Books					34868	29868	5000
6	Journals	-	-	-	-	80	80	-
7	Special Collections	-	-	-	-	2	2	-
8	Microfilms	-	-	-	-	-	-	-
9	CD ROMs	-	-	-	-	113	113	-

The Library maintains separate Accession registers for each kind of collection it possesses. For some of the palm leaf and paper manuscripts, descriptive catalogues are available. Table B lists the acquisitions of the paper manuscripts and palm leaves by period. Soon after the great Tamil savant Dr. U.V. Swaminatha Iyer passed away, Mr. S. Kalyanasundaram left the Library 271 paper manuscripts and 939 palm leaf manuscripts. Tamil enthusiasts have donated the remaining manuscripts.

Metaverse

The term “metaverse” was initially used in Neal Stephenson’s science fiction book “Snow Crash,” which was released in 1992. A metaverse is a platform that facilitates the creation of an interface between people who inhabit the real world and the virtual computer environment. By combining the user and digital data in real-time, it allows users to assume the role of real-life avatars, a phenomenon known as augmented reality (AR). Additionally, it gives the user the impression of being in a three-dimensional virtual environment, also known as virtual reality (VR). By generating holographic depictions of people within digital spaces, it additionally aids in creating authentic living experiences for users. The coexistence of the real and virtual worlds as well as their natural, meaningful merging are made easier by mixed reality (MR). Through immersive learning, it aids in the achievement of a paradigm shift in the way that users learn. The convergence of augmented reality, virtual reality, and mixed reality has brought about a metaverse revolution in education by demonstrating the relationship between the cohesiveness and coexistence of the virtual and physical worlds.

The term "metaverse" refers to an ever-present, multi-user environment that blends digital virtuality and physical reality. It's the universe of post-reality. Its foundation is the convergence of technologies, including augmented reality (AR) and virtual reality (VR), which enable multimodal interactions with digital objects, virtual environments, and people. Consequently, the Metaverse is an everlasting multiuser platform that links a network of immersive, socially interactive worlds. It permits dynamic interactions with digital artifacts as well as fluid, real-time user-embodied communication. When avatars were first created, they had the ability to move between multiple virtual worlds. The Metaverse as it exists now consists of social, immersive VR platforms that interface with AR collaborative spaces, MMORPGs, and open game worlds. (Mystakidis, 2022).

The following are the characteristics of metaverse

- It creates a natural connection between the user's real-world and virtual experiences.
- By enabling participatory movement in the virtual three-dimensional (3D) spaces, users can move freely as avatars.
- Users experience and relish the freedom to learn using their own methods and abilities.
- It is an embedded technical technology that is shared by all.
- Makes user-centric conduct possible.
- With the aid of extended reality, allows users to construct virtual rooms and provides other users with access to them across multiple platforms and systems.
- Uses a variety of technologies, including mixed reality, augmented reality, and virtual reality, to provide natural interaction between the real and virtual worlds.
- • Takes into account all modes of communication.
- • Combines large-scale, participatory, interactive real-world learning. As a result, it permits the simultaneous participation of the greatest number of users.
- • Encourages user participation while preserving their uniqueness.
- • Guarantees the continuity of data, including identities, objects, payments, interactions, histories, and so forth.
- • Provides a collective, device-independent virtual environment.

Metaverse in Libraries

The users of the library are granted access to the Metaverse. During their learning process, it allows them to live in a virtual world and engage in online interactions. This is achieved by creating avatars for the users, which in turn motivates them to actively participate in the virtual world and pursue knowledge acquisition. The following developments in libraries have led to an increase in the use of metaverse:

Over the past few decades, as information and communication technology has evolved, so too have the forms of materials used in libraries to preserve their information content. Each library patron uses a different approach to satisfy their curiosity about the wealth of information available in the virtual world. Users' collective behavior toward these particular searchers is always evolving. The virtual world's exposition of literacy

is constantly evolving in every aspect. Users anticipate being able to remotely access the educational materials found in the virtual world. In order to make the necessary adjustments in the process of providing the appropriate information to the appropriate kind of potential users at the appropriate time and from the user's perspective, the informative space in the virtual world is growing larger and larger.

Application of Metaverse in Libraries

Libraries employ a variety of metaverse technologies, including blockchain, internet of things, artificial intelligence, mixed reality, mixed reality cloud, augmented reality, virtual reality, head-mounted displays, 3D reconstructions, software tools, applications, platforms, hardware, and user-generated content. It is expected of librarians to be able to actively engage as users and builders in the Metaverse as well as act as audience members. It's true that libraries in the metaverse are still in their infancy. Current metaverse libraries are still in the phases of experimentation, project development, and prototype. A community that uses the Metaverse to gather, create, innovate, and collaborate can be found in some metaverse libraries.

Libraries can create interactive simulations and immersive learning experiences by utilizing the Metaverse. Libraries may interact creatively with communities and reach new audiences thanks to the Metaverse. The Metaverse offers a chance to reinvent and customize the experience for library patrons. This makes it easier for users to access the wealth of information that is available in the virtual world in the form of information materials covering all subjects, utilizing their own preferences and style.

Advantages of Metaverse Application in Libraries

The following are the advantages of metaverse application in libraries:

1. It assists users in achieving comprehensive digital use by helping them make the most of their screen time, using the digital space in a healthier way, and giving them a sense of community involvement.
2. It empowers users to co-create, empowering them to become digital citizens and entrepreneurs.
3. It facilitates location teleportation within the metaverse network.
4. It enables users to engage in appropriate speech and intellectual property rights viewpoints while adhering strictly to privacy.
5. It aids users in developing critical thinking, conceptual thinking, and appropriate content creation skills.
6. Through online collaboration, communication, and digital footprints, it fosters effective digital communications for the users.
7. By fostering social and emotional awareness, emotional regulation, and empathy within themselves, it aids users in developing digital emotional intelligence.
8. By enabling password protection, internet security, and mobile security, it aids users in their evolution.

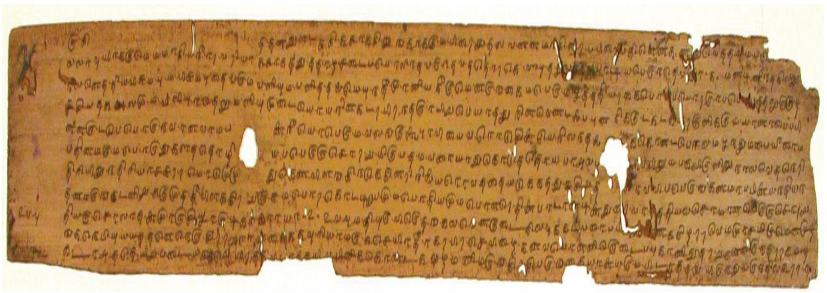
9. By preventing potential behavioral hazards that may arise from using immersive metaverse applications, it aids in achieving digital safety.
10. By lowering the risk of contact and content, it contributes to the achievement of digital safety.

Application of Metaverse in Mahamahopadhyaya Dr.U.V.Swaminatha Iyer Library

The MSS library can be very important to society in the Metaverse. The library can assist society in becoming aware of, comprehending, and making safe, healthy, and beneficial use of the Metaverse. Additionally, the MSS library could improve users' quest for knowledge by utilizing immersive content experience technology. The library might eventually exist both digitally and physically in virtual cyberspace. Libraries must once more change as society gets ready for the Metaverse. Libraries can create interactive simulations and immersive learning experiences by utilizing the Metaverse. MSS libraries can reach new audiences and interact creatively with communities thanks to the Metaverse. The Metaverse offers a chance to reinvent and customize the experience for library patrons. The concept of Metaverse also creates more advantages for libraries in terms of collection resource management, reading space, cultural promotion, reading experience, and special user services. Metaverse and its related technologies are essential to advancing libraries toward fully intelligent libraries.

Additionally, it is feasible and possible to create digital repositories for palm leaf manuscripts, print the digitized manuscripts in their original form, and include critical annotations, English transliteration, and recorded voice instructions for optimal use.

(Fig. 1).



புறம்

மண் திணிந்த நிலன் உம் - புற.2-1
நிலன் ஏந்திய விசும்பு உம் - புற.2-2
விசும்பு தைவரு வளி உம் - புற.2-3
வளி தலஈய தீ உம் - புற.2-4
தீ முரணிய நீர் உம் என்றாங்கு புற.2.5
ஐம் பெரு பூதத்து இயற்கை போல - புற.2-6

maN tiNinta nilanum
nilan Entiya vicumbum
vicumbu taivaru vaLiyum
vaLitalaiya tIyum
tIymuraNiya nIrum enRAngu
aimperumpUtattu iyaRkai pOla

audio

Voice 082.m4a

Fig.1 Palm leaf MSS in original, Tamil text, English transliteration with Audio link

The application of Metaverse for the sample palm leaf MSS is given above. Rendering of the content of the manuscripts by various subject experts are recorded both in audio and video format. The same work available in paper and palmleaf manuscripts are thus compared. It is interesting to note that in Dr.U.V.Swaminatha Iyer Library there exist difference in their respective contents.

Conclusion

It is important to stress that the metaverse is a novel concept being applied in a number of industries, including banking, education, and libraries. Its use in education and libraries, particularly MSS libraries, will be very helpful for delivering instruction and offering information services. Additionally, it will be a delightful experience for the academic community and patrons. It is not hyperbole to say that libraries will be setting the standard for easy access to information via cloud platforms. The metaverse libraries would be helpful to the library's patrons in meeting their constantly evolving information needs. Though they offer better opportunities, the development and application of metaverse in libraries, education, and other fields will also bring with them certain issues, problems, and challenges that must be resolved in due course. It is important to keep in mind that while the metaverse is a technological advancement intended for societal use, it is not a replacement for the physical world. Libraries will reimagine themselves in the future by refining the course they have already taken. They will merge more and more with the real and virtual worlds. In the current situation, the metaverse is an option. Libraries will conduct research in the era of the knowledge economy on topics such as the creation and use of information resources, virtual library construction, intellectual property rights protection in the electronic age, etc., laying the groundwork for knowledge innovation. LIS professionals must use Metaverse for Libraries in general and MSS libraries in particular, which require immediate attention in the days ahead, in order to meet the challenges of the knowledge economy.

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APPLICATION OF SECURITY MECHANISM WITH FEATURE SELECTION TECHNIQUES IN INTERNET OF THINGS BASED LIBRARY DIGITAL INFRASTRUCTURE ENVIRONMENT USING MACHINE LEARNING ALGORITHMS

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Introduction To Internet of Things Based Library Digital Infrastructure

The Internet of Things (IoT) is transforming various sectors by embedding connectivity and intelligence into everyday objects, enabling them to collect and exchange data. Libraries, as repositories of knowledge and hubs for community engagement, stand to benefit significantly from IoT technologies. By integrating IoT into library infrastructure, libraries can enhance their operational efficiency, improve user experience, and offer innovative services. IoT can streamline the management of library resources. RFID (Radio Frequency Identification) tags and sensors can be attached to books and other materials, enabling real-time tracking of inventory. This reduces the time and effort required for manual cataloging and inventory checks, and helps prevent loss and misplacement of items. Libraries can use IoT to enhance user experiences by providing personalized services. Smart shelves can guide users to the location of specific books, and IoT-enabled systems can recommend books based on borrowing history. Additionally, environmental sensors can adjust lighting and temperature to create a more comfortable reading and working environment. IoT can automate many routine tasks within a library. IoT can bolster security in libraries through smart surveillance systems, access control, and monitoring. IoT devices generate vast amounts of data that can be analyzed to gain insights into library usage patterns, popular materials, and user preferences[1]. The key components of IoT based library infrastructure are RFID Tags, sensors, smart shelves, automated check in and out systems, environmental sensors and user devices. With the increase in data collection, libraries must ensure that user data is protected and that privacy concerns are addressed. Implementing robust security measures and adhering to data protection regulations are critical. Seamless integration of IoT with existing library

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management systems is essential for effective functioning. This may require updates to current software and hardware. The integration of IoT into library infrastructure offers numerous benefits, but it also introduces significant challenges related to data privacy and security. Ensuring that these systems are secure and that user data is protected is critical for maintaining trust and safeguarding sensitive information devices in libraries collect a wide range of data, including user interactions, borrowing patterns, location data within the library, and personal information. This extensive data collection can raise privacy concerns among users who may be unaware of the extent and nature of the data being collected. Ensuring that users are fully informed about the data being collected and how it will be used is essential. Libraries need to implement clear policies and obtain explicit consent from users, which can be challenging to manage and communicate effectively[2]. Adhering to the principle of data minimization-collecting only the data that is necessary for specific purposes-can be difficult with IoT systems that tend to gather large volumes of data. Libraries must balance the need for data with privacy considerations. There are several challenges in security of library infrastructure. IoT devices are often targeted by cybercriminals due to their relatively weak security features. Libraries must ensure that all IoT devices are secure and protected against unauthorized access, malware, and other cyber threats. The integration of numerous IoT devices can create complex networks that are difficult to secure. Ensuring the integrity and security of the network infrastructure is crucial to prevent data breaches and unauthorized access. Data transmitted between IoT devices and central systems can be intercepted if not properly encrypted. Libraries need to implement strong encryption protocols to protect data during transmission. Libraries must comply with various data protection regulations. Managing a large number of IoT devices, including regular updates and security patches, can be resource-intensive[3]. Libraries need robust systems in place for device management to ensure security and functionality. Many libraries have existing legacy systems that may not be compatible with new IoT technologies. Ensuring seamless integration while maintaining security standards can be complex and costly. Beyond legal compliance, libraries have an ethical obligation to use data responsibly. This includes avoiding invasive data collection practices and ensuring that data is used to benefit users without compromising their privacy. There are mitigation strategies to address these challenges, libraries can adopt several strategies. One of security mechanisms with feature selection techniques addressed in this paper

IOT Features For Library Infrastructure

Libraries, as repositories of knowledge and hubs for community engagement, stand to benefit significantly from IoT technologies. By integrating IoT into library infrastructure, libraries can enhance their operational efficiency, improve user experience, and offer innovative services. IoT can streamline the management of library resources. RFID (Radio Frequency Identification) tags and sensors can be attached to books and other materials, enabling real-time tracking of inventory[4-5]. This reduces the time and effort required for manual cataloging and inventory checks, and helps prevent loss and misplacement of items. Libraries can use IoT to enhance user experiences by providing

personalized services. Smart shelves can guide users to the location of specific books, and IoT-enabled systems can recommend books based on borrowing history. Additionally, environmental sensors can adjust lighting and temperature to create a more comfortable reading and working environment. IoT can automate many routine tasks within a library. IoT can bolster security in libraries through smart surveillance systems, access control, and monitoring. IoT devices generate vast amounts of data that can be analyzed to gain insights into library usage patterns, popular materials, and user preferences[6]. The key components of IoT based library infrastructure are RFID Tags, sensors, smart shelves, automated check in and out systems, environmental sensors and user devices[7]. With the increase in data collection, libraries must ensure that user data is protected and that privacy concerns are addressed.

IOT Features Selection Using Machine Learning Algorithms

The Internet of Things (IoT) has burgeoned into a pervasive force, interlinking physical devices and digital systems to revolutionize industries and daily life. Central to IoT's efficacy is the capacity to distill actionable insights from the deluge of data it generates. However, the sheer volume and diversity of this data present challenges, necessitating effective feature selection methodologies. Machine learning algorithms offer a potent solution to this imperative, enabling automated, data-driven feature selection tailored to the intricacies of IoT environments. Machine learning's ascendancy in IoT feature selection stems from its ability to discern patterns, correlations, and anomalies across vast and heterogeneous datasets [11]. Leveraging supervised, unsupervised, and semi-supervised learning paradigms, machine learning algorithms embark on a quest to identify salient features crucial for predictive modeling, anomaly detection, and optimization within IoT ecosystems. Supervised learning algorithms, such as Random Forests, Support Vector Machines (SVM), and Gradient Boosting Machines (GBM), excel in discerning predictive features [13] by learning from labeled data [12]. They sift through feature spaces to isolate attributes with the most predictive power, thereby enhancing the accuracy and generalizability of IoT models.In contrast, unsupervised learning algorithms, like K-means clustering, Principal Component Analysis (PCA), and Self-Organizing Maps (SOM), autonomously uncover inherent structures and relationships within IoT data. By discerning clusters, reducing dimensionality, and highlighting intrinsic patterns, these algorithms distill critical features crucial for anomaly detection, clustering, and segmentation in IoT applications. Semi-supervised learning algorithms offer a hybrid approach, capitalizing on both labeled and unlabeled data to distill pertinent features. Techniques such as Self-Training, Co-Training, and Generative Adversarial Networks (GANs) augment feature selection by leveraging the synergies between labeled and unlabeled data, enhancing model robustness and adaptability in dynamic IoT environments.However, the efficacy of machine learning algorithms in IoT feature selection hinges on several considerations. IoT data's inherent characteristics-such as sparsity, noise, and heterogeneity-pose challenges that necessitate algorithmic adaptability and customization. Moreover, resource constraints, including limited computational power, energy, and bandwidth, mandate the development of lightweight,

energy-efficient algorithms tailored to IoT's exigencies. In conclusion, machine learning algorithms stand as formidable allies in the quest for effective feature selection within IoT ecosystems. Their prowess in discerning relevant features [14], optimizing model performance, and accommodating IoT's idiosyncrasies renders them indispensable tools for unlocking IoT's transformative potential. As IoT continues its inexorable expansion, the synergy between machine learning and feature selection will catalyze innovations, propelling us toward a future imbued with smart, connected, and sentient environments.

There are different approaches for feature selection using machine learning algorithms.Here we discussed types of feature selection techniques which helps to choose the paritcular technique for library infrastructure environment. Instance-based techniques to feature selection function without a preset algorithmic procedure for creating feature subsets. At their foundation, instance-based approaches draw upon the substance of the data itself, sampling several small data instances to inform the feature selection process. In essence, features [15] are analysed based on their unique functions in describing the disparities between various classes within the dataset. This technique works only where the correlations between features and classes may be non-linear or context-dependent. Nondeterministic techniques to feature selection, like as algorithmic genetics and simulated annealing, offer unique and powerful strategies for navigating the complicated landscape of feature subsets. Unlike deterministic methods that follow a predefined set of rules, these strategies employ probabilistic search algorithms to explore the enormous solution space and uncover optimal feature subsets. This increased investigation allows for the identification of innovative solutions that may not be attainable by typical deterministic methodologies. Genetic algorithms[15-16], inspired by the principles of natural selection and genetics, operate by iteratively developing a population of candidate solutions to a given issue. In the context of feature selection, each candidate solution represents a possible feature subset. The algorithm progresses through multiple generations, applying genetic operators such as selection, crossover, and mutation to develop offspring solutions with potentially increased fitness. Through this iterative process of selection and reproduction, genetic algorithms efficiently explore the solution space, progressively converging towards optimal or near-optimal feature subsets[17]. In the field of machine learning, particularly when dealing with actual life datasets, the existence of various features sometimes provides a considerable barrier. Not all features contribute equally to the predictive performance of a model, and introducing superfluous ones might lead to diminished accuracy, increased complexity, reduced generalization capability, and bias. The basic purpose of feature selection is to discover a highly informative subset of features that optimally contribute to the model's prediction capability. Several prominent strategies for feature selection in machine learning exist, each with its particular approach and methodology. These techniques can essentially be divided into three basic types: filter methods, wrapper methods, and embedded methods. Filter approaches operate by separately evaluating the importance of each characteristic based on statistical measures or heuristics. These metrics analyse the link between specific attributes and the target variable, ranking them according to their potential for prediction. Common metrics used in filtering techniques include

correlation coefficients, mutual information, and statistical analyses like ANOVA or the chi-square Features [19] are picked or ranked purely on their scores, without considering the interactions between features. Wrapper approaches use a more extensive approach by testing the performance of different feature subsets using a specific machine learning algorithm. These methods often employ a search algorithm, such as forward selection, backward elimination, or iterative feature elimination, to iteratively select or remove features based on their impact on the performance of the model. The performance of each feature subset is examined using cross-validation or a similar validation technique, allowing for the identification of the optimal subset that maximizes model performance. Embedded approaches integrate feature selection directly into the model-building process, optimizing feature selection alongside model training. These methods exploit the intrinsic feature selection mechanisms within specific machine learning algorithms, including decision trees, support vector machines, or methods of regularization like Lasso and Ridge regression. By penalizing the coefficients of unimportant characteristics or automatically picking useful features during model training, embedded approaches expedite the feature selection process and boost model interpretability.

Information Gain is a crucial concept in feature selection [22] within the context of machine learning. It assesses the quantity of information offered by a characteristic in terms of its capacity to identify or predict the target variable. Specifically, Information Gain quantifies the reduction in entropy values attained by considering a certain feature. Entropy, in the context of machine learning, reflects the uncertainty or disorder inside a dataset. A high entropy value suggests a significant degree of randomness or unpredictability, whereas a low entropy value signifies a more structured or predictable collection. Therefore, by reducing entropy, we effectively increase the predictability or information content of the dataset. When calculating Information Gain for each characteristic, we consider the target variable or class labels. The purpose is to assess how much information about the target variable can be gleaned by examining the values of a given characteristic. Features that contribute considerably to lowering the uncertainty or entropy of the target variable are judged more informative and are thus prioritized for inclusion in the feature subset.

Mathematically, Information Gain is computed using the following formula:
$\text{Information Gain}(X) = \text{Entropy}(Y) - \sum i = \ln |Xi|\ |X| \times \text{Entropy}(\ Y \mid Xi\ )$
$\text{Information Gain}(X) = \text{Entropy}(Y) - \sum i = \ln |X|\ |Xi| \times \text{Entropy}(Y|Xi)$
Where: $\text{Entropy}(Y)$ $\text{Entropy}(Y)$ is the entropy of the target variable YY before considering the feature XX.
$|X|$ $|Xi|$ represents the number of instances in the dataset where feature XX takes on value X Xi
$|X||X|$ denotes the total number of instances in the dataset.
$\text{Entropy}\ (\ Y \mid Xi\ )$ $\text{Entropy}(Y|Xi)$ is the conditional entropy of the target variable YY given that feature XX has value XiXi.

By computing Information Gain for each attribute and comparing their values, we can identify the most informative features for predicting the target variable. Features

with higher Information Gain values are considered more discriminative and are thus selected for inclusion in the final feature subset.

The Chi-square test, designated as Chi-square method (χ^2), is a statistical technique often applied to analyse the association between categorical variables within a dataset [23]. Unlike approaches created for continuous variables, such as correlation parameters, the Chi-square test is specifically tailored to assess categorical data. At its core, the Chi-square test compares the observed frequencies of categorical variables to their anticipated frequencies under the premise of independence. The test assesses if there is a substantial relationship or dependency between the variables based on the observed discrepancies between the actual and expected values. To commence, a contingency table, which is alternatively referred to as a cross-tabulation or a contingency matrix, is created by tabulating the observed frequencies of every combination of categories in relation to the variables of interest [18]. Each cell in the contingency table reflects the count of observations falling into a certain combination of categories. Once the contingency table is built, the Chi-square test derives a test statistic, denoted as χ^2, based on the discrepancies between the observed and expected frequencies. The formula for the Chi-square statistic is as follows:

$$\chi 2= \quad \sum(O-E) \qquad 2 \qquad E\chi 2= \sum E(O-E)2$$

Where O represents the observed frequency in a cell of the contingency table

EE represents the expected frequency in the same cell, calculated under the assumption of independence between the variables. The summation is performed across all cells of the contingency table. The Chi-square statistic assesses the amount to which the observed frequencies depart from the expected frequencies. A bigger Chi-square value implies a greater disparity between the observed and predicted values, implying a stronger link or reliance between the category variables. To evaluate the statistical significance of the Chi-square statistic, it is measured against a critical value from the Chi-square distribution with appropriate degrees of freedom. If the estimated Chi-square value exceeds the critical value at a selected significance level (e.g., $\alpha = 0.05$), then the null hypothesis of independence between the variables is rejected, showing a meaningful association[25].

Fisher's Score, named after the famed statistician and biologist Ronald Fisher, is a feature selection approach that assesses and selects individual features separately based on their scores according to the Fisher criterion. Unlike some other feature selection strategies that include relationships between features, Fisher's Score acts on a per-feature basis, potentially resulting to a suboptimal subset of features. The Fisher criteria, also known as Fisher's Discriminant Ratio or Fisher's Linear Discriminant, is a statistical metric used to quantify the discriminative ability of a feature with regard to class labels. It estimates the degree of separation between various classes based on the distribution of feature values. When employing Fisher's Score for feature selection, each feature is examined independently, and its Fisher score is calculated. The Fisher score represents the extent to which the feature values of various classes are spread out or separated. Features

with higher Fisher scores suggest a larger discriminatory ability, implying that they are more effective at distinguishing between distinct classes. The process of feature selection using Fisher's Score entails ranking features based on their individual scores. Features with higher Fisher scores are regarded more informative and are consequently selected for inclusion in the final subset. However, it is vital to highlight that Fisher's Score selects elements independently of each other, without addressing potential interactions or dependencies between features. As a result, the subset of features obtained by Fisher's Score may not always be ideal in terms of total predictive performance[26].

Correlation Coefficient, notably Pearson's Correlation Coefficient, serves as a fundamental metric for evaluating the degree and direction of correlation between two continuous variables within a dataset[27]. This statistical measure offers insights into the linear relationship between variables, helpful in understanding how changes in one variable correspond to changes in another. Pearson's Correlation Coefficient, symbolised by the symbol rr, runs from -1 to 1, inclusive, representing the degree and direction of the relationship between variables. A coefficient of 1 shows a perfect positive linear relationship, suggesting that if one variable increases, the other variable increases proportionally. Conversely, a coefficient of -1 denotes a perfect negative linear relationship, where one variable increases while the other falls in a proportional manner. A coefficient of 0 shows no linear relationship between the variables. The formula for determining Pearson's Correlation Coefficient (rr) between two variables XX and YY is as follows:

$$r=\sum(Xi-X^-)\ (Yi-Y^-)\ \sum\ (Xi-X^-)2\ x\ \sum\ (Yi-Y^-)2$$
$$r=\sum(Xi-X^-)2\ \times\sum(Yi-Y^-)2\ x\sum\ (Xi-X^-)\ (Yi-Y^-)$$

Where XiXi and YiYi represent individual observations of variables XX and YY, respectively .X^-X^- and Y^-Y^- denote the means of variables XX and YY, respectively.

They are machine learning aglorithms like PCA, auto encoders and lasso and elastic net which helps in the process of feature selection [28]. When high-dimensional data needs to be compressed into fewer dimensions while preserving the majority of the information, PCA is frequently employed in the Internet of Things (IoT) for feature extraction. This is especially helpful for applications where sensors gather several correlated readings, such as environmental monitoring. In the Internet of Things, these neural networks are employed for dimensionality reduction as well as feature extraction. They work especially well in applications where there is a lot of redundancy in the data, such sound or picture data from security cameras. These regularisation techniques work well in situations when it's necessary to narrow the feature space in order to prevent overfitting, which frequently occurs with Internet of Things datasets with a large number of features but a comparatively small number of data points. One of case studies with use of PCA, Sensors gather information about machine operations in a smart factory. Pre-emptive maintenance is made possible by feature selection algorithms such as Random Forests[29-30], which can determine which machine parameters are most predictive of breakdowns. Traffic Management Systems: Sensors gather traffic information in smart

cities. By reducing the number of dimensions in the data, PCA can facilitate faster processing and analysis for real-time traffic management.

Existing ML algorithms for IOT features selection and extraction

Machine learning (ML) is a branch of artificial intelligence (AI) that finds and extracts complicated patterns from data using specific algorithms. ML models can identify malicious patterns from network traffic in the context of ML-based NIDS, which can be advantageous.in identifying potential security risks. DL is a new field of machine learning that has demonstrated the ability to identify complex data. trends. Its models are based on biological brain networks, where a network of linked nodes communicates information. Signals for data. Two steps are involved in creating an ML model that uses a supervised classification method: aining and evaluating. The model is trained using tagged harmful and benign network packets from the first phase. training dataset in order to identify trends and adjust the parameters of the associated model. Next, the testing stage assesses the dependability of the model by evaluating how well it classified benign traffic and unseen attacks on the testing set of packets of network data without labels. **The main objective of Fast Correlation-Based Filter (FCBF)** is to prioritise sensor data in industrial environments, where there may be many different types of data streams. The algorithm works by fine-tuning the conventional fast-based-correlation method, improving its capacity to recognise and take advantage of feature correlations[32]. Using a mix of bijective soft sets and a newly developed **CorrACC measur**e, Wrapper-Based Feature Selection is a revolutionary approach that maximises feature selection for IoT traffic identification[20,33]. **The Filter and Wrapper Combination** technique effectively minimises feature sets while attaining high detection rates, even with a little number of characteristics. This represents a huge improvement in cybersecurity. By choosing the most informative features based on preset criteria, filter techniques effectively reduce computational complexity and dimensionality of the feature space. Contrarily, wrapper methods use iterative strategies to assess feature subsets according to how well they perform within a particular learning algorithm, which improves detection accuracy and feature selection. Combining these two strategies yields a solution that minimises computational overhead while maximising efficiency and efficacy in the identification of highly relevant features. This combination makes it possible to identify botnet attacks at many phases of their life cycle, such as penetration, dissemination, and command and control. Furthermore, this approach's flexibility makes it a good fit for the dynamic and ever-changing IoT contexts, where botnet threat detection necessitates resilient and flexible defences. Its ability to function well with constrained feature sets guarantees economical resource usage without sacrificing dependability or accuracy of detection. **swarm intelligence method** combines deep learning [31] neural networks with an innovative feature selection strategy made possible by the Aquila optimizer, and it performs admirably on a variety of assessment measures. This approach's use of deep learning neural networks, which are excellent at identifying intricate patterns

and correlations within data, is one of its main features. Through the integration of deep learning into the feature extraction procedure, the Aquila Optimizer is capable of identifying minute details and potentially harmful activity inside IoT network data. Moreover, the **Aquila Optimizer** presents a novel feature selection method that leverages swarm intelligence systems' advantages. It finds a subset of features through iterative optimization that balances detection accuracy and processing efficiency to optimize the intrusion detection system's performance. The Aquila Optimizer's superior performance across a range of assessment metrics highlights how well it works to improve intrusion detection system capabilities in Internet of Things networks. Swarm intelligence, deep learning [32], and a customized feature selection technique are utilized to provide a strong solution for the particular difficulties presented by cybersecurity threats in Internet of Things environments. Deep Neural Network Feature Selection strategy a major advancement in feature selection as it reduces training time and data quantity while providing better results than conventional algorithms [19],[21],[31],[34-35].

Minimum features set using ML algorithms

Optimising the performance of machine learning models requires choosing a small but functional set of features, particularly when working with high-dimensional data. This study examines several machine learning techniques that determine the minimum feature set required to preserve or improve model performance. We analyses approaches that use ensemble methods[8], feature stability, and correlation to reduce computational complexity and improve prediction accuracy. We describe the consequences of these techniques on several fields, such as audio categorization and network security, and offer a comparison study to direct future investigations and real-world uses. Ensemble Learning for Feature Selection[8,9,10],[36] seeks to capitalize on the complementing qualities of several techniques by combining the output of several feature selection techniques. By using an ensemble technique, the drawbacks of using individual approaches are lessened and a more thorough investigation of the feature space is guaranteed. Multiple algorithms consistently identify features that are important for effective detection because they are more likely to gather pertinent information about network anomalies. Ensemble learning produces a robust reduction in the number of features, which improves the scalability and efficiency of anomaly detection systems while also making the subsequent analysis easier. The method maximises computational performance and detection accuracy by concentrating computational resources on the most informative features. In general, Ensemble Learning for Feature Selection is a potent method for enhancing feature selection in applications related to network security. Through the utilisation of various selection techniques, a more substantial decrease in feature counts is accomplished, which in turn improves the efficiency of anomaly detection systems in detecting and averting security risks. In this paper, ensemble learning is proposed for feature selection techniques in internet of things based library infrastructure.

Implementation

This paper implemented ensemble learning is proposed for feature selection

techniques in internet of things-based library infrastructure. The key components of IoT based library infrastructure are RFID Tags, sensors, smart shelves, automated check in and out systems, environmental sensors and user devices. With the increase in data collection, libraries must ensure that user data is protected and that privacy concerns are addressed. The 15 features are derived from RFID tags, environment sensors and smart shelves. List of features identified for library infrastructure are Unique ID of RFID, number of devices connected, Receiver Sensitivity, SNR (Signal-to-Noise Ratio), Transmitted Power, EVM (Error Vector Magnitude), Packet Sending / Receiving Rate (PSR/PRR), Packet Dropping Rate (PDR), Received Signal Strength (RSS), Packet Arrival Process (PAP), Packet Forwarding Rate (PFR), Forward Delay Time (FDT), Neighbour Nodes (NN), Packet Sending Power (PSP), Packet Mismatch Rate (PMR). This research work has been implemented in three stages. They are data preprocessing, ensemble feature selection and application of security mechanism. In data preprocessing, it is a crucial step in the data analysis pipeline that transforms raw data into a clean and usable format, ensuring that subsequent analytical processes yield accurate and meaningful results. This involves several stages, starting with data cleaning, where errors, inconsistencies, and missing values are identified and addressed, often through techniques such as imputation or removal of outliers. Instead of relying on a single feature selection method, ensemble feature selection combines multiple methods to improve robustness and performance. The proposed methods use filter method to identify the best features. They are variable threshold, chi-square and ANOVA feature selection methods. The union operation has been used to choose feature from different set of features. Input of wrapper has been taken from union operation for this RELFEA algorithm used. This helps out to get high relevant features from uncorrelated one. The figure 1 shows that blocks of this research work.

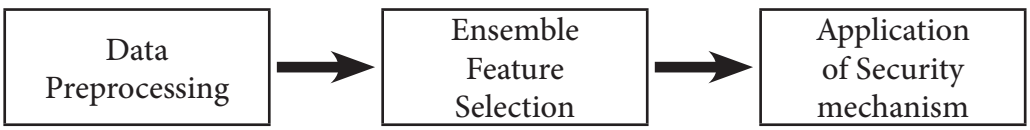


Fig. 1 key blocks

Features are described in mathematical notation as follows

a={a1,a2,a3,...,ai}, where i is the number of features. The removed features are ar={a1r,a2r,a3r,...,akr},
Aa=ar−a, The feature selection methods are defined as follows
Avt=Variance Threshold(Aa,k=5), Acs=Chi-square(Aa,k=5), Aan=ANOVA(Aa,k=5)
The union method formula is Au= Avt∪ Acs∪ Aan
The best feature set obtained by RELFEA is represented as follows:
ARELFEA =RELFEA (Au, k=5).

After the finding best feature set, output of this stage is given to any one of security mechanism methods such as anomaly intrusion detection or misuse intrusion detection methods. The best features are used to train machine learning algorithms . CNN and RNN are employed in ML algorithms. The performance of CNN and RNN

based on features selected by variance threshold, chi-square and ANOVA in library infrastructure are evaluated by accuracy, precision, F1-score and recall. The following tables are performance of ML model with feature selection methods

ML model	Accuracy	Precision	F1-Score	Recall
CNN	95.55	96.2	99.7	98.1
RNN	93.79	95.3	98.4	99.5

Table 1 . ML with feature selection method (Variance Threshold)

ML model	Accuracy	Precision	F1-Score	Recall
CNN	93.2	95.7	97.13	99.6
RNN	94.9	96.23	95.9	98.9

Table 2 . ML with feature selection method (Chi-square)

ML model	Accuracy	Precision	F1-Score	Recall
CNN	91.4	93.3	96.8	98.8
RNN	93.2	90.5	95.17	99.6

Table 3 . ML with feature selection method (ANOVA)

The following figures are performance of ML model with feature selection methods

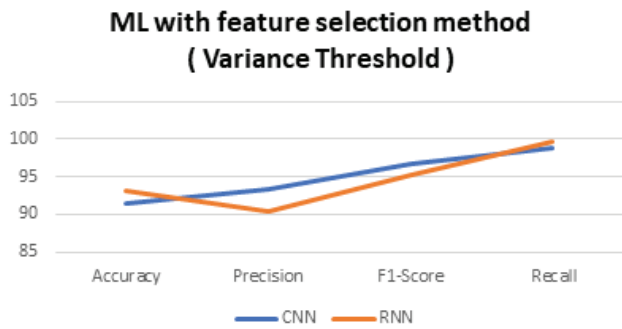


Figure 2 . Performance Metrics ML with feature selection method (Variance Threshold)

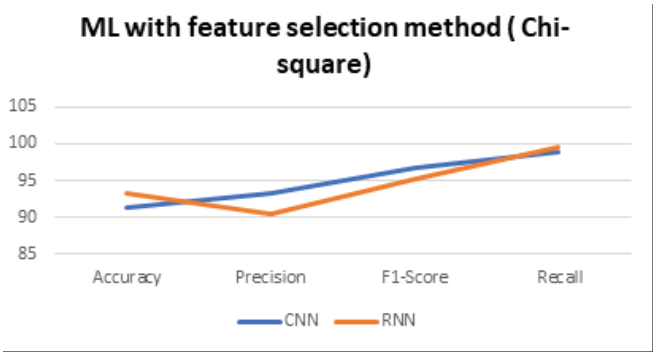


Figure 3 . Performance Metrics ML with feature selection method (Chi-square)

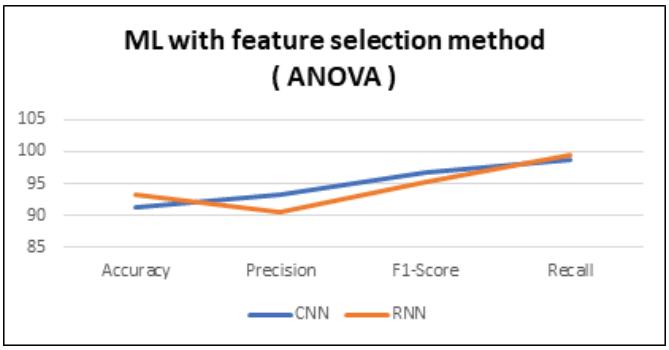


Figure 4 . Performance Metrics ML with feature selection method (ANOVA)

Conclusion

The application of security mechanisms combined with feature selection techniques in an Internet of Things (IoT)-based library digital infrastructure environment using machine learning algorithms presents a robust solution to enhance both security and efficiency. By integrating advanced feature selection methods, we can identify and focus on the most critical data attributes, thereby improving the accuracy and performance of machine learning models in detecting and mitigating security threats. These models, trained on optimized feature sets, can effectively monitor and analyze vast amounts of data generated by IoT devices, ensuring real-time threat detection and response. This approach not only strengthens the security posture of the digital infrastructure but also optimizes resource utilization, leading to a more resilient and efficient library system. Ultimately, the synergy between feature selection techniques and machine learning algorithms creates a sophisticated framework that can adapt to evolving threats and ensure the integrity, confidentiality, and availability of library resources in an increasingly connected digital landscape. It is observed that variance threshold feature selection method in library infrastructure environment using ML algorithms got highest accuracy rate in ensemble learning method

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A STUDY ON ACADEMIC LIBRARIES: TRANSITIONING FROM TRADITIONAL TO DIGITAL FORMATS BY INCORPORATING CUTTING-EDGE ICT TECHNOLOGIES INTO THEIR DAILY OPERATIONS

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Introduction

Technology plays a significant role in all facets of life in the present era. Its profound influence has brought about a revolution in various spheres, including individuals, organizations, and government bodies. Likewise, libraries have continuously transformed themselves over time to offer the finest services and products to their users. Particularly, academic libraries demonstrate a remarkable impact resulting from technological advancements.

It is the responsibility of academic librarians to recognize and comprehend these technologies in order to align their libraries with the expectations of their users and acquire the necessary technological skills. Although technology trends are rapidly advancing, it is evident that librarians may not be able to adopt every single trend in their libraries.

Hence, it is imperative for them to carefully select the technology that will support them in the long term while considering the information needs of their users. Nevertheless, the academic library must serve as the central hub for hands-on experience with these technologies or as a repository of documentation to ensure that the institution remains at the cutting edge of technology in higher education. The objective of this research is to explore various emerging library technologies that offer benefits and advantages to university libraries.

Objectives of the study

The primary aim of the study was to assess the correlation between the ICT competencies of librarians and the adoption of emerging technologies in academic libraries.

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The specific objectives are

- Integrating Advanced ICT/RFID technologies into day-to-day operations in academic libraries can enhance efficiency and improve services.
- Use ICT to create smart library spaces, incorporating technologies like beacons or sensors for wayfinding, space utilization analysis, and to enhance the overall user experience.
- Utilize RFID for real-time inventory tracking, allowing for accurate and efficient management of library resources. This helps in locating and organizing materials more effectively.
- Ensure that the library's ICT infrastructure is interoperable with academic systems, such as student databases or learning management systems, to facilitate seamless information flow.
- Provide training programs to library staff to ensure they are proficient in using and troubleshooting the advanced technologies. Continuous support will help in smooth operations and user assistance.

Scope of the Study

Utilization of ICT/Emerging Technologies Potential Areas for Implementation in Academic Libraries

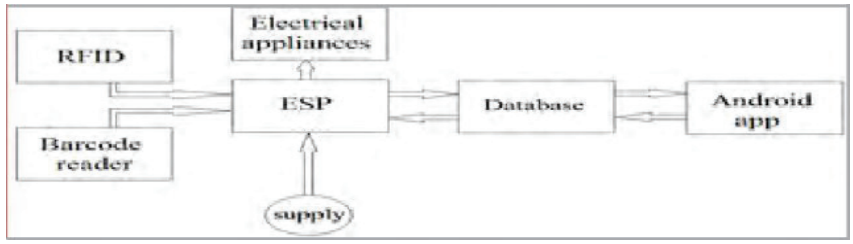
ICT technologies have become an integral part of academic libraries, revolutionizing the way information is accessed, stored, and disseminated. There are several areas where these technologies can be adopted to enhance the overall efficiency and effectiveness of library services.

One area where ICT technologies can be implemented is in the digitization and preservation of library resources. By digitizing books, journals, and other materials, academic libraries can ensure their long-term preservation and provide remote access to users. This not only saves physical space but also allows for easy searching and retrieval of information.

ICT technologies can also be employed to enhance user services and engagement. Academic libraries can develop user-friendly interfaces and online platforms that provide access to a wide range of digital resources, including e-books, databases, and multimedia materials. Additionally, technologies such as virtual reality and augmented reality can be utilized to create immersive learning experiences and virtual tours of library spaces.

Furthermore, ICT technologies can facilitate collaborative research and knowledge sharing among academic institutions. Online platforms and networks can be established to connect researchers, enabling them to share resources, collaborate on projects, and disseminate their findings. This promotes interdisciplinary research and fosters a culture of collaboration within the academic community.

Fig-1



Self-service kiosks are utilized in place of traditional physical cards or registers for circulation purposes.

Physical cards/registers Vs Self-Kiosk machines: Certainly, the physical register for library book circulation is a traditional method of tracking the borrowing and returning of books. It typically consists of a logbook or ledger where librarians or library staff manually record details such as the book title, borrower's name, date of issue, and date of return. This register helps in maintaining a systematic record of book transactions and is often used alongside modern library management systems for comprehensive bookkeeping.

Self-Kiosk machines revolutionize library book circulation by providing a convenient and efficient way for patrons to check in and check out books independently. These machines utilize Radio-Frequency Identification (RFID) technology, allowing users to simply place their library card or the book on the kiosk, and the system automatically reads the RFID tags to process transactions. This technology streamlines the borrowing and returning process, reduces queues, and enhances overall library efficiency. Patrons can also use these kiosks to renew books, pay fines, and manage their accounts, contributing to a more user-friendly and automated library experience.

Fig-2



Fig-3



The Library Management System (ILMS) serves as a digital alternative to the traditional physical accession register

Traditional libraries have been maintaining the physical accession registers to maintaining an organized documented record of a library's book and periodicals acquisitions, supporting effective inventory management, and providing a historical perspective on the library's development.

Physical accession register in a library serves as a traditional method for systematically recording and tracking the entry of new books into the collection. These books register typically consists of a logbook or ledger where librarians manually document essential details about each newly acquired book. Information such as the book's title, author, publication date, accession number, and source of acquisition is recorded in the accession register. This record-keeping method helps maintain an organized inventory of the library's holdings and provides a historical overview of book acquisitions over time.

Library Management System (LMS) is a comprehensive software solution designed to automate and streamline various library functions. It is a system based Integrated Library Management System (ILMS) regarding the entry of library books includes Efficient Cataloguing, Automated Entry and Updating, Quick Retrieval and Search, Inventory Management, Integration with Other Modules, User Account Management, Reporting and Analytics.

The benefit of an Integrated Library Management System for the entry of library books is to automate and optimize various processes, resulting in efficient cataloguing, improved user services, and better overall management of the library's resources.

Fig-4



Utilize a drop box system for returning library books instead of physically bringing them back to the circulation desk

Books Physical Returns System refers to the process and mechanisms in place for patrons to return borrowed books physically to the library. Traditional Libraries may have specific counters or areas within the library where patrons can physically return books during operating hours. Library staff at these counters assist patrons in the return process, check in the books, and update the system accordingly.

Book drop boxes in academic libraries serve as convenient and efficient tools for library users to return borrowed materials outside regular operating hours, ensure the safety of returned materials, book drop boxes are designed with secure mechanisms to protect against theft and damage, The drop boxes are typically designed to be user-friendly, allowing individuals to easily deposit books without the need for assistance, Modern book drop boxes may be integrated with the library's circulation system, automatically updating the status of returned items and reducing manual handling, Some libraries incorporate notification systems to alert users when their items have been successfully returned via the book drop box and Larger academic libraries may have book drop boxes strategically placed at different locations on campus to enhance accessibility for library patrons. By incorporating all above features, book drop boxes contribute to the overall efficiency and accessibility of academic library services.

Fig-5



Catalog Cards Vs Online Public Access Catalog (OPAC)

Earlier academic libraries have been longstanding tools for organizing and facilitating access to the library's collection author and titles catalog boxes in the library premises. These catalog boxes are organized alphabetically, allowing users to locate books based on either the author's name or the title of the work. In addition to basic bibliographic details, catalog cards might include additional information such as subject headings or call numbers to assist users in narrowing down their search.

In the past, these boxes contained printed catalog cards for each book in the library's collection. These cards typically provided information about the author, title, publication details, and sometimes a summary of the content. Libraries would regularly update the catalog boxes to reflect new additions to the collection and remove cards for books that were no longer part of the inventory. Librarians also used these catalog boxes

as quick references for assisting patrons in locating specific books or suggesting related materials. An advanced OPAC (Online Public Access Catalog) system in academic libraries provides numerous advantages, contributing to an enhanced user experience, efficient library management, and improved accessibility to resources:

Advanced OPAC systems offer powerful search functionalities, allowing users to conduct precise and customizable searches based on various criteria such as title, author, subject, and keywords. This improves the accuracy of resource discovery.

OPAC systems typically feature user-friendly interfaces with modern designs. This enhances the overall user experience, making it easier for patrons to navigate and find the information they need.

Users can access the OPAC system remotely, providing convenient access to the library catalog and resources from anywhere with an internet connection. This is particularly beneficial for distance learners and researchers.

Advanced OPAC systems often support the integration of multimedia content, such as book covers, previews, and additional digital resources. This enriches the user experience and provides more comprehensive information about library materials.

Advanced OPAC systems may offer personalization features, allowing users to create profiles, save searches, and set preferences. This customization enhances the Implementing an advanced OPAC system in academic libraries not only modernizes the catalog but also enhances the overall effectiveness of library services, making information retrieval more efficient and user centric.





Fig-6 Fig-7

Physical Stock Verification and Advanced Stock Control with RFID Technology

Physical stock verification is a *crucial process* in traditional academic libraries to ensure the accuracy of their collections and maintain efficient library operations. Physical Stock Verification involves manually counting and verifying the quantity of items in stock, which can be time-consuming and prone to human error. With Physical

Stock Verification, employees must physically handle each item and manually update the stock records. This process is labor-intensive and can lead to inaccuracies due to human mistakes. Additionally, it requires a significant amount of time and effort to complete, especially for large inventories.

Academic libraries conduct regular and systematic physical stock verification, often on an annual basis, to reconcile the actual physical presence of books with the records in the library catalog. The process aims to verify that the cataloged information matches the physical presence of each book on the shelves, helping to identify discrepancies, losses, or missing items. Librarians and library staff actively participate in the stock verification process. They may work individually or in teams to systematically go through each section of the library, checking books against the catalog.

Libraries often use detailed checklists or inventory sheets to mark off each item as it is physically verified. This systematic approach helps ensure that no item is overlooked during the verification process. Any discrepancies or changes discovered during the stock verification process are documented, and the library catalog is updated accordingly. This ensures that the

Implementing RFID (Radio-Frequency Identification) technology in academic libraries offers significant advantages for stock control, making the management of library collections more efficient and streamlined.

RFID tags on library materials allow for quick and automated check-in and check-out processes. Patrons can simply place their borrowed items on an RFID-enabled station, and the system updates the library's database in real-time, reducing manual handling.

RFID technology facilitates rapid and accurate inventory management. Librarians can use handheld RFID scanners to perform quick and comprehensive inventory checks, ensuring that the physical collection aligns with the cataloged information.

RFID tags can serve as security measures. Gates equipped with RFID readers at library exits can detect items that haven't been properly checked out, helping prevent theft and unauthorized removal of materials.

RFID technology allows libraries to track the location of items within the library accurately. This is particularly beneficial for large collections or when items are misplaced, as librarians can quickly locate materials using RFID tracking systems.

The adoption of RFID technology often results in a more user-friendly experience for patrons. The streamlined check-in and check-out processes, along with self-service options, contribute to a more efficient and satisfying library visit.

By leveraging RFID technology for stock control, academic libraries can significantly improve their overall operations, enhance security, and provide a more convenient experience for both library staff and users. while Physical Stock Verification

relies on manual processes and is prone to errors, Advanced Stock Control with RFID Technology offers a more efficient and accurate solution for inventory management. By automating the tracking and control of stock using RFID technology, businesses can streamline their operations, reduce costs, and improve overall inventory accuracy.

Fig-8



The RFID gate security panels are compared to human supervision at the entrance of the library:

Human supervision may not provide comprehensive coverage, especially in larger libraries with multiple entry points. It can be challenging for a small number of staff members to monitor all areas effectively, leading to potential blind spots.

Having human staff stationed at the entrance requires a significant allocation of resources, including personnel costs. Libraries with limited budgets may find it challenging to maintain sufficient staffing levels for continuous monitoring. Visual inspections by human staff are inherently subjective, and biases may come into play. This subjectivity can result in inconsistencies in the identification of suspicious behaviour or unauthorized items, leading to potential security gaps.

In libraries with high foot traffic, human supervision alone may struggle to efficiently handle large volumes of people entering and exiting, potentially causing delays and queues. Human supervisors may experience fatigue during long working hours, impacting their attention span and vigilance. This can lead to lapses in security and decreased effectiveness over time. Continuous visual monitoring raises concerns about personal privacy. Library users may feel uncomfortable or perceive it as an invasion of privacy, impacting the overall atmosphere of the library.

As libraries expand or experience variations in visitor numbers, scaling up human supervision may not be easily achievable. The resource demands associated with increasing staff levels can be prohibitive. While human supervision plays a valuable role in providing a personal touch and flexibility, it's essential to weigh these disadvantages against the benefits and consider whether a combination of automated systems and human oversight might provide a more balanced and effective security approach.

Implementing RFID gate security panels offers several benefits compared to human supervision at the entrance of the library:

RFID gate security panels automate the process of tracking library materials, allowing for quick and efficient check-in and check-out. This automation significantly reduces the time and effort required for routine tasks, contributing to overall operational efficiency.

RFID gates provide real-time detection of library materials equipped with RFID tags. Any attempt to remove an item without proper check-out is immediately flagged, enhancing security measures.

Implementing RFID gate security panels can reduce the dependency on human resources for routine monitoring tasks. This can lead to cost savings and allow library staff to focus on more complex and value-added services.

RFID gate security panels seamlessly integrate with library management systems. This integration ensures that the library's catalog is updated in real-time, maintaining accurate records of the collection.

RFID systems generate data that can be analysed to gain insights into library usage patterns, popular materials, and collection management. This data-driven approach aids in making informed decisions about library services and resource allocation.

While human supervision provides a personal touch and flexibility in handling unique situations, RFID gate security panels offer a technologically advanced and efficient solution that addresses many challenges associated with manual monitoring at library entrances. The combination of both approaches can provide a well-rounded and effective security strategy for academic libraries.



Fig-9

Conclusion

The utilization of Information and Communication Technology (ICT) and emerging technologies in academic libraries holds immense potential across various areas. These technologies contribute to the modernization and efficiency of library services, enhancing the overall learning and research experience for students and faculty.

the effective utilization of ICT and emerging technologies in academic libraries has the potential to revolutionize traditional library services, providing a more dynamic, accessible, and collaborative learning environment for students and faculty. Continued exploration and implementation of these technologies are essential to keep pace with the evolving landscape of education and research.

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TRANSFORMING LIBRARY SERVICES WITH DATA ANALYTICS: STRATEGIES AND OUTCOMES

Ahammed[1] & Dr. B. Mini Devi[2]

Introduction

Libraries have traditionally been knowledge stores that are essential to community involvement, education, and research. But as a result of the opportunities and problems brought about by the digital era, libraries have had to change. In this context, the application of data analytics is among the most important advancements. Libraries may improve service delivery and operational efficiency by gaining insights into user behaviours, preferences, and trends through the systematic collection, analysis, and interpretation of data.

The use of data analytics is among the most important innovations in this digital revolution. The methodical gathering, processing, and analysis of data to find trends, patterns, and insights that can guide decision-making is known as data analytics. When it comes to library services, data analytics helps libraries maximize resource allocation, improve overall operational efficiency, and better understand and predict the demands of their patrons. Libraries may move from reactive service models to proactive, data-driven strategies that better satisfy the expectations of the contemporary information ecosystem by using data analytics.

Data and Data Analytics

Zhan and Widen (2019) define big data as massive data sets that rapidly grow across several file formats, potentially complicating data handling methods and accelerating the development of technology solutions. It is challenging to use and manage data due to the characteristics and diversity of data sets. Data can be collected and organised uniformly by data scientists or commercial enterprises. On the other hand, other data types are unstructured and come from a variety of sources, including emails and data acquired online (Wang, Xu, Chen & Chen, 2016).

An array of quantitative and qualitative methods for extracting insightful information from data is referred to as data analytics. In contrast to data analysis techniques that are only descriptive, data mining aims to uncover predictive information

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hidden within massive databases. An organisation may make proactive, knowledge-driven decisions by using data mining techniques, which forecast future trends and behaviours. Another useful strategy for libraries is predictive analytics, which makes use of data to make future predictions. To find relevant data, draw conclusions, and aid in decision-making, it is the process of gathering, cleansing, converting, and modelling datasets with the use of specialised software (Patnaik, 2019)

Data Analytics in Libraries

Data analytics may help libraries by using different kinds of data to enhance their operations, services, and user experience. Key data types that are pertinent to libraries for data analytics include the following:

Circulation Data: Data in a library includes information on borrowing and returning materials, including checkout records, return records, and renewal data.

Catalogue Data: Inventory records of books, e-books, journals, and multimedia items, acquisition data of new materials, and cataloguing information providing metadata like author, title, subject, and classification.

Patron Data: Demographics, borrowing history, and activity logs, providing insights into patrons' characteristics, past borrowing behaviour, and interactions with library services.

Usage Data: Foot traffic data collected from people counters, online catalogue search logs, and website analytics, offering insights into visitor behaviour both physically and digitally.

Digital Resource Data: e-book and e-journal usage statistics, including data on downloads, views, and interactions, as well as logs tracking the frequency of database access by patrons, providing valuable insights into the utilization of digital resources.

Operational Data: Staff schedules detailing working hours and resource allocation information, such as budget and space distribution, facilitating efficient management of library resources and personnel.

Maintenance and Facilities Data: information on both facility usage, including the utilization of various areas like study rooms and computer labs, and maintenance records detailing activities such as repairs and upgrades, ensuring the efficient operation and upkeep of library facilities.

Strategies for Implementing Data Analytics in Libraries

The emergence of data analytics has brought about a revolution in many fields, including library administration. The strategic application of data analytics in academic libraries may greatly improve user experiences, and optimise resource allocation, and decision-making processes. Libraries may learn more about the habits of their patrons, how they use their collections, and how to run their operations more effectively by utilising sophisticated analytical tools and techniques. Libraries can now not only satisfy

but also anticipate the changing requirements of their patrons thanks to this transition towards data-driven initiatives, which guarantees the ongoing relevance and significance of library services in the digital era. Several ways exist for implementing data analytics in libraries, including;

Identifying key data sources

As earlier mentioned, Utilisation data show trends in the way resources are used, such as checkouts and digital access. Demographic data and patron information offer insights into the requirements and preferences of users. Data on acquisitions and resource management aid in the optimisation of the library's collection. Libraries may improve overall operating efficiency, adapt products to patron demands, and enhance services by analysing these data sources.

Selecting appropriate data analytics tools and technologies

For the analysis of big data in libraries, the use of data visualization tools and statistical analysis software is essential. These tools enable librarians to interpret complex datasets, uncover patterns, and present findings in an accessible manner.

Data Visualization

As data becomes aggregated due to constantly growing sources and enormous web sources, data visualisation in academic libraries is a crucial and developing field in the digital era. Academic libraries have been using data visualisation for assessment purposes and have improved the quality of library services (Murphy, 2013). Additionally, Finch and Flenner (2016) have examined academic library collections to compare collections and expenditures. Some of the major Data Visualization tools used for analysis are;

Tableau: Tableau helps people to see and understand data. Offering a revolutionary approach to business intelligence, it allows users to quickly connect, visualize and share them with colleagues, partners or customers. To use Tableau, no programming skills are required.

Zoho Analytics: An intelligent dashboard and data visualisation may be produced with the aid of the business intelligence and reporting tool facilitates turning data into insights that can be put to use.

Power BI: Microsoft created the business analytics programme Power BI. With the self-service business intelligence features it offers, end users may generate reports and dashboards independently of IT personnel by using interactive visualisations. Hundreds of data sources may be connected, and live dashboards and reports help make the data come to life.

Google Charts: A great approach to display statistics on your website is with Google Charts. The chart gallery offers a wide range of ready-to-use chart formats, from straightforward line charts to intricate hierarchical tree maps. Embedding basic JavaScript into your website is the most popular method of using Google Charts.

Developing a data-driven culture

To foster a data-driven culture in libraries, intentional measures must be taken to incorporate analytics and data literacy into daily operations. First and foremost, library employees must get thorough training. Resources and workshops should be made available to help them become more adept at gathering, analysing, and interpreting data so they can use it to make decisions.

Second, it's critical to promote a culture of ongoing development and data-driven decision-making. This entails motivating employees to regularly integrate data into their processes, promoting dialogues on data insights, and setting up systems for continuous feedback and modification in response to data discoveries. Libraries may foster a proactive approach to data utilisation by institutionalising these practices. This will empower staff to make well-informed decisions that maximise operational efficiency, responsiveness to user demands, and overall service quality.

Establishing clear goals and metrics

Specifying precise, measurable, attainable, relevant, and time-bound (SMART) objectives is a deliberate procedure that is necessary to establish clear goals and measurements in library administration. The selection and application of key performance indicators (KPIs), which act as quantifiable benchmarks to monitor progress, support well-informed decision-making, and guarantee continuous strategic alignment with organisational goals and stakeholder expectations, complement this methodology.

Outcomes and Benefits of Data-Driven Library Services

The outcomes and benefits of implementing data-driven library services are manifold:

Improved User Satisfaction and Engagement: Library services may be customised to match the unique requirements and interests of patrons thanks to data-driven insights.

Increased efficiency and resource optimization: Streamlining operational processes based on data insights reduces costs and improves workflow efficiency whereas predictive analytics aid in forecasting demand for resources, ensuring adequate stock levels without over-investment.

Enhanced decision-making and strategic planning: Analysis of patron demographics and behaviour informs long-term planning and service development and benchmarking against key performance indicators (KPIs) facilitates continuous improvement and adaptation to changing community needs.

Demonstrating library value to stakeholders: Communicating library contributions to stakeholders is facilitated by the reporting of data like use statistics and user satisfaction scores. Evidence-based outcomes, on the other hand, enhance advocacy efforts and funding requests by proving ROI and societal advantages.

Challenges of Data Analytics

There are many different obstacles to overcome when integrating data analytics into library services, therefore considerable thought and strategic preparation are needed. Priority should be given to protecting customer privacy and data security. Libraries must balance the advantages of data-driven insights with ethical obligations, adhering to strict privacy standards and establishing strong methods for safely processing patron data. Clear rules on permission, anonymization, and data usage transparency are essential for navigating ethical conundrums and building user confidence and responsibility in libraries. Second, there are major obstacles due to financial and technological limitations. Libraries frequently have tight budgets, so it's important to make wise investments in the right equipment and knowledge to handle and analyse data efficiently.

Technology plays a crucial role in big data applications. To develop alterations from traditional library services, new sophisticated technology approaches must be included in the current systems. Additionally required are data mining, collection and analysis methodologies, as well as novel approaches like distributed frameworks and parallel computing. Technically proficient librarians are both necessary and brought about by big data. The fundamental data management skill sets required in the age of digital libraries are still lacking in many librarians. These libraries need staff members with expertise in managing data processing tools and technology where technical requirements of the position must be taken into account while hiring new employees (Husain & Shahid, 2022).

Future of Data Analytics in Library Services

Many individuals want to feel confident in the technology and security around data sharing with third parties since they might be concerned about it. Furthermore, this is a worldwide issue. People seek guarantees that their data won't be shared without consent and that they are not required to provide it. However, when it is lawfully gathered and processed, it offers chances for all involved parties to obtain rich analytics that may aid in decision-making, enhance services, and ultimately provide better results (McDonald et al., 2018).

While we discuss Future Directions and Innovations in Data Analytics for Libraries there might be several things to come up, they include;

Artificial Intelligence and Machine Learning Applications: Utilizing AI to analyse user behaviour and preferences to provide tailored book and resource suggestions and Implementing machine learning algorithms to streamline and improve the accuracy of cataloguing processes.

Predictive Analytics for Future Planning: Using predictive models to inform long-term planning and policy-making, ensuring that library services remain relevant and efficient.

Potential for Collaborative Data Initiatives: Collaborating with other libraries to share resources, data, and infrastructure, which can lead to cost savings and improved services also engaging in cooperative research initiatives to explore new data analytics methods and applications.

Conclusion

The integration of data analytics into library services represents a transformative shift, enhancing operational efficiencies, user experiences, and strategic planning. Utilizing artificial intelligence and machine learning, libraries can offer personalized services, automate processes, and make informed decisions based on predictive analytics. Collaborative data initiatives further enhance these benefits by enabling resource sharing and collective innovation among libraries and institutions. These advancements position libraries as dynamic, user-centric hubs of knowledge, ensuring their continued relevance and impact in the digital age. Embracing data analytics is essential for libraries to evolve and effectively meet the needs of their communities.

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DEVELOPMENT OF MONOGRAPHS MANAGEMENT SYSTEM

Khushboo Kumari[1] & Alka Bansal[2]

Introduction

DRDO Monographs/Special Publications Series1 was started in 1994 with an aim to promote and provide the specialised literature with specified focused topic that have direct relevance to defence science and technology. The monographs are mainly written by retired DRDO scientists and eminent scientists from other R&D organisations.

A monograph captures the life-long experience of scientists in research, experimentation, product development, trial and evaluation. Each title published in this Series gives in-depth information on the subject covered, tracing its history to the current and future trends in the area. The subjects selected are generally the ones which have not been covered in already published monographs.Each monograph undergoes five stages of project lifecycle-(a) Proposal acquisition and evaluation, (b) Manuscript development, (c) Art Direction, (d) Pre-press Production, and(e)post-press work.

Lot of communications are involved with authors, reviewers, Director Generals of technology clusters, Monograph Committee members, editorial team and financial authorities. For each such stage lot of documents gets generated. For managing monographs projects, many policy documents, guidelines, manuals, etc., got evolved. Templates for easier and faster processing are created which can be modified as per requirements. During project life cycle of each monograph writing project, many new documents are created and many policy documents are repeatedly required along with templates. The management of monographs, encompassing various documentation, access, and payment processes, can often be cumbersome and time-consuming.

The editorial team often faces challenges in efficiently organizing, storage and access of records of monographs for both current and future utilization. The editorial team required streamlined organisation system and user-friendly accessibility tools to efficiently manage and access monographs records and data.

Literature Survey

Abadi[2] in his article discussed the limitations and opportunities of deploying data management issues on emerging cloud computing platforms. Paper by Musembe[3] aims at

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rolling out strategies towards improving management of records in institutions of higher learning to enhance quality services. Challenges are identified and ways and strategies for improvement of records management to enhance quality of services are suggested for the Institution.

The research conducted by Touray[4] underscored the critical role of records management as a pivotal instrument in attaining organizational goals. The study underscored the contemporary significance of records management, emphasizing that records and information serve as the lifeblood of any organization and form the foundation upon which decisions are founded.

A study by Bayram[5], et al. highlighted TÜRKSAT A.Ş.'s development of the "Electronic Records Management System (ERMS)" for institutions, enabling secure management, sharing, and web-based archiving of records. TÜRKSAT A.Ş. is tasked with establishing and overseeing e-Government services in Turkey. The ERMS project was evaluated across three different organizations. The study compared the project's efficacy based on various parameters, examining how these factors influence project outcomes and how diverse institutional contexts are addressed.

The purpose of the research study by Mphanza& Mupala[6] is to design and develop a web based electronic record management system for easy storage and retrieval of information at St Lawrence parish from a manual based system. The parish need to fully utilize ERMS or move to EDRMS, to save retrieval time, save filing space, save stationery such as toner and blank paper, pave a way to paperless offices and avoid users queuing for one file, allow maximum communication with users, low errors, low costs, and timely access to information, accurate data and high physical efficiency.

There are few document management systems available. The DESIDOC monographs processes had their own unique features requirements such as document retrieval, sorting of document, information about each project, current status of monographs, etc., which were not presently available in any specific software package.

Need and Aim

The Editorial team frequently encounters challenges in organising, accessing, and submitting monographs efficiently for current and future use. To address these challenges, a sophisticated in-house system solution was requiredaiming at streamlining monograph management processes.

Features Required

It was decided to develop a system which has the following features

- Description of about the monograph and its processes
- Information about each current and published monograph
- Availability of frequently used documents
- Forms and formats

- Downloadable records related to each monograph
- Contact information

Technology Used

- HTML[7] 5.0 and CSS[8] 3.0 are used for webpage creation and designing. To create static web pages and web applications HTML markup language is used. For the presentation of documents, CSS is used.
- Visual Studio Code[9] is used for free coding editor that helps coding and task running quickly.
- XAMPP[10] is used to create, test and verify program on a local web server.
- HP scanners are used for digitization of the documents.
- Wordpress[11] is open source software and freely available. It is a Content Management System used to manage the content of the system.

Processes

Design Phase

Table 1 highlights the steps for development of monographs management system.

Table 1. Step-Wise Description of Monographs Management System Development

Step 1 :	Digitization and collection of required documents of the monographs
Step 2 :	Collection of Forms and Formats, Policy, Guidelines and other relevant documents
Step 3 :	Installation of Visual Code editor for writing, running and editing the code
Step 4 :	Download & installation of XAMPP to the PC
Step 5 :	Download the wordpress and extract the files
	Keep the extracted files in C drive as C:/xampp/htdocs and rename the folder as website name
	Create database in MySQL
	Create user name 'root' and password
	Open the page in Internet browser with localhost/wordpress/wp-login
	Open the web browser and login with username and password
	According to user convenience using the system, select the theme & plugins and install it to wordpress
Step 6 :	Cr Create, maintain, upload, manage and publish the system
Step 7 :	Create menu and submenu of Monograph Management System
Step 8 :	Created a particular html page using VS code editor for each monograph to link
Step 9 :	Open the page in Internet browser with http://localhost/wordpress
Step 10:	Use the Monographs Management System

Salient Features and Content Organisation

Table 2 describes the salient features and organization of contentin the monographs management system.

Table 2. Salient Features of Monographs Management System

Menu	Sub- Menu	Brief Description of contents/Links
Home page	--	Home page describing useful general information about the monographs under icon 'Home' (Fig. 1) is made available.
About	--	Detailed information about the monograph processes, submission criterion, payments details, etc. are described
Monographs	List of monographs	List of monographs is provided within icon 'Monographs' (Fig. 2).
	Monograph Details	On click of monograph name, all the details of each monograph is available (Fig. 3) which include title, authors' names, addresses, bank details, reviewers' reports, honorarium receipts, project sanctioned document, full manuscript (downloadable) (Fig. 4), etc.
Forms and Formats	--	Various datasets are made available under 'Forms and Formats' which are common for all monographs project initiation and processing such as proposal proforma, prereceipt dataset, copy right forms, etc.
Published Monographs	List of monographs	A consolidated list of published monographs is also available under 'Published Monographs'.
	Monographs Brochure	Brochures are made available to have brief details about each published monograph
Status	--	Complete status of monographs can be seen under 'Status' icon.
Contact Us	--	It describes roles and responsibilities well as contact details.Users can get information about whom to contact by clicking 'Contact' icon.



Figure 1. Home page



Figure 2. List of monographs



Figure 3. Information about each monograph



Figure 4. E-book for each monograph

Benefits

The system has been implemented and has following key benefits for users and publisher:

Streamlined Forms and Format

The system simplifies the submission process by providing streamlined forms tailored to meet specific format requirements for monographs. User can effortlessly fill out necessary information, reducing the time and effort required for submission.

Quick Submission and Access to Detailed Information

By standardizing forms for submission, the system ensures consistency and accuracy in documentation, about each monograph enhancing the overall quality of submissions.With this system, users can access detailed information about each monograph with a single click. This feature enables quick retrieval of essential bibliographic data, such as author details, publication date, title, as well as sanction details, reviewers' details, proposal, etc. By facilitating easy access to information, the stystem enhances the user experience and promotes efficient decision-making.

Effortless Submission of Prepared Documents

Users can submit prepared documents, such as proposals, guidelines, and policies, with ease using this system. The system streamlines the submission process, allowing users to upload documents directly through the platform. Automated checks ensure that submissions meet specified criteria, reducing the likelihood of errors and delays.

Convenient Full-Text Download

The system enables users to download full-text versions of monographs conveniently. Whether accessing publications for research purposes or personal use, users can easily obtain complete copies of monographs through the platform. This feature enhances accessibility and promotes knowledge dissemination. The system also enables downloading of required documents of each monograph.

Seamless Payment Processing Assistance

The system offers seamless payment processing assistance, simplifying payment documents processing for both publishers and authors. Authors can be easily besupplied the datasets required to fill-up and submit for the payments such as pre-receipts, bank detail proformas, undertaking, information about past payments, etc.. Through the system, publishers can easily use the documents like policy document, sanction documents, transactions, etc., for further payment processing.

Inclusion of Historical Perspectives and current status

Each published monograph is accompanied by historical perspectives, providing valuable context and insights. By integrating historical data, the system enriches the

user experience and promotes a deeper understanding of monographs' significance over time. Stages of each monograph like proposal receiving stage, reviewing stage, recommendation/Approval, Financial Sanction, recommendation of writing, Plagiarism, Security Clearance, and publishing stage, etc, can be easily identified through the system and enable for further action for the monograph..

Comprehensive Information on Past and Upcoming Monographs:

The system provides comprehensive information on past and upcoming monographs, offering users insights into publication schedules and thematic areas. By maintaining an extensive database of monographs, the system facilitates exploration and discovery.

Conclusion

The system represents a significant advancement in monograph management, offering a range of features designed to streamline documentation, access, and payment processing. By simplifying submission processes, enhancing access to information, and managing achives, the system contributes to greater efficiency and effectiveness in managing monographs. It is believed that this system will make a valuable contribution to the publishing communities, supporting scholarly research and knowledge dissemination on a wider scale.

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7. html5.0.https://html.com/attributes/a-target/
8. CSS 3.0.https://www.w3schools.com/css/default.asp
9. Visual Studio Code.https://code.visualstudio.com/
10. XAMPP. https://www.apachefriends.org/
11. Wordpress. https://wordpress.org/

A REVIEW OF STUDIES ON HOW ACADEMICS AND RESEARCHERS USE SOCIAL NETWORKING PLATFORMS FOR LEARNING

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Introduction

In recent years, academics and researchers have grown more and more accustomed to using academic social networking sites (ASNSs). These websites give scholars a place to interact, exchange their work, and work together on research initiatives. By enabling quicker and more effective research distribution, promoting researcher collaboration, and giving academics chances to improve their academic reputation, the usage of ASNSs has the potential to completely transform scholarly communication. When utilizing ASNSs for scholarly work, it is crucial to carefully weigh their benefits and drawbacks. However, using ASNSs also brings up a number of ethical and privacy problems. We will look at the state of the research on academics' and researchers' use of ASNSs in this review. We will look at the reasons people use ASNSs, how they affect academic communication, how they might be used for collaborative research, and the privacy and ethical concerns that come with utilising these platforms.

Methodology

This analysis is based on a thorough search of the academic literature across a number of databases, including Google Scholar, Web of Science, and Scopus. Relevant search terms including "researchers," "academic social networking sites," and "scholarly communication" were used. The search was restricted to English-language articles published in peer-reviewed journals between the years 2010 and 2022.

A screening procedure was used to choose articles that satisfied the inclusion requirements from a vast number of articles that the original search produced. The article's focus on the use of ASNSs by academics and researchers was required, as were insights into the causes of their usage for collaborative research, their impact, and the ethical and privacy concerns that come with them.

A total of 50 articles were included in this review after being screened. An overview of the state of study on the use of ASNSs by academics and researchers was given by thematically analysing the papers and synthesising the results.

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Objectives of the study

The major goal of this study is to give an in-depth analysis of the available literature on academics' and researchers' use of academic social networking sites (ASNSs). The evaluation seeks to

1. Determine the reasons why researchers and academics use ASNSs;
2. Analyze how ASNSs affect scholarly communication;
3. Examine the application of ASNSs for group research;
4. Draw attention to the privacy and ethical concerns raised by academics' and researchers' usage of ASNSs.

By fulfilling these goals, this study hopes to offer a better knowledge of the state of research on the usage of ASNSs by academics and researchers as well as to point up prospective directions for further study. This review also intends to highlight the possible advantages and disadvantages of these platforms, as well as insights that may be helpful for academics and researchers thinking about using ASNSs for their scholarly work.

Analysis of Network Structure

A technique for examining the structure of a network, such as a social network, is network structure analysis. This entails analysing the connections and interactions between the network's nodes (individuals) in order to spot patterns.

Social network analysis is one method for performing network structure analysis (SNA). SNA is a strategy that examines the connections between people in a social network using statistical and mathematical tools. This may entail assessing the degree and direction of ties inside the network, locating hubs or central actors within it, and measuring the strength and direction of ties between individuals.

SNA can be used to study the interactions between academics and researchers on academic social networking sites (ASNSs). SNA can be used by researchers, for instance, to find influential people within a certain field of study or to look at co-authorship and collaboration trends. SNA can also be used to examine how ideas for new studies spread or how information moves within a certain research group.

Researchers can learn a lot about the dynamics of scholarly communication within a given field of study by doing network structure analysis on ASNSs. As well as helping to better understand the social and professional interactions between academics and researchers, this can help devise ways to improve collaboration and knowledge exchange.

Looking for Experts and Peers

To find peers and authorities in their field of study, academics and researchers frequently use academic social networking sites (ASNSs). Researchers can interact with people who have similar research interests and experience via ASNSs, and they can establish business contacts that can help with collaboration and knowledge sharing.

Researchers can use ASNSs to find peers and subject matter experts based on a variety of factors, including research interests, location, institutional affiliation, and professional experience. Identifying possible mentors or collaborators who might be able to provide advice or support for their research endeavours might aid researchers.

By engaging with the research community on ASNSs, researchers can gain insights into emerging trends and debates in their field and can also share their own research findings with a wider audience. Additionally, ASNSs can help researchers keep up to date with the latest research developments in their field by following the work of their peers and experts.

By sharing their research on ASNSs, researchers can receive comments and ideas from their peers and experts, which can assist to improve the quality and impact of their research. ASNSs can also offer a platform for researchers to request feedback and peer review on their work.

In general, academics and researchers use ASNSs to connect with peers and specialists since it gives them a place to network professionally, get input on their research projects, and keep up with the most recent advancements in their field.

Search for Scholarly Knowledge of High Quality

The desire for high-quality scholarly material is a key driver for academics and researchers to use academic social networking sites (ASNSs). Research articles, conference papers, databases, and other academic information and resources are all accessible to researchers through ASNSs.

By offering options for searching, filtering, and sorting material based on a variety of criteria, including publication date, author, journal, and citation count, ASNSs can assist researchers in locating high-quality research articles and other scholarly resources. The most pertinent and influential research publications and other resources for research projects can be found using this.

Also, by giving users access to metrics and indications of academic impact like citation counts, h-index, and altmetrics, ASNSs can assist scholars in assessing the quality of research articles and other scholarly resources. When choosing which academic resources to use for their research projects, researchers can use these measures to evaluate the influence and impact of scholarly papers and other resources. Access to peer review and editorial processes through ASNSs can also help researchers ensure the calibre and rigour of scholarly resources like research publications. Researcher participation in the editorial and peer review processes on ASNSs enables them to offer input and support the improvement of the scholarly information's quality.

Overall, the desire for high-quality scholarly information is a significant driver for academics and researchers to use ASNSs because they give them a platform for accessing, evaluating, and participating in the peer review and editorial processes that ensure the rigour and quality of scholarly information.

Looking Outside of a Formal Repository

Researchers can share and disseminate their findings outside of institutional archives through academic social networking sites (ASNSs). While institutional repositories can give researchers a platform for sharing their work with other members of their institution or organisation, ASNSs give researchers a bigger stage to share their work with a larger audience throughout the world.

By giving academics access to a larger audience of potential readers and collaborators, ASNSs can assist researchers in increasing the exposure and impact of their study. Researchers can reach a wider audience of colleagues and subject matter experts as well as potential non-academic audiences by sharing their research on ASNSs.

Moreover, ASNSs can offer researchers resources like social media sharing tools and citation tracking tools for promoting and spreading their findings. These tools give researchers the ability to distribute their study more widely and monitor the impact and influence of their work over time, which can help researchers raise the exposure and impact of their work.

By enabling researchers to get feedback and comments on their work from peers and experts, ASNSs can also give researchers a platform for communicating with their audience. This can aid researchers in modifying and enhancing their study plans and open the door to fresh research partnerships and collaborations.

By giving researchers access to a larger audience of potential readers and collaborators, promoting and tracking the impact of their research, and enabling engagement with their audience, ASNSs provide researchers with a valuable platform for sharing and disseminating their research outside of institutional repositories.

Investigating the Potential of Alternative Metrics

Alternative metrics, or altmetrics, are a brand-new category of metrics that, as opposed to standard citation metrics, gauge the influence of scholarly research through internet and social media activity. Since they offer a variety of social media and online activity data, academic social networking sites (ASNSs) are a crucial platform for the creation and use of altmetrics. This data may be utilised to measure the impact of scholarly research in novel and creative ways.

Researchers may get access to a variety of altmetrics using ASNSs, such as social media mentions, downloads, views, shares, and bookmarks. By evaluating the online interaction of readers and users with research, these alternative metrics can give researchers insights into the reach and effect of their work beyond traditional citation counts.

Moreover, ASNSs can help academics investigate the potential of alternative metrics by giving them access to tools and services that make altmetrics data gathering and analysis possible. As an illustration, a few ASNS give researchers access to

dashboards and visualisations that let them track and keep tabs on the online activity and participation in their research.

Moreover, ASNSs can encourage the creation of fresh and creative approaches for using altmetrics to gauge the impact of scholarly research. For instance, based on social media activity and online engagement, some ASNSs have created machine learning algorithms that can recognise and assess the impact of scholarly research.

Overall, ASNSs offer scholars a useful platform for investigating the potential of alternative metrics, giving them access to a variety of altmetrics data and tools and facilitating the creation of fresh, cutting-edge approaches to gauging the impact of scholarly research.

Conclusion

As a result, scholarly communication and collaboration between academics and researchers are increasingly taking place on academic social networking sites (ASNSs). The analysis of studies on the use of ASNSs by academics and researchers reveals a number of reasons and advantages for doing so, such as networking and collaboration, seeking out peers and subject-matter experts, the search for high-quality scholarly information, looking outside institutional repositories, and investigating potential for alternative metrics.

Researchers can interact with peers and subject-matter experts to collaborate and can acquire and assess high-quality scholarly information using a variety of tools and services made available by ASNSs. Additionally, by giving researchers access to a larger audience of potential readers and collaborators, promoting and tracking the impact of their research, and enabling engagement with their audience, ASNSs give researchers a platform for sharing and disseminating their research outside of institutional repositories.

ASNSs also make it easier to develop and use alternative metrics, which present novel and innovative ways to evaluate the impact of academic research based on social media and online activity.

Overall, ASNSs have altered scholarly communication and collaboration, and they will likely continue to be significant for academic research and scholarship in the future.

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A COMPARATIVE ANALYSIS OF ACADEMIC SOCIAL NETWORKING PLATFORMS IN THE DIGITAL ERA

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Introduction

The digital revolution has fundamentally changed how we access and interact with educational resources. The emergence of the internet has ushered in an era characterized by unrestricted 24/7 access to educational resources, sometimes referred to as boundaryless learning. In this context, academic and social media platforms have played a crucial role in enabling and expediting the transition towards boundaryless learning. In recent years, the use of Academic Social Networks (ASNs) such as ResearchGate, Academia.edu, LinkedIn, and others has become important for scholars, professionals, and others globally in their research and collaborative pursuits. These networks continually evolve and adapt to cater to the dynamic requirements of the academic community. The University of Toronto defines "Academic Social Networks" (ASNs) as specialized online platforms for academics. They enable users to create profiles, connect with peers, and share academic content. ASNs are user-friendly and offer a convenient way to showcase research to a global scholarly audience.

ASNs facilitate information dissemination, collaboration, and networking within academic communities, thus transforming the traditional academic landscape into a more interconnected and dynamic environment In the digital era, where boundaries between academia and industry are becoming increasingly blurred, understanding the functionalities and impact of platforms such as ResearchGate, Academia.edu, and LinkedIn is crucial. ASNs have emerged as reliable platforms for information seeking, sharing, blogging, publishing, and collaborating in the present era of the World Wide Web.

Literature Review

Evaluating these platforms and determining how they fulfil modern-day requirements becomes necessary as technology evolves. The study examines the functionalities, user engagement mechanisms, and impact of ResearchGate, Academia.edu, and LinkedIn, aiming to elucidate their contributions to scholarly communication and professional networking.

1,2 DRTC, Indian Statistical Institute,

Bhardwaj (2017) conducted a comparative study of academic social networking sites, revealing that ResearchGate, Academia.edu, Mendeley, and Zotero features are poor. ResearchGate, with the highest point score of 61.1%, and Academia.edu, with a 48% score, ranked above average and average, respectively. Meishar-Tal & Pieterse (2017) conducted a study revealing that researchers use ASN platforms more for seeking information than for sharing and interacting with people. They found that promotion, acquiring knowledge, joining the peer community, and peer interaction are the main motivations for using ASNs. Similarly, Gruzd (2018) and Majumdar (2022) revealed in their study that more people join ASNs in order to get visibility and help academics get information (Jordan, 2019). Corvello et al. (2020) Researchers use the information on social networking sites dedicated to the scientific community in their research to develop new skills. Chugh et al. (2020) studied social media usage in higher education institutes based on a literature review and found that some academics just use social media platforms for research dissemination. They highlighted and reported that user motivation to use social media platforms such as Twitter, ResearchGate, academia.edu, and LinkedIn is increasing based on its benefits.

In particular, the study seeks to understand how each platform facilitates academic collaboration, knowledge sharing, and professional interaction within the digital landscape. The study aims to provide insights into the strengths and limitations of ResearchGate, Academia.edu, and LinkedIn to inform scholars, practitioners, and policymakers. Based on the literature, it has been found that in recent years, these platforms have changed, so it is necessary to compare them.

Methodology

This study employs the systematic approach of web content analysis to investigate the role and current functionalities of academic social networking platforms. ResearchGate, Academia.edu, and LinkedIn. As of May 2024, ResearchGate has 25+ million members, Academia.edu has 261+ million members, and LinkedIn has more than 1 billion members, which highlights the popularity and importance of these platforms.

The websites of each selected platform have been analyzed to gather relevant data from each platform, including platform features, user profiles, content types, engagement metrics, and others. These platforms offer scholars, professionals, and researchers a means to connect, share research findings, and build networks, accelerating progress. Qualitative and quantitative analysis methods are employed to examine the characteristics and functionalities of each platform. The analysis framework aims to identify the differences across these platforms in facilitating academic collaboration, knowledge dissemination, and professional networking.

Platforms Overview

ResearchGate: Ijad Madisch, Horst Fickenscher, and Sören Hofmayer founded ResearchGate in 2008 as a social networking site designed specifically for researchers and scientists to share their publications, ask and answer questions, and find collaborators.

It allows citation & read count tracking, sharing research updates, and discussing topics with peers. It has no editorial or review board, rather, it serves as a platform that allows one to share and seek scholarly information. ResearchGate allows sharing of research articles, conference articles, preprints, presentations, theses, books, etc. It provides various metrics for the author and user, such as citation, read count, author research score, etc., to understand the relevance and importance.

Academia.edu: Academia.edu is a profit-making social networking platform that was established by Richard Price in 2008. It is important to note that despite having a '.edu' domain, it is not an academic institute. Academia offers its users a wide range of features, has more than 262 million registered users, 55m+ upload papers, and provides 20 million daily recommendations, with over 101 million monthly visitors on its platform. This platform serves as a hub for academics and professionals to share their research, follow the work of other researchers, and monitor the impact of research work. It offers a space for users to build their profiles, highlight their academic achievements, and establish connections with their peers. It offers advanced options to its premium members such as translation of research, full text pdf search, search alerts, Curriculum vitae (CV) making, personal website, advance search, etc.

LinkedIn: LinkedIn was founded by Reid Hoffman and Eric Ly in 2003; since then, LinkedIn has made several acquisitions to grow and expand, and in 2016, it was acquired by Microsoft. While primarily a professional networking site, over time, it has developed features and emerged as a platform to support academic research sharing, networking, and collaboration. It offers features for job searching, skill endorsements, professional development, and others, making it a valuable platform for academics seeking to connect with industry professionals. It also offers search tools, software recommendations, and daily games to keep users updated. Users can connect, find jobs, learn from various learning resources, generate CV based on given information, and stay updated on industry trends. Moreover, it allows users to post their achievements, jobs, events, etc., and explore various fields such as marketing, healthcare, engineering, and more through courses, articles, and recommendations. The 'Open to Work' feature lets users discreetly indicate their job search status.

Findings

The study's findings have been grouped into categories based on the common features and functions of the platforms.

Accessibility

All platforms (Table 1) are accessible through websites and in mobile applications. They provide user-friendly interfaces that look like social media platforms and allow similar features such as post, like, share, comment, ect. Language is one of the aspects where ResearchGate supports only the English language and does not offer other options to choose from. Academia.edu, by default, supports English, but it also supports Spanish in the beta version. Whereas LinkedIn is available in 26 languages, demonstrating its

commitment to embracing linguistic diversity and expanding its user base in regions where these languages are spoken. It reflects LinkedIn's efforts to cater to the needs of professionals from diverse cultural backgrounds and linguistic preferences. Providing content and interface in users' preferred languages improves the overall user experience, leading to higher satisfaction and retention rates.

Table 1: Website link and language support

Platform	Website Link	Language Support
ResearchGate	https://www.reserachgate.net	English
Academia.edu	https://www.academia.edu	English (Spanish in Beta version)
LinkedIn	https://www.linkedin.com/	English, Hindi, and 25 other

Platform Features

Platform features related to academics have been selected for the comparison (Table 2). Researchers can search for publications, authors, and specific research topics on ResearchGate and Academia.edu. Features include profile creation, collaboration tools, and metrics to track paper views, reads, and citations. Privacy settings allow researchers to control who views their work.

Table 2: Availability of Features Facilitating Scholarly Communication on LinkedIn, Academia.edu, and ResearchGate

Parameter	ResearchGate	Academia.edu	LinkedIn
Premium Version Support	No	Yes	Yes
Profile Views Statistics	No	Yes	Yes
Connections/Followers Count	Yes	Yes	Yes
Likes, Comments, Repost	No	Yes	Yes
Document Views/Downloads Statistics	Yes	Yes	No
Citations Count	Yes	No	No
H-Index	Yes	No	No
Recommendations/Endorsements Count	Yes	Yes	Yes
Publications Engagement	Yes	Yes	Yes
Q&A Participation Statistics	Yes	No	No

LinkedIn is beneficial for professional networking and endorsements, making it suitable for increased professional visibility. However, it lacks scholarly features such as citations, document views, etc. LinkedIn shows profile visit statistics for 90 days, while Academia.edu shows this data for 60 days. ResearchGate, on the other hand, does not provide profile visit statistics but instead shows the read count for research items.

Academia.edu excels in document views and provides comprehensive engagement data and recommendation services, offering useful indicators for academic influence. ResearchGate is a strong platform for academic networking and dissemination, offering a wide range of tools for scholarly communication, including full profile views,

document views, citations, and Q&A participation. By understanding each platform's advantages, researchers can strategically choose where to put their efforts to optimize visibility, engagement, and impact within their academic and professional communities.

Metrics and Statistics

The influence and impact metrics offered by ResearchGate, Academia.edu, and LinkedIn provide academics and professionals with valuable insights into their work's reach, engagement, and influence within their respective academic and professional networks. ResearchGate offers metrics such as an author's research interest score, citations, and h-index. Additionally, it provides metrics on recommendation counts, reads, and full-text reads. Users can check individual item-based metrics and totals, including the number of followers, research item count, and following count. Academia.edu provides more metrics and statistics than ResearchGate, such as unique visitor counts, downloads, views, and detailed information based on geographic domain and affiliations where your profile has been viewed, including country, city, and university names. It also tracks page reads, traffic sources, and researcher fields. Users can view where their research items or profiles are searched and acquire individual paper engagement data for the research items added to their profiles. It also provides detailed information about profile visitors to Academia.edu premium members.

LinkedIn offers various metrics and statistics for both profiles and individual posts. The platform allows users to check statistics in the profile section, showing various data such as post-performance, impressions, engagements, engagement rate, clicks, reactions, click-through rate, reposts, and comments. Additionally, LinkedIn provides detailed insights into the types of reactions that a particular post has received. LinkedIn offers various metrics and statistical parameters to monitor performance for different types of profiles, including personal, company, and institutional pages.

Career Development Opportunity

Amongst all the selected platforms, LinkedIn has extensive career-related functionalities, including job search, skill enhancement courses, skill endorsements, and industry networking, providing scholars and professionals with opportunities to explore career paths outside academia, connect with potential employers, and facilitate a seamless transition between academia and industry. ResearchGate provides an opportunity to follow people of interest and has recently added a job feature to its platform where people can search for jobs based on individual criteria. Academia.edu does not offer a specific job-related section however, it offers courses on various topics to help users learn skills and accelerate their careers.

Mobile Application

As per the data collected from the Google Play Store (for Android devices) and Apple App Store (for IOS devices), all three platforms have their dedicated mobile application to provide a handy and enhanced experience to the user. As per the data

collected from the Google Play Store, LinkedIn is the most popular among all the three selected platforms based on download count. LinkedIn, ResearchGate and Academia.edu have a download count of 1B+, 500K+, and 1M+, respectively (as of 20 May 2024). However, the Apple app store does not provide the app download count.

Based on the data from both app stores, ResearchGate has the highest rating at 4.8 (out of 5), followed by Academia.edu and LinkedIn. Interestingly, LinkedIn's rating varies between both the stores: it has a 4.1 on the Google Play Store and a 3.9 on the Apple App Store. However, it's important not to focus solely on the ratings. We must also consider the number of reviews each app has received. Although LinkedIn has ratings of 4.1 and 3.9 on the Google Play Store and Apple App Store, respectively, and more users have reviewed it than the other platforms. This higher volume of reviews adds context to LinkedIn's ratings, indicating a broader user base. Additionally, these apps are designed for specific age groups based on content, language, etc., and are categorised accordingly by the Google and Apple app stores. According to the data, Academia.edu is suitable for age groups 3+ and 4+ on the Google Play and Apple App Store, respectively. Whereas, LinkedIn is categorized for users aged 12 and above.

Table 3: Mobile application

	LinkedIn		Research Gate		Adademia.edu	
	Google play store	Apple app store	Google play store	Apple app store	Google play store	Apple app store
Mobile App	Yes	Yes	Yes	Yes	Yes	Yes
Downloads	1B+	-NA-	500k+	-NA-	1M+	-NA-
Rating	4.1	3.9	4.8	4.8	4.7	4.7
	Based on 2M reviews	Based on 15k ratings	Based on 21k reviews	Based on 2.3k ratings	Based on 94k reviews	Based on 1.7k ratings
Rated for	12+	12+	12+	4+	3+	4+

*NA: Data not available

Upload Option

ResearchGate offers a wide range of sections for users to upload items, including articles, literature reviews, theses, posters, patents, etc. Similarly, Academia.edu provides options for uploading papers, conference presentations, books, drafts, and thesis chapters, though its offerings are not as extensive as those of ResearchGate. LinkedIn offers limited options as it lacks item segregation and features. It allows users to add projects, patents, and publication sections for adding research items such as articles, conference papers, books, etc. Furthermore, LinkedIn does not provide a specific option or section for uploading the preprints, data, code, etc.

ResearchGate and Academia.edu mainly focus on the needs of academics and researchers. LinkedIn covers a wide range of content, including professional profiles, job postings, industry news, etc.

Table 4: Upload option

Platforms	Research Item / Content Upload								
Research Gate	Articles,	Literature reviews	Thesis	Books	Conferences Paper	Data / Raw Data	Preprints	Presen tations	Posters
	Chapter	Code	Cover Page	Experient Findings	Method	Patent	Negative Results	Research Proposal	Technical Report
Academia. edu	Papers	Books	Teaching Documents	Draft	Conference Presentation	Thesis Chapter			
LinkedIn	Publi cation	Courses	Patent	Project					

Search

ResearchGate offers a basic search option where users can browse and perform simple searches by titles, keywords, authors, journals, questions, etc. It provides results in various sections such as research, journals, people, questions, jobs, and institutes to get the most relevant results for the search query. ResearchGate allows further sorting of the search results in the research section only by applying filters such as type of item (paper, presentation, code, etc.), date, and full text.

Table 5: Search Option

Platforms	Basic Search	Advanced Search	Filters
ResearchGate	Yes	No	Yes - (Limited and not available in all sections)
Academia.edu	Yes	Available in Premium version	Available in Premium version
LinkedIn	Yes	No	Yes

Acadamia.edu comes with a basic search option, which is available to all users, and an advanced search option, which is exclusively available for the premium version. In basic search, users can search and view results in various section paper titles, papers (full text), people, videos, and courses. If users are not subscribing to the premium version, then search results will be less than those of an advanced search since it does not include search results from full text and will not allow users to filter search results.

LinkedIn's search capabilities extend beyond research-focused content, and users can search for people, posts, companies, groups, jobs, products, services, events, and courses. LinkedIn also allows further sorting of the results based on available filters. When individuals search for publications and patents, LinkedIn displays the profiles of the individuals associated with those items rather than the searched items themselves.

Suggestions and Recommendations

These platforms provide suggestions and recommendations to registered users based on their search behaviour, research interests, profiles, and other activities.

ResearchGate offers suggestions for research items, similar profiles, author and co-author profiles, questions, and jobs. ResearchGate also allows users to recommend, follow, and share research items with other researchers they know. According to 'academia.edu', it provides over 20 million daily recommendations based on users' recent searches and research interests. Users can save research items in their drive and share them with their academic network and on Facebook and X (formerly Twitter). LinkedIn shows similar profiles, posts, jobs, articles, and courses based on users' recent searches, views, likes, comments, reads, and connections. LinkedIn also sends job alerts, course suggestions, and recommendations for users with similar profiles.

Geographic Distribution of Users

Users access these platforms from different parts of the world. The following data has been taken for the top 5 countries for a period of Feb - April 2024 from https://similarweb.com/.

Table 6: Country-wise user distribution

ResearchGate	Traffic (%)	Academia.edu	Traffic (%)	Linkedin	Traffic (%)
United States	15.46	United States	10.26	United States	29.64
India	9.19	Indonesia	8.26	India	9.4
United Kingdom	4.52	Mexico	6.39	United Kingdom	5.7
Philippines	4.4	Brazil	5.1	Brazil	5.16
China	3.61	India	3.97	France	4.13
Others	62.82	Others	66.02	Others	45.97
Total	100	Total	100	Total	100

Note: Platform traffic data has been collected from 166, 157, and 172 countries for ResearchGate, Academia.edu, and LinkedIn, respectively.

Table 6 shows that ResearchGate has received the highest traffic in terms of users from the United States, followed by India, with 15.46% and 9.19%, respectively. Similarly, academia.edu has received the highest traffic from the United States, followed by Indonesia with 10.26% and 8.26%, respectively. LinkedIn has received 29.64 % traffic from the United States, which ranks the highest amongst all the three platforms.

Discussion

The findings highlight the diverse functionalities and roles of ResearchGate, Academia.edu, and LinkedIn in facilitating academia-industry connections and advancing scholarly communication within the digital era. ResearchGate and Academia.edu are invaluable platforms for scholars to connect, collaborate, and share research findings within the academic communities. These platforms offer features such as discussion forums, project collaborations, and document sharing, facilitating seamless communication and knowledge exchange among researchers. Additionally, they provide visibility and recognition for scholarly work, enhancing researchers' academic profiles and facilitating career advancement.

LinkedIn emerges as a key platform for bridging academia and industry, offering opportunities for scholars to showcase their academic achievements alongside professional credentials. With its extensive user base spanning various industries, LinkedIn provides a platform for scholars to engage with industry professionals, explore career opportunities, and contribute their expertise to real-world challenges. Furthermore, LinkedIn's job search functionalities and industry connections enable scholars to transition seamlessly between academia and industry, fostering a culture of interdisciplinary collaboration and knowledge transfer.

Based on the data analyzed by the Google Play Store and Apple App Store, data from Table 3 shows that ResearchGate (rating 4.8) is ideal for researchers seeking high user satisfaction and reliable academic interactions. LinkedIn, with lower ratings (4.1 on Google Play, 3.9 on Apple App Store) but a large user base, is essential for extensive professional networking. Academia.edu, suitable for younger users (3+ on Google Play, 4+ on Apple App Store), effectively engages students and early-career researchers. Researchers can use ResearchGate for quality academic engagement, LinkedIn for broad networking, and Academia.edu for reaching younger audiences. It's also worth noting that a higher rating doesn't always correlate with more downloads. The quality of a platform is often more important to its users than its popularity. So, even though ResearchGate has fewer downloads, the high rating indicates that its users find it useful and satisfactory. Additionally, according to Table 4, ResearchGate offers more options for users to upload various items in their profiles to make them visible in the public domain.

Understanding the geographical distribution and user interaction on these platforms is critical for academics seeking to increase their academic and professional visibility. Country-wise user distribution data from Table 6 gives useful information on the distribution of users across countries. Researchers can customize their interaction techniques based on the platform's user base for example, those targeting American and Indian audiences may prefer LinkedIn and ResearchGate. Academia.edu's broad user base helps encourage international cooperation, particularly among researchers from emerging economies. LinkedIn provides several options for professional networking and career promotion, making it an essential tool for researchers seeking connections in the industry.

Platforms such as Academia.edu, LinkedIn, ResearchGate, and others offer specific advantages and limitations that influence how scholars collaborate, exchange work, and develop networks in the ever-changing world of academic communication. A strategic choice is crucial because various areas of academic and professional visibility are catered to by each site. However, more advanced collaboration technologies are required to support collaborative research projects, virtual labs, and interdisciplinary work, such as shared workspaces, integrated communication, and project management features.

In the age of artificial intelligence (AI), every other platform, service provider, software, tool, etc., is trying to use AI to enhance its performance and services. ASN platforms also use AI-backed solutions for their various services, such as suggestions, personalization, recommendations, jobs, reading, etc. Adding to the context, LinkedIn offers its premium users the option to rewrite a post with the help of an AI. Users can provide the information, and the AI feature will assist in rewriting the post. Continuing this study, we are also conducting research to identify opportunities and gaps in implementing these new-age technologies in current Academic Social Networking Sites (ASNs). We aim to suggest how these technologies can leverage the usability of ASNs, as well as showcase their relevance in the future.

Conclusion

This study underscores the importance of academic networking platforms in the digital age and highlights the need for ongoing evaluation and critique within the academic domain. By understanding the unique features and functionalities of ResearchGate, Academia.edu, and LinkedIn, researchers and information professionals can leverage these platforms effectively to advance their scholarly pursuits and professional endeavours. Academic social networking platforms' diverse functionalities and roles are crucial in enhancing interdisciplinary collaboration, information dissemination, and professional networking within the digital age. These platforms catalyze boundaryless learning and innovation, bridging the gap between academia and industry and driving positive societal impact through collaborative research and knowledge exchange.

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NAVIGATING DOUBLE EDGED SWORD: UNCOVERING THE HAZARDS OF AI ENHANCED SOCIAL NETWORKING SITES THAT IMPACT LIBRARY USAGE.

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Introduction

The advent of Artificial Intelligence (AI) has significantly transformed numerous sectors, including social networking and information dissemination. In this evolving landscape, libraries, long regarded as bastions of knowledge and community engagement, are increasingly adopting AI technologies to enhance their services and reach. AI-enhanced social networking sites (SNS), in particular, have become pivotal in shaping how users access and consume information. These platforms offer unparalleled convenience and personalized content, aligning well with the digital age's demands for instant and tailored information. However, this technological shift also brings forth a set of challenges that traditional libraries must navigate. The integration of AI in SNS, while beneficial in many respects, poses several hazards that impact library usage. Among these are the declining frequency of physical library visits, the proliferation of misinformation, and escalating concerns over data privacy. As users become more reliant on AI-curated content from SNS, the role of libraries as primary sources of reliable information and community spaces is being undermined.

This paper aims to uncover the hazards associated with AI-enhanced SNS and their impact on library usage. By examining the dualistic nature of these technologies—both their benefits and their risks—we seek to provide a nuanced understanding of how libraries can adapt to and mitigate the adverse effects of AI. Through a mixed-methods approach, incorporating qualitative interviews with library professionals and quantitative surveys of library users, this study delves into the core issues at play. It also offers strategic recommendations for libraries to harness the potential of AI while safeguarding their fundamental values of information integrity and user privacy.

AI-Driven SNS

AI is increasingly being integrated into social media platforms, allowing for advanced features such as targeted advertising, content curation, and user behavior prediction. These AI-powered capabilities have transformed how people interact with

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SNSs, resulting in increased engagement and user satisfaction. However, integrating AI introduces potential risks that can have far-reaching consequences, particularly in terms of library usage. AI algorithms are intended to personalize content, providing users with information that is relevant to their interests and behaviors (Bakshy et al., 2015). While personalization boosts engagement, it can also create echo chambers and filter bubbles, limiting access to diverse perspectives (Pariser, 2011).

Factors Contributing to the Rise of AI-Enhanced Social Networking Sites

Developments in AI Technology: More complex AI-powered features and functionalities for social networking sites (SNS) have been made possible by the quick advances in AI technology, especially in fields like machine learning, natural language processing, and computer vision.

- **Consumer Demand for Personalisation:** Consumers are becoming more and more accustomed to receiving experiences that are customised to their tastes and passions. AI algorithms boost user satisfaction and engagement by enabling SNS to deliver highly targeted content, recommendations, and ads.
- **Competition between SNS Platforms:** Robust competition between SNS platforms encourages uniqueness and innovation. Intelligent chatbots, content recommendations, and photo tagging capabilities are examples of AI-enhanced features that give businesses a competitive edge by drawing and keeping users.
- **Possibilities for Monetization:** SNS platforms can now more efficiently monetize user data thanks to AI-powered marketing and advertising tools. Platforms can maximise advertising revenue by maximising the delivery of more relevant ads by utilising AI algorithms to analyse user behaviour and preferences.
- **Data Accessibility and Availability:** A rich source of information for AI algorithm training is the abundance of digital data created by users. The development of AI-enhanced features is driven by the abundance of user-generated content, social interactions, and demographic data that SNS platforms have access to.

Hazards of AI in Social Networking Sites

Despite its promise, the proliferation of AI in social networking sites has raised concerns about privacy, autonomy, and data manipulation. The opaque nature of algorithmic decision-making increases the risk of bias and discrimination, exacerbating existing inequalities and limiting the diversity of perspectives available to users. Furthermore, SNS platforms' commodification of user data raises ethical concerns about the ownership and control of personal information, undermining user privacy and autonomy. In the context of libraries, relying on AI-powered recommendation systems may unintentionally reinforce echo chambers and filter bubbles, limiting access to diverse perspectives and credible sources.

Echo Chambers and Filter Bubbles: AI algorithms can filter out information that contradicts a user's prior beliefs, resulting in intellectual stagnation and limited information exposure. AI-powered content curation algorithms can generate filter bubbles and echo chambers,

exposing users to a narrow range of perspectives and information. This can result in a lack of exposure to diverse perspectives and a distorted understanding of various topics, including those concerning libraries and their resources.

Information Overload: AI-powered recommendations may overwhelm users with an abundance of information, making it difficult to determine quality and credibility.

Privacy Concerns: Data collection by AI algorithms on social networking sites raises concerns about user privacy and the potential misuse of personal information. AI-enhanced SNSs collect massive amounts of user data, which is susceptible to breaches and misuse. This raises concerns about privacy and data security, which may deter users from using library resources that require personal information.

Addiction and Distraction: Artificial intelligence-powered features in social networking sites are intended to keep users engaged for extended periods, potentially leading to addiction and distraction. This can have a negative impact on library usage because users may prefer to spend their time on social networking sites rather than visiting libraries or using their resources.

Reduced Reliance on Librarianship: Over-reliance on AI recommendations could undermine the value of professional librarians who can curate resources and guide research.

Methodology

To investigate the impact of AI-enhanced AI driven Social Networking Sites on library usage, this study employs a mixed-methods approach, combining quantitative and qualitative data collection and analysis.

Quantitative Data Collection

Distributed to 100 SNS users to gather data on research, reading habits and hazards. Out of 100, 93 responses were received from the respondents. Questions that focus on the extent of SNS influence on information seeking behaviors.

Usage Statistics

Analysis of library usage statistics after the rise of AI-enhanced SNS to identify trends and patterns.

Table 1.1: Level of Success in Research Using AI driven Social Networking Sites

S.No	Level of success	No of Respondents	Percentage
1	High	52	55.9
2	Average	31	33.3
3	Low	10	10.8
	Total	93	100.0

Source: Primary data

From the table 1.1, it is interpreted that 52 respondents have high level of success in research because of using AI driven Social Networking Sites. About 31 respondents have average level of success whereas 10 respondents have low level of success in research.

Table 1.2: AI driven Social Networking Sites Affect Reading Habit

S.No	AI driven Social Networking Sites affect Reading Habit	No of Respondents	percentage
1	Yes	65	69.9
2	No	28	30.1
	Total	93	100.0

Source: Primary data

Table 1.3: Dangers Associated with AI driven Social Networking Sites

S.No	Dangers	Strongly Disagree	Disagree	Agree	Strongly Agree	Total
1	Theft of valuable data.	16 (17.20%)	11 (11.82%)	44 (47.31%)	22 (23.65%)	93
2	Internet addiction	22 (23.65%)	16 (17.20%)	41 (44.09%)	14 (15.05%)	93
3	Laziness	23 (24.73%)	6 (6.45%)	50 (53.76%)	14 (15.05%)	93
4	Lack of privacy	19 (20.43%)	10 (10.75%)	53 (56.98%)	11 (11.82%)	93
5	Cyber-bullying	19 (20.43%)	19 (20.43%)	47 (50.53%)	8 (8.60%)	93
6	Others	23 (24.73%)	13 (13.97%)	46 (49.46%)	11 (11.83%)	93

Source: Primary data

From the table 1.2, 65 respondents say that using AI driven Social Networking Sites affect their reading habit. Only 28 respondents say that using AI driven Social Networking Sites doesn't affect their reading habit.

Table 1.3, are the dangers that occur due to the usage of AI driven Social Networking Sites. The danger theft of valuable data is strongly agreed by 22 respondents, about 44 respondents agree, 11 respondents disagree and 16 respondents strongly disagree this danger. Internet addiction is being strongly agreed by 14 respondents while 41 respondents agree and 16 respondents disagree. 22 respondents strongly disagree

this danger. About 23 respondents strongly disagree the danger of laziness. Only 6 respondents disagree this danger whereas 50 and 41 respondents agree and strongly agree respectively. Lack of privacy is strongly disagreed by 19 respondents. 10 respondents disagree and 53 respondents agree with the danger of privacy lacking. 11 respondents strongly agree with it. Cyber bulling is strongly agreed by 8 respondents. 47 respondents agree whereas 19 respondents disagree and strongly disagree with this danger.

Table 1.4: Problems faced while using AI driven Social Networking Sites

S.No	Problems	Yes	No	Total
1	Network problem	87 (93.55%)	6 (6.45%)	93
2	Mental health impact	63 (67.74%)	30 (32.25%)	93
3	Ram speed	64 (68.8%)	29 (31.18%)	93
4	Vision problem	52 (55.91%)	41 (44.08%)	93
5	Back pain	49 (52.69%)	44 (47.31%)	93
6	Hand pain	47 (50.53%)	46 (49.46%)	93
7	Hacking	43 (46.24%)	50 (53.76%)	93
8	Misuse	28 (30.10%)	65 (69.89%)	93
9	Others	43 (46.24%)	50 (53.76%)	93

Source: Primary data

The table 1.4 describes the problems that are faced by the respondents while using the AI driven Social Networking Sites. Network problem is being faced by almost 93.55 % of the respondents while only 6 respondents said that they are not facing network issues. 67.74 % respondents suffer from mental health impact while the remaining 32.25 respondents says no to this issue. About 68.8 % respondents agree that their device RAM speed as problem whereas 31.18 % respondents disagree this problem. Back pain is faced by almost 52.69 % respondents while remaining 47.31 respondents says no. Because of using mobile phones almost half of the respondents i.e. 50.53 % respondents suffer from hand pain remaining half disagree this problem. Hacking of their accounts is faced by 46.24 % respondents. 53.76 % respondents disagrees the threat of hacking. Misusing of their accounts is faced by 30.10 % respondents while 69.89 disagree.

Strategies for Libraries in the Age of AI-Enhanced SNS:

- Develop AI Literacy Programs: Libraries can educate users about AI algorithms and their potential biases, empowering them to critically evaluate information encountered online.

- **Promote Human Expertise Alongside AI:** Highlight the irreplaceable value of librarians as information navigators who can provide context and guidance beyond AI-powered recommendations.
- **Curate High-Quality Content:** Libraries can leverage their expertise to curate reliable and trustworthy resources, differentiating themselves from the potentially biased information flow on SNS.
- **Embrace AI for Internal Operations:** Libraries can utilize AI for internal tasks like collection management, resource organization, and user behavior analysis to improve service delivery.

Conclusion

This study aims to shed light on the complex relationship between AI-enhanced social networking sites and library usage. By examining both the hazards and benefits, we hope to provide a nuanced understanding of how these technologies influence information consumption and the role of libraries. The findings will offer valuable insights for library professionals, policymakers, and tech developers in navigating the digital landscape and ensuring that libraries continue to thrive as vital centers of knowledge and community. In conclusion, the integration of AI into social networking sites presents a double-edged sword for libraries, offering both opportunities and hazards that must be carefully navigated. While AI-enhanced SNS have the potential to revolutionize information access and engagement, they also pose risks to privacy, autonomy, and information diversity. By critically examining the implications of AI in social networking and advocating for ethical practices, libraries can mitigate these hazards and harness the power of AI to better serve their patrons. As guardians of knowledge in the digital age, libraries play a crucial role in shaping the future of AI-enhanced social networking and ensuring that it remains a force for positive change.

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THE ROLE OF FACT-CHECKING TOOLS IN COUNTERING MISINFORMATION

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Introduction

Social media allows everyone to create and post information to the world. This causes the production of an enormous volume of information online.In an information-explosive era, information literacy is crucial.UNESCO defines information literacy as which " empowers people in all walks of life to seek, evaluate, use and create information effectively to achieve their personal, social, occupational and educational goal" (*Information Literacy | UNESCO*, 2023). Evaluation of information is an important skill that's needed at the current time. It isn't easy to filter all the huge amount of information produced every minute. Much of this information will be misinformation, fake news, or disinformation. So, it is more of a kind of a duty of every individual to evaluate the information that is received, for its authenticity.

Information that is incorrect, misleading, or untrue is referred to as misinformation; however, it should be noted that misleading information can also be presented out of context without necessarily being false (Treen et al., 2020).There are also various other terms related to misinformation like disinformation, malinformation, etc. Misinformation can have serious consequences for a society from influencing individual opinions, health, and safety of people to elections. The studies like (Allcott & Gentzkow, 2017) shows how much misinformation was spread during the 2016 American election. Misinformation can have very serious consequences. Making ordinary people aware of the misinformation, its consequences, and the possible ways to overcome are needed for bringing up a knowledgeable society. Solibrarians must createthis awareness among people and make them information literate.

Methodology

The data for the study is collected from various sources on the internet. This study defined and examined the features of the three categories of fact-checking methods. Various open access and proprietary fact-checking tools are identified from the internet

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and studied for their features. Various tools that debunk misinformation that are spreading in the Indian atmosphere are also listed and analyzed. The objectives of this study are:

- To examine various free and commercial fact-checking tools available online.
- To examine the strengths and limitations of various fact-checking methods.
- To understand the effectiveness of various fact-checking tools in contexts like politics, science, health, and culture.
- To understand the role of AI in fact-checking.

Analysis and Discussion

Numerous surveys indicate that 61.4% of people worldwide utilize social media, with 80.8% of audiences over the age of 18 using it as well (*Backlinko.Com*, n.d.). All these people have the opportunity to create and share information to the public. It is difficult to verify or sensor all this information and social media like Whatsup have privacy agreements like end-to-end encryptions. So it is difficult to monitor all the information before sharing. Social media carries a lot of fake information. The information which are false can be again classified as misinformation, disinformation, or malinformation One of the most effective ways each individual can follow to counter fake news is by practicing fact-checking.

Misinformation, Disinformation, Malinformation (Wardle & Derakhshan, 2017) defines these terms as:

- Mis-information is when false information is shared, but no harm is meant.
- Dis-information is when false information is knowingly shared to cause harm.
- Mal-information is when genuine information is shared to cause harm, often by moving information designed to stay private into the public sphere.

Fact-checking is the process of evaluating the information. Fact-checking can reduce misinformation (Chan et al., 2017)debunking it is an important scientific and public-policy goal. This meta-analysis (k = 52, N = 6,878.It helps to guarantee that the public has access to trustworthy and dependable data by acting as a barrier against the dissemination of misleading information.

When evaluating a piece of information, we need to follow a few criteria. In 2004 Sarah Blakeslee of California State University created an acronym for these steps to remember and thus the CRAAP test came into use(Blakeslee, 2004)

C – Currency (timeliness of the information)
R – Relevancy (Whether the information relatesto the topic or your needs)
A - Authority (The source of the information)
A – Accuracy (The reliability, truthfulness and correctness of the content.)
P – Purpose (For what purpose the information is created and existing)
(*Evaluating Information – Applying the CRAAP Test*, 2004).

Fact-CheckingMethods

Fact-checking methods are the systematic process of evaluating the correctness of information.Fact-checking methods can be classified into three as manual fact-checking, automated fact-checking, and hybrid fact-checking.

Manual Fact Checking

In manual fact-checking human experts verify the claims by directly checking the source and its other features. The major steps in manual fact-checking are primary source verification, expert consultations, cross-referencing (*Fact-Checking*, 2024)

Automated Fact Checking

One of the important parts of everyone's life today is social media, which carries a majority of misinformation. So, it isn't easy to evaluate the information we come across online. Automated fact-checking makes this easy. Fact-checking done using algorithms and AI without any human help is called automated fact-checking. Automated fact checking contains two steps i) Claim detection and ii) Information extraction. AI-poweredautomated fact-checking uses Natural Language Processing (NLP) and Machine Learning (ML) (Ünver, 2023).

Hybrid Fact Checking

Hybrid fact-checking involves both human and automated processes in fact-checking. The combination of automated and human fact-checking makes this method more efficient and accurate.

Fact-CheckingTools

Fact-checking tools are software, websites, or programs that help the user identify information correctness. Many fact-checking sites on the internet help us in countering misinformation. To bring together the global community of fact-checkers and supporters of accurate information in the global battle against misinformation, formed an international network of fact-checkers called International Fact-Checking Network (IFCN) at Poynter in 2015. IFCN encourages innovative projects and initiatives that enhance journalistic responsibility, provide resources to fact-checkers, and add to public conversation. According to the code of principles of IFCN in 2016, the networked sites should have a professional commitment to non-partisanship transparency of the organization and their funding, transparency of methodology, and corrections.

Open Access Fact-Checking Tools

Open-access fact-checking tools are digital resources and platforms that are freely accessible to the general public, enabling anybody to check facts and dispel falsehoods. Because of their accessibility and ease of use, these tools enable individuals, journalists, researchers, and organizations to independently verify the veracity of a range of statements and data. Some of examples of open-access fact-checking tools are:

Snopes.com

Snopes is a fact-checking site started in 1994 by David Mikkelson and Barbara Mikkelson. It is the largest and oldest fact-checking site(*Snopes.Com*, 2024). Although Snopes itself is proprietarythe public can freely view the fact-checks and articles that the organization produces by visiting their website.

Features

Fact-checks on topics like politics, science, culture, etc. But mostly US-centred news.

- Can submit your claims and verify
- Home page contains newly fact-checked claims
- Give ratings for the verified claims like false, mostly false, true, mostly true, etc.
- Give explanations for the claims along with the source citations
- Google Fact Check Tools

The Google fact check tools consist of two tools i) Fact Check Explorer and ii) Fact Check Markup Tool. The fact check explorer allows easy searching of fact checks and the fact check markup toolmakes the process of creating ClaimReview markup easier, by allowing markup to be submitted via a simple web form without the need to add anything to the article itself(*Fact Check Tools Recents*, n.d.). Google fact-checking tools incorporate various other fact-checking tools like Snopes, FactCheck, etc, so searching a claim in Google fact check explorer provides results from these sources.

Features

- Collaborates with various fact-checking sites like Snopes, FactCheck, PolitiFact, Vera Files, etc.
- Includes a wide variety of topics even international ones as it has collaborated with various fact-checking sites
- Fact Checking is available in multiple languages
- Can submit your claims and verify
- Can search by image
- Home page contains recent fact-checked news
- Provide explanations for the claims with authentic sources

Factcheck.org

Factcheck.org is a nonprofit, non-partisan fact-checking project developed by the Annenberg Public Policy Center of the University of Pennsylvania. This project aims to reduce the level of deception and confusion in US politics (*FactCheck.Org*, n.d.)

Features

- Mostly debunks American political misinformation
- Can submit your claims and verify by emailing the claim to the editor
- Home page contains recent fact-checked news
- Provide explanations for the claims with authentic sources

PolitiFact

PolitiFact is a nonprofit fact-checking organization started in 2007 by Tampa Bay Times, Now the ownership of PolitiFact is transferred from Tampa Bay Times to Poynter Institute for Media Studies. PolitiFact partners with Meta and TikTok. Meta and TikTok flag posts that they believe may be factually inaccurate or misleading. Fact-checkers from PolitiFact review the posts and advise the social media companies on the veracity of the claims made in them(*PolitiFact*, n.d.)

Features

- Mostly debunks American political misinformation
- Partners with Meta and TikTok
- Can submit your claims and verify
- Home page contains recent fact-checked news
- Provide explanations for the claims with authentic sources.

Truthor Fiction

TruthorFiction is a non-partisan fact-checking website designed to verify the misinformation spreading through email and social media from 1999 onwards.

Features

- Subscription for ad-free browsing
- We can't submit any claims for verification.
- Home page contains recent fact-checked news
- Provide explanations for the claims with authentic sources

ClaimBuster

Claimbuster was founded in 2017 by the University of Texas at Arlington. It is an automated live fact-checking tool. This tool using NLP techniques identifies the claims that have factual inaccuracies. Apart from other fact-checking tools, this tool specifies debunking the claims needing further clarification. However, this tool can identify the authenticity of photos(*ClaimBuster*, n.d.).

Features

- Automated live fact-checking using NLP
- Allows verification of claims in multiple languages
- The home page does not contain recent fact-checked claims.
- This site doesn't directly verify the claims but instead automatically identifies the claims worth fact-checking.
- Can submit your claims and verify
- Provide explanations for the claims with authentic source
- Collaborates with Facebook. Facebook uses Claimbuster to identify potentially false claims

LeadStories

Lead Stories is an online fact-checking tool that focuses on confirming popular stories and dispelling misleading information that appears on social media and other online channels. Lead Stories, which was founded in 2015, has made a name for itself as a trustworthy resource for debunking rumors and conducting fact-checks(*Lead Stories*, n.d.).

Features

- Fact-checking partner of Meta applications like Facebook, Instagram, and Threads and also TikTok.
- Can submit your claims and verify.
- Home page contains recent fact-checked news.
- Provide explanations for the claims with authentic sources

CaptainFact

CaptainFact is one of the rare, crowdsourced fact-checking platforms where users can add comments and sources to a fact-checked video by quoting the statement, adding comments or sources behind the statements, voting on the quality of the sources to earn a reputation for each vote(Monnier et al., 2022). CaptainFact is a copylefted libre online platform, transparent and open to different perspectives(*CaptainFact.Io*, n.d.)

Features

- Verifies the accuracy of statements in videos.
- Home page contains recent fact-checked news
- Provide explanations for the claims with authentic sources. CaptainFact provides tools for users to add references, links, and sources to support or reject claims.
- Users can vote on the reliability of the claims and the quality of the fact-checks

Table 1: Comparison of Open Access Fact-Checking Tools

Fact-checking tools	Founder	Country of Origin	Coverage	Provides source citations for the verifications	Can submit your Queries	Can search the claims	compliant with IFCN principles
Google fact-checking tools	Google	-	Broad	Yes	Yes	Yes	-

Snopes	David Mikkelson and Barbara Mikkelson	United States	Broad coverage including Politics, Health, Science, Entertainment, Popular Culture, etc.	Yes	Yes	Yes	Yes
Factcheck.org	Annenberg Public Policy Center	United States	Political	Yes	Yes	Yes	Yes
PolitiFact	Tampa Bay Times, a Florida newspaper	United States	Political	Yes	Yes	Yes	Yes
Truthor Fiction	Rich Buhler	United States	Broad	Yes	No	Yes	No
Claim Buster	Dr.Chengkai	United States	Broad	No	Yes	Yes	- (It's not an Organisaton)
Lead Stories	Maarten Schenk, Alan Duke, Perry Sanders, and Sarah Thompson	United States	Broad	Yes	Yes	Yes	Yes
Captain Fact	Benjamin Piouffle	-	Broad	Yes	Yes	Yes	No

Open Access Fact-Checking Tools for Indian News

FactChecker.in

FactChecker.in started in 2013 is considered as the first dedicated Indian fact-checking website. It deals with verifying claims made by Indian politicians, public figures, and media(factchecker, n.d.).

Features

- Focuses on the broad subject of areas but mainly on Indian politics.
- Can submit your claims and verify.
- Home page contains recent fact-checked news.
- Provide explanations for the claims with authentic sources

AltNews

Alt News is a well-known fact-checking website that aims to refute false information found in the media, politics, and social media. AltNews was started in 2017 by Pratik Sinha and Mohammed Zubair(*Altnews.In*, 2024)

Features

- Can submit your claims and verify.
- Home page contains recent fact-checked news.
- Provide explanations for the claims with authentic sources.

The Quint Fact Check

The Quint Fact Check or also called WebQoof is a fact-checking division of the digital news platform 'The Quint'. The Quint was founded in 2013 by Raghav Bahl and Ritu Kapur (*The Quint WebQoof*, n.d.).

Features

- Covers a wide range of topics, including political statements, viral social media content, health information, and claims made by public figures
- Can submit your claims and verify.
- Home page contains recent fact-checked news.
- Provide explanations for the claims with authentic sources.

Boom

Boom is a fact-checking website that aims to debunk and verify misinformation, particularly on social media. Boom was founded in 2014 by Govindraj Ethiraj.

Features:

- Can submit your claims and verify.
- Home page contains recent fact-checked news.
- Provide explanations for the claims with authentic sources

Table 2: Open Access Fact- Fact-Checking Sites for Indian News

Fact-checking tools	Founder	Coverage	Provides source citations for the verifications	Can submit your Queries	Can search the claims	compliant with IFCN principles
FactChecker.in	Govindraj Ethiraj	Broad but mostly Indian Politics	Yes	Yes	Yes	Yes
AltNews	Pratik Sinha	Broad but mostly Indian Politics	Yes	Yes	Yes	No
The Quint Fact Check (WebQoof)	The Quint (Raghav Bahl)	Broad but mostly Indian Politics	Yes	Yes	Yes	Yes
Boom	Govindraj Ethiraj	Broad	Yes	Yes	Yes	Yes

Proprietary Fact-Checking Tools

Proprietary fact-checking tools are not publicly accessible, but they are made to help with information verification. They usually come with large databases, specialized features, and advanced features that are intended for professional use by fact-checking organizations, journalists, and researchers. Some proprietary fact-checking tools are:

FactMata

FactMata is an artificial intelligence (AI) startup whose mission is to detect and remove harmful content, prejudice, and disinformation from the internet. FactMata was founded in 2017 by Dhruv Ghulati, Mevan Babakar, and Andreas Vlachos. Natural language processing (NLP) techniques are used by Factmata's AI technology to automatically identify and classify internet content that may be dangerous or unreliable. As a sort of triage system for misleading content, the AI rates the trustworthiness of every piece of content it looks at. The trust rating provides a thorough assessment of quality, safety, and credibility by evaluating reliability from the standpoint of nine distinct signals, such as toxicity, political bias, clickbait, and others(*Factmata*, n.d.).

Logically

Logically is a hybrid fact-checking tool that uses artificial intelligence and human expertise to correct misinformation. It uses automated tools to verify claims and provide accurate information quickly and it generates detailed reports on misinformation trends and specific false claims(*Logically*, n.d.).

AI in Fact-Checking

The amount of misinformation produced is increasing every minute and also its rate of spreading is at an alarming rate. It is impossible to identify and correct all the misinformation that is created manually. AI can give a solution to this problem to a great extent. AI can help in pre-detection, debunking false claims on the internet, and to some extent verifying the claims. The use of AI in automatically detecting, and correcting misinformation can be termed as automated fact-checking.

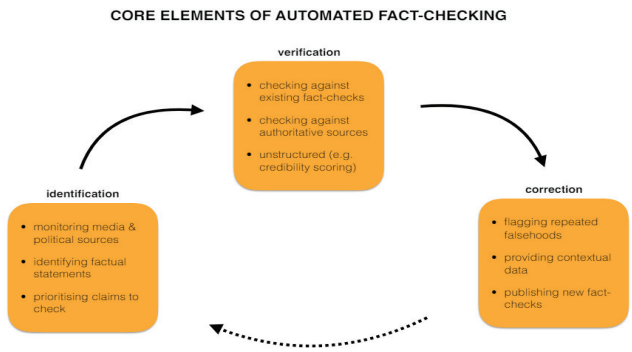


Figure 1: Automated Fact-Checking Process (Graves, 2018)

Automated fact-checking contains two steps i) Claim Detection and Information Extraction. ii) Verification iii) Correction. In the Identification process, the algorithm oversees the media and online information sources and identifies the statements that need to be checked and prioritises them. NLP (Natural Language Processing) technologies are used to identify the claims that require verification. NLP helps to analyze thetextual content and identifies factual inaccuracies (Ünver, 2023). In the information extraction process entities like people, organizations, dates, etc are identified which is called the named entity recognition (NER), and the relationship between these entities is determined.Understanding the emotions behind the information is crucial in automatically identifying false claims. Advanced methods like BERT, convolutional Neural Networks (CNNs), etc do the sentiment analysis and stance detection procedures (Ünver, 2023). The second step is information verification which includes three ways. The first one is checking against existing fact checks done before. The second one is checking against the authoritative sources and the third one is evaluating the credibility of the source. The last step in the automated fact-checking process is correction. It includes providing contextual data and creating new fact-checked data.

The use of AI at the same time is a solution and reason for the misinformation. The widespread use of AI among people has increased the creation of deepfake photos and videos. Deepfake shows people doing and speaking things that they have never done or said(Fallis, 2021). But there is AI which checks whether the videos are AI created or not. Using those can correct that deep fake misinformation to an extent.

Chat GPT as a fact-checking tool

Open AI launched a generative AI model called ChatGPT-3.5 in November 2022. Later in March 2023, the new version GPT-4 was introduced. It is very easy to get information about 'anything through ChatGPT. It doesn't mean ChatGPT can be used as an authentic information source especially for fact-checking. (Cuartielles et al., 2023) studied about the pros and cons of using ChatGPT as a fact-checking tool. ChatGPT works based on pre-trained data. Much of the data this chatbot provides depends on this pre-trained data. If the pre-trained data is biased, the fact-checking cannot be trusted. The fact-checker community is distrustful of ChatGPT because of the scope of the database it was trained on(Cuartielles et al., 2023). Another limitation of ChatGPT as a fact-checking tool is that ChatGPT is not up to date with the knowledge. ChatGPT lacks information or events after September 2021.

Chat GPT can't provide correct citations for the sources of information they provide, which is a major setback in fact-checking. For ChatGPT to become a tool that is frequently used in fact-checking procedures, there would need more transparency and dependability in the sources it uses and more rigor and abundance in the responses it generates (Cuartielles et al., 2023). So ChatGPT cannot be used as an authentic fact-checking tool. As said by the ChatGPT itself "ChatGPT can make mistakes. Check important info." .

Results

There are various fact-checking tools available on the internet. of these, there are freely accessible fact-checking tools and proprietary fact-checking tools. Some of the open-access fact-checking tools are Snopes, Factcheck.org, PolitiFact, Google fact-checking tools, TruthorFiction, Claimbuster, LeadStories, and Captain Fact, etc. There are proprietary fact-checking tools available. Examples for this are Factmata, Logically, etc. Both Factmata and Logically use AI tools to identify and correct misinformation. of these fact-checking tools, google fact-checking incorporates various other fact-checking sites like Snopes, and Factcheck.org, etc. So, it is more user-friendly. Most of the tools are user-friendly in designing their home page with easy access to the search bar for searching the claims and with the homepage showing recently fact-checked claims. Most of the tools shows the verified information with tags like true, mostly true, false, mostly false, misleading, etc. Among these tools studied, ClaimBuster is a tool that only debunks the most possible misinformation, but doesn't verify it. ClaimBuster uses AI technologies to identify claims that may be possibly false.

Google fact-checking tools, Snopes, TurthorFiction, ClaimBuster, etc verify misinformation on a wide area of topics including health, politics, science, entertainment, culture, etc. FactCheck.org, PolitiFact verifies misinformation on the topic politics. Both mostly debunk American political misinformation. The fact-checking tool CaptainFact verifies misinformation spreading through videos. This site converts the audio of the video into text and fact-checksthis text. There are fact-checking tools that are specifically designed for verifying misinformation in Indian news. The tools like FactChecker. in, Altnews, The Quint News Fact Check, Boom,etc are some examples for it. Even though these tools verify most of the misinformation of the Indian context, the tools FactChecker.in, Altnews, The Quint News Fact Checks concentrates on Indian Politics. The Quint News is a part of a digital news website, all others are independent fact-checking tools. Automated fact-checking tools that incorporate AI in identifying and verifying claims are now in use. Natural Language Processing (NLP) and Machine learning (ML) techniques are used for fact-checking. ChatGPT cannot be used as a good fact-checking tool. ChatGPT itself says that ChatGPT can make mistakes. Even though ChatGPT gives answers to all our questions, they don't provide correct source citations. There are many limitations to ChatGPT as a fact-checking tool.

Conclusion

This study helps the librarians and researchers in understanding various factchecking tools and thereby making the ordinary people aware about it. As there are so much misinformation spreading in the social media, fact-checking is an essential method to be practiced by the people. There are various fact-checking tools available and the use of these can counter misinformation to a greater extent.

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FINANCIAL IMPLICATIONS FOR UNIVERSITY LIBRARIES: A STUDY ON DIGITAL LIBRARY AND AUTOMATION

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Introduction

The University develops based on the allocation of the budget for the financial year; it helps in planning and organizing in the library management for the long term development. The librarian is the only responsible personality for estimating, discussing and implementing of the financial budget in the University Library. Generally the budget allocation for one financial year, it happens in the December month of every year. In the library budget, there are three classifications; the recurring grants are; normally for the sake of acquisition of books, periodicals, magazines, newspapers, journals including E-Journals, employees' salaries or wages, institutional membership in the professional bodies, general management in the library. The non recurring grants are; contraction of new library buildings and extension of existed library buildings, purchase of equipment to connection of internet and intranet and furniture of tables, racks, chairs etc, electronic devices like; computers, Xerox machines, scanners, bar-code machines, cleaning machines etc. The ad-hoc budget is; which is using for the development of

Table-1 Classification of Budget on Libraries

Recurring grants	Non Recurring grants	Ad-hoc Grant
Employees' salaries or wages	Contraction of new library buildings	Using for the development of special collections in the University libraries.
Institutional membership in the professional bodies	Extension of existed library buildings	Transformation of digital libraries and automation development
General management in the library	Purchase of equipment to connection of internet and intranet	Sustaining and rapid changes in the modernization of libraries
Acquisition of ; • Periodicals • Magazines • Newspapers • E-Journals • Books • Journals	Furniture of tables, racks, chairs etc Electronic devices; • Computers, • Xerox machines, • Scanners, • Bar-code machines, • Cleaning machines	Sign boards for inspection, sudden increase of students in the university, heavy damages due to natural calamities. Emergency replacing of the machines and equipment.

Source:Secondary Data

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special collections in the University libraries and transformation of digital libraries and automation development which are mention in the table-1. In these aspects, some functioning in the University libraries, need to be proper budget allocation is requiring for sustaining and rapid changes in the modernization of libraries. The main objective of the paper is to analyze the budget allocation and their implications in the university libraries especially transforming the digitization and automation era. In this context, the library in the university must be developed to provide special provision of adequate funds to manage of library activities. The budget must be supervised periodically to avoid the misuse of funds or lapse of funds in the financial year.

Digital Libraries

Digital libraries may be defined as electronic information collections containing large and diverse repositories of digital objects, which can be accessed by a large number of geographically distributed users. Such repositories would exist in locations physically near of remote from the users. The digital objects include text, images, maps, sounds, videos, catalogues and indices and hypertext multimedia compositions etc.

Table-2 Details of Different Components and Prerequisites of Digital Library

Components of Digital Library	
Digital library is not a single entity.	It requires technology to link the resources of many.
Information services are transparent to end users.	Universal access of information services
In Intellectual Property Rights and Digital Rights Management.	Its collections are not limited to document surrogates.
Prerequisites for Establishing Digital Library	
High Speed Computer	Server Segments
Multimedia Kit	Printer
Fast Scanner	LAN Connectivity
Internet Connectivity	Trained Library Staff

Source:Secondary Data

The data in the prescribed format shows that various components and prerequisites to conversion of the library as digital library in the institution. For this changes huge budget allocation has required for the institutions.

Table-3 Details of Description activities in the Digital Library Process

S. NO	Name of the Digital Activity	Description of the Activity
1	Electronic Publishing	Publishing on websites, digi-boards etc
2	Audio and Video Communication	permit all participants to hear, see, and speak to all other participants in real time
3	Electronic Table of Contents	Alerts are an easy way ot manage your online collections
4	Internet Information Sources Mirroring	E format that's provide the information and an interface
5	Reports & Journals	Easy to access of Chronological order and search based
6	Discussion groups and forums	Online discussions of posted items
7	Special Collections service	Refers to any cohesive collection of research materials linked by origin or by a thematic focus
8	Reference Service	Direct aid to the library users
9	CD-ROM Databases	Storage of large quantity of data in the form of bibliographical, full text, numerical, graphical and even sound
10	Remote Information Services	Provides a single login interface for accessing subscribed e-journals, e-books and databases
11	Internally Published Newsletters	Send or use though emails, scanners, what app groups, face books, .twitter, Instagram etc
12	Cataloging	Availability of resources in open access
13	Bulletin Board Service	A venue to announce new arrivals in the library through computer or screen
14	Net news system	Electronic messages distributed by means of news groups such as Usenet
15	E-mail	All services' alert from library staff and use public and private information sharing
16	Electronic Table of Contents	All available and new data bases arrivals announces electronically
17	Electronic Theses and Dissertations	Open access to the Research scholars and Researchers in the University/Institution
18	Electronic Publishing	The publishing of online content, including books, magazines, journals, and news papers
19	Central storage facilities for Hosting digital collections and indexes	CD ROM, DVD ROM, Blue Ray or opt-magnetic devices,HSM (hierarchical mechanisms) SAN(storage area networks) and NAS ((network attached network
20	Tools for loading, storing, searching, and displaying digital objects	Programs, websites, applications, and other internet and computerized resources that facilitate, enhance and execute digital .processed and overall digitization efforts

Source:Secondary Data

The table 3 data describes the information of digital library process of activities and management in the central as well as departmental libraries for this purpose huge financial implications are required to fulfill the gap of digital era from the traditional methods.

Library Automation

It refers to the use of computers to serve the needs of library users. The operations of library get a quantum jump with the introductions of computers. The computers help to provide fast and reliable access to the resources available in the library as well as elsewhere. The application of computers in the library operations avoids repetitive jobs and saves lot of labour, time, speeds up operations, increases use of library resources. Computers are not only used as a tool for processing the data, but also for data storage and accessing.

Table- 4 Basic Features and Prerequisites for Library Automation

Features of Library Automation	
It is electronics based activity	It is helpful to providing library services
Standardization in library work	Accuracy in work
Avoid duplication in the library work	Speedily communication of information
Trained staff	User friendly system
Prerequisites for Establishing Library Automation	
Financial Assistance	Hardware
Software	Trained Staff
User training	Maintenance and training
Adequate collection	Support some electronic devices

Source:Secondary Data

Role and Responsibilities of LC

The higher educational institutions are forming the standing committee of the academic council for perfect decision making on the library management, which activities are predominantly related to the budget preparation and implementation in the organization. It's a general policy making body for the library service of the university which advises the Syndicate on any matter connected with the Library services including funds, books, staff and adoption of technology in the library etc.

Table-5 Details of Constitute the Library Committee/Finance Committee for Library Management

S. NO	Authority in Higher Educational Institution	Nominated Position
1	Vice Chancellor/Director/Principal	Chairman
2	Registrar/University Librarian/College Librarian/Assistant University Librarian/Assistant University Librarian(Senior Level)//Deputy Librarian/Documentation Officeer/ Information Offiecer/Library Co-ordinator(No Regular Staff/Senior Staff not in the Institution)	Member and Secretary/ Convenor
3	Dean of Schools/Head of the Departments	Members
4	Dean Students' Welfare	Member

5	Senior Professors	Member
6	Research Scholars and Students(2 to 4 Members)	Member
7	Finance officer/CA/Senior Accounts of Officer	Member

Source:Secondary Data

The data in the table 5 is analyzing the framework of the library committee and finance committer which is intended to purchase the various library physical infrastructure and soft infrastructure for the development of the digital libraries in the higher educational institutions.

The following functions of the library committee:

- The library committee monitors the acquisition of books, journals, and the sanction of the budget according to the forwarding authorities from the departments.
- To monitor the disbursement of funds and utilization of funds for various departments for the procurement of books and journals for the Central and Departmental libraries.
- Regular advises and reviews on library policies for facility, services,financial resources, human resources, physical resources and instruction.
- Special recommendations in relation of library financial services, particularly innovation of library buildings and other digitization process.
- To maintain liaison between central library and various academic departments for the acquiring of transforming networking of departmental libraries with the main or central library in the university or college.
- To discuss and finalizing of weeding out materials and patch works to the books etc.

Table-6 Various Library Softwares for Automaton

KohaILS	Easylib Library Automation	NewGenLib
Codeachi Library	Evolve library	Oliver v5
Destiny Library Manager	Insignia Library System	ResourceMate
BiblioteQ	Cataloguing	Genesis G4
Handy Library Manager	LIBSYS Ltd.	TMAS
Alexandria	Mandarin	Bibliocommons
Library Manager	Librarian	Surpass
Accessit Library	Soutron	Liberty
SOUL 3.0	Smart campus Connect	SirsiDynix Symphony

Source:Secondary Data

The data revels that in the table; various Softwares are using for library automation in India and world. These are predominately contributing the services to the library management in modern era. The higher educational institutions are high frequency of library users. These are popularized for enhancing of service quality and maintenance in libraries.

Table-7 Finance allocation on Digitalization and Automation Process in the Libraries

Digitalization	Expenditure (In Lacs)	Automation	Expenditure (In Lacs)
1 to 3 Years	3 to 50	1 to 3 Years	2 to 70

Source:Secondary Data

The financial allocation depends on correct and effective estimation of scientific methodology by the university. The institution has to follow, whether per capita method, proportional method and method of details. The table 7 shows the when higher educational institutions want to change the transformation to traditional system to modernization on an average 10 to 50 lacs for the college level and 20 lacs to 90 lacs for universities are required. These are changing dramatically in library management and services to the library users.

Conclusion

The foundation of proper budgeting depends upon correct and effective forecasting like colleges and universities, public libraries and other research institutions attempt to make financial estimations of their needs and resources. The above basis in this paper how much budget a library requires depends upon the various superior institutions amendments like; UGC,Central Government, State Government, NAAC, PCI, NCTE,NBA, ICAR, ICMR, State Higher education Councils, AICTE and BCI. It also extended upon library users, new programmes are introducing in the institution every year and the scope of the extension of the building.

University libraries in India receive funds in various proportions from the following sources; University own budget, University Grants Commission, Grants from state and Central governments, gifts and endowments from the individuals, organizations, library fee prescribed by the university or college such as development fee, security fee and fines on damages of books and others. These grants are usually either in total to the university or phased manner distribute for transformation of technology. In modern era, very rapidly changing the education system also changes the library management systems in the universities.

The budget was must approved by the library committee and distributed to purchase of various activities and management issues in the library. The sudden instructions of the above cited institutions, the university has allot the Adhoc-budget to the library to uplifting the activities of digitalization process and automation process in the libraries.

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SECTION IV

LIS REPOSITORY AND SECURITY

APPLYING TEXT ANALYSIS TOOLS IN THAI DIGITAL ARCHIVE

Dr.Namtip Wipawin[1] & Dr. Duangkaew Ngernpoolsap[2]

Introduction

Thai higher education has an extensive history dating back to the nineteenth century. The Ministry of Higher Education, Science, Research, and Innovation (MHESI) was founded with a mission of improving higher education, science, research, and innovation. In 2022, it merged agencies with major responsibilities from the Ministry of Education, the Ministry of Science and Technology, and the Prime Minister's Office into one ministry. The MHESI includes over 100 agencies, each with a rich history and an array of significant, relevant, and historical data. Information regarding the evolution preceding the reform is disseminated both within and outside the ministry. It is available in various kinds of formats but is not yet suitable for use as academic information. Data management technology have advanced significantly, and there is a growing demand to access and use data from archives for research and teaching. However, no Ministry agency has yet initiated this.

The National Research Council of Thailand (NRCT), a government agency under the Ministry of Higher Education, Science, Research, and Innovation, holds responsibility under the Act on Administrative Regulations of the Ministry of Higher Education, Science, Research, and Innovation, B.E. 2562 (2019), which designates the NRCT as an agency with the important mission of establishing a database and index on science, research, and innovation in Thailand. Furthermore, the Science, Research, and Innovation Promotion Act of B.E. 2562 (2019) has assigned it an important mission: to establish a central information system that links national and international research and innovation data with the information systems of agencies in the research and innovation framework; to collect, analyze, and synthesize data on research and innovation operations and results in order to provide information for evaluating the status of research and innovation; and to provide guidelines for the country's science and technology strategic development policy and plan for science, research, and innovation.

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As a result, the national archives of higher education, science, research, and innovation contain important government documents that should be preserved in permanence. Furthermore, it is regarded as a record of government agency operations, a national treasure with administrative, legal, and research value. It is an operational plan and project document that is an important tool for administrators and operators. It serves as material for policy making, planning, and decision-making in order to determine and regulate operations based on previous activities. Legal records are also essential to defend and protect rights in the event of a lawsuit, whereas financial documents reveal the agency's financial situation and spending. When all historical records are collected and linked with other agencies' archival documents, they will reflect history, developments, events, and key activities that are relevant to understanding the agency's past and progress. It also represents the work of key persons who participated in the activities described in the record and can be used to reference that person's history, beliefs, attitudes, and opinions as expressed in their work at the time.

The construction of a Thai Higher Education Archive* is thus required to reflect the country's history and progress, which is important for preserving and extending knowledge. In Thailand, archival document management standards include AGLS, DACS, EAC-CPF, EAD, ISAAR(CPF), and ISAD(G). The National Archives also uses the ISO 15489 standard to help with the archive document management process, namely determining the value of historical records. By adhering to international standards in managing archival documents for preservation and long-term access to display knowledge on the development of Higher Education, it is therefore helpful in developing the country's higher education, science, research, and innovation archival system into an innovative data link that is the organization's memory and is intellectual property that reflects developments, changes, and progress in implementing the Higher Education development policies.

Research Objectives

The research objectives for developing the digital archive are:

- To design the process of developing the Thai higher education digital archive before examining the text analysis process;
- To apply the text analysis tools used in Thai higher education digital archive.
- Literature Review
- Higher education archive

As indicated in the Internet archives document management network in the form of a digital library (https://archive.org/), research archives systems overseas are frequently run in university libraries, government archives, and research organizations of various types. Several model agencies, including the United Nations Archives Search Engine and the National Library of the Netherlands' e-Depot archives system, have been certified for information management by the international standards CoreTrustSeal, an archival data management standard for managing archival work in open information

repositories based on METS, MODS, PREMIS standards, and the Open Archival Information Systems (OAIS) Reference Model.

Other examples of digital archives include the Archives Portal Europe, which is an online archive that provides access to information and stored items from multiple European countries. It complies with the cataloging standards apeEAD, apeEAC-CPF, apeMETS, EAD3, and EAG2012. The Citizen Archivist program of the United States National Archives allows individuals from the public to contribute to the catalog by labeling, describing, and commenting on archive records. This improves the ability to search for and access even more.

The PRONOM (Public Record Office and Nôm) project at the National Archive UK entails organizing digital files by creating a web-based database and outlining the features of currently available file types. General users can look up technical information about the file type they want to store based on its technical properties, such as the display of the file type identifier (PRONOM unique identifier (PUID), the provision of digital file metadata in accordance with the UK e-Government Metadata Standard, which displays file version information and file update time, and reduces operational level problems. Users can use a developed program called DROID (Digital Record Object Identification) to search for appropriate extensions and file types based on metadata standards before selecting, sorting, improving, or copying files and properly recording them in the archival information warehouse system database.

Text analysis in digital archive

Text analysis is the first digital humanities tool that applies techniques to analyze a large number of texts, known as a corpus, in order to learn about the information contained within them and to answer questions. Specific approaches include concordances, which arrange words inside a text to determine their frequency, topic modeling, which discovers repeating themes in texts based on common phrases, and stylometry.

Aangenendt (2022) concluded that artificial intelligence must be included into archiving systems and practices. Since the 1990s, governments and other archival organizations have increasingly used digital technology. This adjustment did not immediately cause a shift in archival practices and workflows. As long as the collection and document capacities allowed, the archiving procedure was mostly dictated by manual assessment, selection, and review. However, the opportunity for this change is swiftly closing. More and more historical collections are being digitized, and newly created digital materials are being submitted to archives on a larger scale. As a result, manual archiving is becoming less viable. At the same time, records continue to be assessed to ensure the quality and confidence that are the pillars of archives. As a result, while dealing with huge amounts of historical material, human archivists must rely on computer agents. The function of archivists is thus transformed since they must learn to use machine thinking for assessment and selection, as well as to evaluate machine decisions. The archive evolves into a big data organization, and as with all big data

organizations, it must rely on Artificial Intelligence (AI), mostly in the form of machine learning, to assist with the transition.

Hawkins (2021), on the other hand, proposes incorporating AI and low threshold tools, such as Wikidata, into the Linked Data production workflow in order to scale up the production of Archival Linked Data as a means of increasing access to and utilization of digitized and born-digital archives in order to increase collaboration between the two disciplines, and to enable individuals and institutions to interact with Linked Data.

Reiter (2019) also conducted a case study on the rising innovations in technology of computer-aided content analysis, which is becoming more common. The volume of available data, notably in sociology, history, and management and organizational sciences (MOS), is constantly increasing, complicating or constraining manual examination. Emerging techniques provide new possibilities of study and should be studied. In a large-scale research project, a significant utility company's non-digital archive examined different approaches for digitally analyzing paper documents.

Research Methods

This study designed the process of establishing Thai higher education digital archive before assessing the text analysis process and employing text analysis tools such as the Vayant and InfraNodus tools to produce a data visualization system. Commence by choosing ten issues related to higher education policy and development from the higher education ministry and offices in the archives, websites, and papers of Thai publications from 2013 to 2023, and then performing text analysis on the articles obtained from the archives.

Research Findings

The research findings are in two parts.

i. The method of designing Thai higher education digital archive before examining the text analysis process is in three steps, as follows:

ii. The acquisition of contents from five sources of information: the ministry websites, the organizations under the ministry, the university archives, the personal information of experts, and other medias;

iii. The contents are classified into ten content groups, including history and development, organizational structure, expert personal information, higher education policy and plan, mission and outcome, media and related documents, acts and laws, and information on science, research, and innovation;

Figure 1 The classification of content groups



Figure 1 The classification of content groups

4.1.3 Omeka S software is used to catalog the metadata. The Dublin Core metadata in higher education digital archives has 15 elements: Title, Subject, Description, Creator, Source, Publisher, Date, Contributor, Rights, Relation, Format, Language, Type, Identifier, and Coverage. Additional elements can also be used.

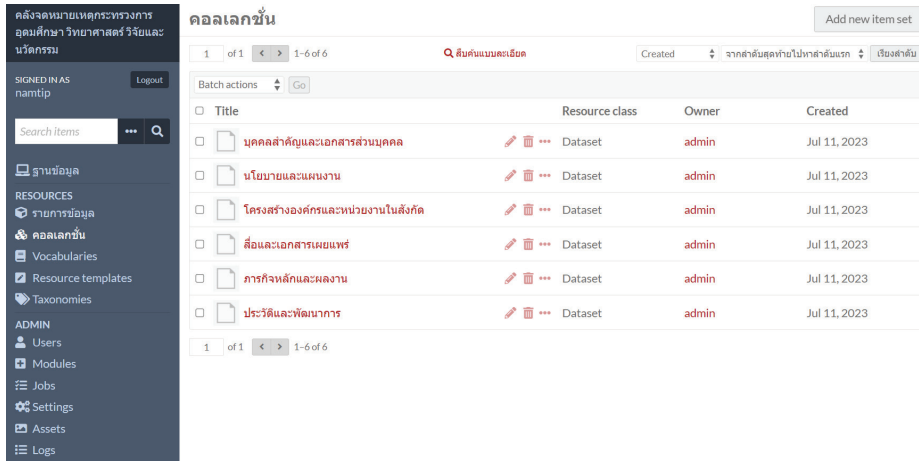


Figure 2 Cataloging and metadata by Omeka S software

4.2 The text analysis tools used in Thai higher education digital archive

The contents of information such as title, subject, and description can be downloaded using an Application Programming Interface (API) in the archive of higher education, science, research, and innovation to be evaluated in generating text visualization, which is classified into ten content groupings. Using archived information for data analysis and displaying data with text visualization tools such as Voyant and InfraNodus. The interface of this archive displays in five parts, as seen in Figure 3.

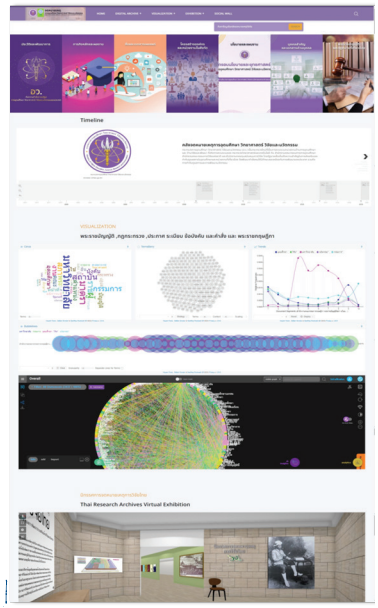


Figure 3 The archive interface of 5 parts.

As stated in this study, the text analysis tools utilized in Thai higher education digital archives are Vayant tool in Part 3 and Infranodus tool in Part 4, as follows:

Using Voyant tool

The Voyant tool is an online toolkit for text analysis that offers a variety of methods for displaying analytical results. Choosing a collection of tools requires making decisions based on the need to use the data analysis results, which may be categorized as the following key tools: wordcloud, loom graph, cirrus graph, TermsBerry, Trends, Collocates, and Bubblelines. These technologies allow individuals to comprehensively analyze textual data without any prior knowledge of statistics or computers. Voyant tools are suitable for text analysis in digital archives, academic research, creative writing, and business analysis.

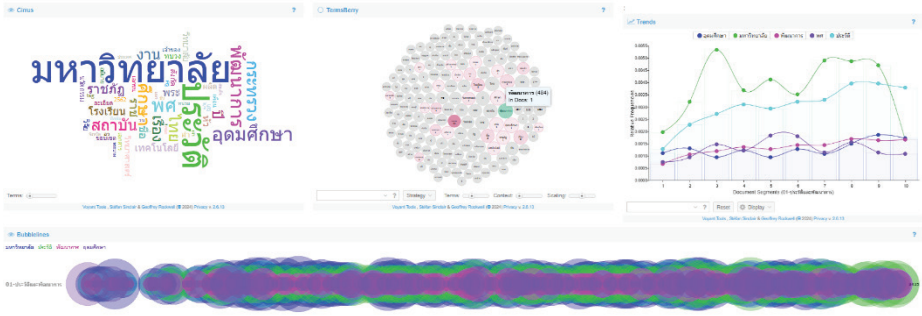


Figure 3 Text analysis by Vayant tool

Using InfraNodus tool

InfraNodus is a text network visualization tool that allows users to create graphs and represent any text as a network. It is a text and network analysis application that uses artificial intelligence (AI) to help users extract knowledge from text and simplify studies. The InfraNodus network visualization depicts messages as networks. A single thought (or entity) is a node, and their coexistence is a node-to-node link. Networks are created from data by displaying the most influential words in a graph, or simply those that are often used. Words (nodes with the highest mutuality) are displayed in large size, whilst words (nodes) that occur more frequently together are grouped into subject clusters and colored differently.

InfraNodus tool has seven sets of tools, including:

- Main Idea displays the most important subjects in the data. They are discovered by looking for groupings of words that frequently appear together in the same context. It is expressed as a percentage that indicates a topic's relative influence in the data, which is calculated by adding the centrality of the nodes included in it. The centrality of nodes is a measure of how important it is to link to other nodes in the graph
- Blind Spots are groups of words that are distinct and not well related, yet have a high level of word repetition. This may bring about fresh ideas and creativity since it brings together different viewpoints and thoughts.
- Relations refer to the connections between words in data. It can help to make sense how different things are related. The connections between nodes determine the total influence score. The greater the number, the more significant the relationship in the context of the conversation
- Sentiment refers to the emotional tone of the communication. Sentiment analysis can be used to understand how people feel about the topic. It can be positive, negative, or neutral.
- Trends represent changes in the most influential themes and phrases over time. By separating the dataset into ten blocks, it is possible to examine how important themes were formed and how frequently they were used
- Structure refers to the type of connections between network nodes. Network topologies can be categorized into distinct types based on the degree of diversity, based on numerous measurements
- Stats are the statistics of word count of node name, degree, frequency and betweenness.

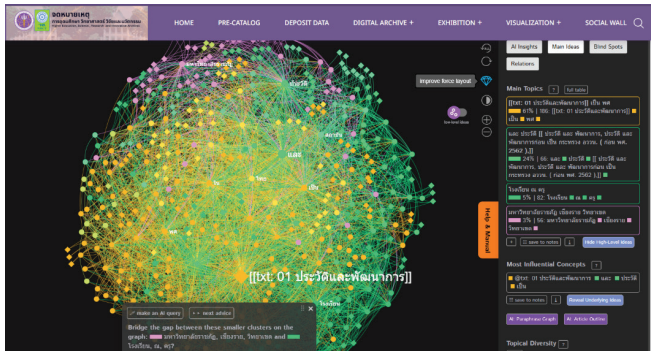


Figure 4 Text Analysis by InfraNodus tool.

Figure 4 shows how this visual data could help Thai higher education organizations identify developing data trends for future planning and development.

Conclusion

Before employing text analysis technologies, the Thai higher education digital archives were developed by acquiring content from five sources of information, categorizing content into 10 content groups, and cataloging with metadata using Omeka S software. Using a text analysis tool is an efficient way to build a deeper understanding of text. The steps for conducting text analysis on Thai language data sets are as follows: Thai word wrapping (word tokenization) with AI (deep learning), import and analyze data sets with tools such as InfraNodus and Voyantools. Wrapping Thai words with AI (deep learning) improves the accuracy of cutting Thai words. This allows text analysis tools to accurately analyze text data. The findings can be exhibited using the Vayant and InfraNodus tools for Thai language data analysis. This visual data will help Thai higher education organizations detect new data patterns for future planning and development.

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PROACTIVE STRATEGIES of LIBRARIES FOR ADDRESSING THE DIGITAL DIVIDE AMONG PEOPLE WITH DISABILITIES

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Introduction

The era of digital transformation has arrived, with rapid advances in technology and explosive growth in data volumes around the world. In the era of digital transformation, the digitization of many resources and the integration of various information that were previously dispersed are making it easier for people with disabilities to access information. However, the information literacy of people with disabilities, which accounts for 15% of the world's population, is not keeping pace with the speed of digital transformation. In fact, according to the '2023 Digital divide Survey Report' published in 2024, 'digital information access' is 98%, while 'digital information competency' is only 75.6% (Ministry of Science and ICT, 2024). This means that while the level of information access for people with disabilities has increased, they still face difficulties in using it. This is not just a matter of the digital divide. It can lead to widening educational, economic, and cultural gaps and even isolation from the local community. Libraries, as regional gateways to knowledge, should play a role as an institution that creates and shares all kinds of knowledge. People with disabilities should not be excluded from the beneficiaries of this. As one of the movements to solve this problem, the World Intellectual Property Organization enacted the "Marrakech Treaty" in 2016. This means making exceptions to copyright law for people with visual impairments and others who have difficulty reading books. In addition, even in countries around the world, various efforts, policies, and services are provided, such as creating a new organization dedicated to providing services for people with disabilities, to solve the problem of information disparity and book famine among citizens. The studies to date have focused on individual countries or institutions and lacked cross-country comparisons. Furthermore, the cross-country comparisons have focused on one country to suggest ways for development. This study aims to compare library services in three countries and suggest ways to proactively respond to the information needs of people with disabilities.

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Literature review

The issue of information access for people with disabilities is a sensitive and complex issue that combines both social and cultural aspects with technology. The library community also considers the problem of information access for people with disabilities to be important, and research related to the disability services provided by each country is actively being conducted. In the United States, there has been research to find out the changes in library services and the satisfaction that followed the enactment of the ADA (Americans with Disabilities Act). According to Nelson P. P. (1996) survey results, nearly three-quarters of respondents reported the removal of physical barriers, but few assigned responsibilities to specific staff members in charge of disability services, and fewer still conducted formal assessments of the need for special services. Julia Todaro (2005) of Argentina analyzed the information service for disabled people in Argentina based on a survey conducted at 20 libraries and concluded that there was a general opinion that the library service for disabled people is still weak. On the other hand, Owen (2007) pointed out the blind spots in the library services for the visually impaired in the UK and emphasized the need for measures through the 'Share the Vision' project and the active role of the UK government. In addition, Yoon (2020) selected Japan, Sweden, the United States, and South Africa, and revealed the need for Korea's National Library of the Disabled to benchmark the services of advanced countries, including the enactment of laws.

Analyze the state of disability services

This study focused on the websites of the National Library for the Disabled of Korea, the National Diet Library of Japan, and MTM (a national knowledge center for accessible media in Sweden), which provide library services for the disabled. Library websites are the only way and medium to connect library information resources to all users(Baek, 2019). Japan experienced local autonomy earlier than Korea, and the two countries have similar administrative systems and public library operations (Park, Lee, 2015). In March 2023, the National Library for the Disabled of Korea and the National Diet Library of Japan held the "Role of Libraries in Realizing an Inclusive Information Society - Efforts of the National Library for the Disabled of Korea" and have been conducting business exchanges. Sweden, like South Korea and Japan, offers a national service specifically designed for individuals with disabilities. The country has ratified the "Marrakech Treaty" at the European Union level and incorporated it into its national legislation.

The National Library for the Disabled of Korea

The National Library for the Disabled of Korea is a central institution that aims to eliminate barriers to information and provide library information services tailored to the needs of individuals with disabilities. This is to ensure that they have equal opportunities in daily life, education, employment, social participation, and cultural enjoyment, as do those without disabilities in the information era.

As of December 31, 2023, it had 79,262 books, categorized into four main categories and 14 types: Blind, Deaf, Developmental, and Common. To use the materials, you need to verify your disability registration with the Ministry of Health and Welfare. The official website of the National Library for the Disabled allows users to search for materials from both the National Library for the Disabled and the DREAM (Direct Rapid Easy Accessible Materials) service. To access this resource, an assistive technology device or the DREAM app, which works on both mobile and web platforms, must be used. The quality of DREAM data was upgraded in 2023. Fig 1 is the main search screen of the National Library for the Disabled of Korea.

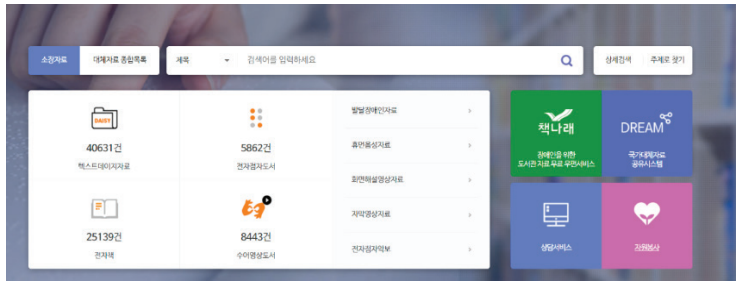


Fig 1. The National Library for the Disabled of Korea

The National Library for the Disabled of Korea provides customized services, including “Requesting Alternative Material”, “Available in 3 days (DAISY)”, “Mathematical Reading,” and “Braille Print Services”. The “ Requesting Alternative Material “ allows applicants to request materials necessary for academic, professional, self-development, and cultural activities, which are then produced by the National Library for the Disabled of Korea and shared through DREAM. Elementary, middle, and high school textbooks, EBS materials, and teaching materials designed for specific classes are not eligible, even for academic purposes. ‘The 3-Day Dream (DAISY)’ service provides DAISY materials that allow users to quickly understand the overall content of a book within three days. This service is beneficial for obtaining rapid information and a general understanding of a book’s content. It should be noted that these materials may contain numerous typos and omit all tables and illustrations due to minimal editing after scanning the original document. The National Library for the Disabled of Korea conducts specialized training on reading aids annually and provides digital collections, including Textbook Reference Books, Deaf Book Collection, and Disability Policy Materials. Korea ratified the Marrakesh Treaty in October 2015, respectively, but failed to introduce copyright restrictions due to conflicts with existing copyright laws.

The National Diet Library of Japan

In 2019, Japan enacted the ‘An Act to Promote the Development of Reading Environments for the Blind and Others’, following the Marrakesh Treaty. The National Diet Library of Japan oversees library services for people with disabilities nationwide and focuses on digital transformation. One of its seven plans is to promote access to materials for people with reading disabilities, including the visually impaired. The National Diet

Library of Japan is enhancing its services to collect, retrieve, and deliver barrier-free materials and support the creation of accessible texts.

The National Diet Library of Japan has mid- to long-term plans, such as The Disability Service Action Plan 2017-2020 and The Disability Service Action Plan 2021-2024. It is an agency directly under the Diet, with the Library Cooperation Division of Kansai handling disability services. The National Diet Library of Japan holds 813,300 recorded materials and 50,220 Braille and large print materials. The National Diet Library of Japan collects and provides bibliographic information on disability alternative materials produced by libraries and volunteer organizations across Japan, including materials currently under production.

According to the Disability Service Action Plan 2021-2024, The National Diet Library of Japan will focus on collecting bibliographic information on non-digital alternative materials for the disabled. On January 5, 2024, The National Diet Library of Japan launched "mina-search," an integrated search service for disability-related materials and data. This service is linked to the "Data Transmission Service for Visually Impaired Persons and Others," allowing registered users to download and stream disability-related materials and data immediately after searching. Fig 2 is the main screen of mina-search.



Fig 2. Main screen of the National Diet Library of Japan Mina Search

The library has conducted experimental projects to support text data production and other library services. They train librarians at libraries that serve people with disabilities. They also have a close relationship with 'Sapie', a private service. Under the Marrakesh Treaty, data for the visually impaired produced abroad can be received in Japan, and Japanese-language data, including Japanese Braille, can be used overseas.

MTM (A National Knowledge Centre for Accessible Media of Sweden)

MTM began as Sweden's National Library of Recorded Braille (Talboks-och Punktskriftsbiblioteket), which led the development of alternative materials and national services for the blind. The organization was later renamed Myndigheten för Tillgängliga

Medier (MTM) under the Ministry of Democracy and Culture. Their mission is to ensure that everyone, regardless of reading ability or disability, has access to literature, news, and social information based on everyone's circumstances. The MTM will develop strategic goals for four areas over the period 2024-2026, with systematic and phased goal achievement to ensure that everyone can read on their own terms. In addition, in 2025, a new law, the Law on the Accessibility of Certain Products and Services (2023:254), will come into force, mandating e-books, and reading programs, and the MTM will be the overseer and promoter of this law.

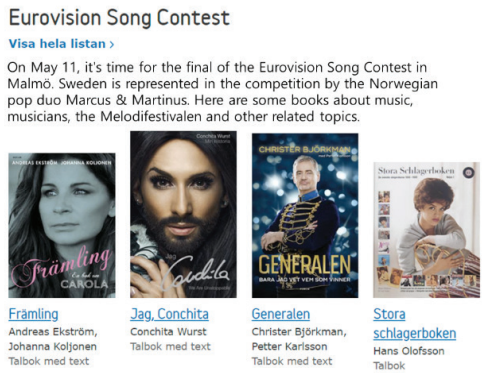


Fig 3. Digital collections from MTM

The MTM supports access and use of approximately 140,000 meterials, including DAISY, Braille books, and e-textbooks, through its digital library, through 'Legimus', in accordance with the Marrakech Treaty. 'Legimus' also offers digital collections that are close to life, as shown in Fig 3. 'Legimus' works as a web and mobile application, and through 'Legimus', students with disabilities can receive lecture materials in talking books, Braille, and tactile formats. MTM produces 3,000-4,000 talking books every year with the national budget, which is a resource guaranteed by the Copyright Act. MTM has incorporated LL-förlaget (a publisher of easy-to-read books) and 8sidor (an easy-to-read newspaper that is politically neutral) as part of its operations. It also offers a variety of media, including a subscription program for Braille magazines for children and adults, and the publication of over 100 Swedish daily newspapers as audio newspapers. MTM provides Braille services for individual needs, such as instruction manuals for household appliances and music lyrics. MTM regularly hosts webinars and conferences, and recently, it has been hosting seminars with 8sidor to explain important matters related to people's lives, such as election policies, in preparation for the 2024 EU elections.

Comparative Analysis

Comparison of disability services: Korea, Japan, and Sweden

The purpose of this study is to compare the status of disability services in three countries and propose strategies for proactively responding to these needs in libraries. Table 1 compares the disability services of libraries in South Korea, Japan, and Sweden.

Table 1. Comparing disability services in South Korea, Japan, and Sweden

	The National Library for the Disabled of Korea	The National Diet Library of Japan	MTM
Search for alternative materials	The National Library for the Disabled of Korea	Mina-search	Legimus
Key Services	- Requesting Alternate Materials - Available in 3 Days (DAISY) - Mathematical Reading - Braille Print Services	- Create a DAISY of scholarly articles - LL Books, LL Comics Studies - Collect bibliographic and collection information for accessible materials - Data transfer services for the blind and others	- Create braille books for all ages - Swedish Talking Book Model (DAISY) - Recorded books for reading training - LL books (easy-to-read books), Braille tactile picture books - Publishing 8 Sidor and Braille magazines in easy-to-read Swedish, and over 100 Swedish daily newspapers in audio newspaper format
Training Programs	Training for reading assistive devices	Training for librarians serving people with disabilities	Exercising your right to vote in the European elections
Digital Collections	- Curriculum Reference Books - Books on Deafness - Disability Policy Resources - Poetry Collections - Sheet Music Collection - Book Trailers		- Eurovision Song Contest - Paul Auster 1947 - 2024 - 1984 was - “May the 4th be with you” - World Book Day
Non-digital Braille Service	Braille Print Services	Focus on collecting bibliographic and material information for non-digital accessible materials	

The analysis of the disability services of the National Library for the Disabled in Korea, the National Diet Library in Japan, and MTM in Sweden shows that the National Library for the Disabled in Korea offers customized services to meet urgent information needs, such as “requesting alternative materials” and “Available in 3 days (DAISY)”. This is an important role for the library. This is an important role for the library. The library is expanding its collection of alternative materials by adding 10,000 items each year. Based on the ‘Basic Research on Establishing a Plan for Collecting Library Materials for People with Disabilities’ conducted from June to October 2023, it is expected that more substantial development of materials will be possible.

The National Diet Library of Japan is the organization that oversees library services for people with disabilities in Japan. The library produces DAISY versions of scholarly texts that are difficult for public libraries to produce and collects bibliographic and cataloging information on various accessible formats. It provides this information through a search service called ‘Mina-search’ and distributes it through the ‘Data

Transmission Service for Visually Impaired Persons and Others' managed by the National Diet Library of Japan. The 'Mina-search' does not currently provide digital collections.

Sweden's MTM is unique in that it is both an independent institution and a library. To ensure access to literature, news, and social information for everyone, it publishes easy-to-read books through LL-förlaget and a politically neutral weekly magazine through 8sidor. We also produce talking books, tactile picture books and Braille books, making them accessible to everyone in Sweden, as well as audio versions of more than 100 daily newspapers. It also produces alternative materials for university lectures. MTM is an organization that provides information services for everyone, including access to alternative materials produced through Legimus and publishing books and newspapers. The library did not provide a tailored non-digital braille service for users.

The purpose of this study is to compare the status of disability services in three countries and propose strategies for proactively responding to these needs in libraries. <Table 1> compares the disability services of libraries in South Korea, Japan, and Sweden.

Suggestions for proactive Strategies to close the disability digital divide

In the cases of the three countries, the reason behind the production of alternative materials is the request of the customer. While passive production of alternative materials for the disabled is important, there is a need to proactively produce and provide alternative materials by understanding the information needs of the disabled. In Korea, a basic research project was conducted to establish a plan for collecting library materials for the disabled. Similarly, other countries should develop strategies for collecting materials for the disabled and proactively produce alternative materials based on the information needs of the disabled. This will help to reduce the information gap for the disabled and ensure their information accessibility.

Second, proactive production and provision of materials that are closely related to daily life is necessary. In Sweden, voice versions of 100 daily newspapers are provided, and a collection of materials related to Eurovision is provided ahead of the event. In Japan, local and daily life information such as medical, disaster prevention, shopping, and event information is provided through 'Sapie'. It is one of the important tasks of public libraries as community facilities to collect and provide information about the community (Kim et al., 2015). Disabled libraries also need to perform this task. In addition to the production of alternative materials for structured data such as books, proactive provision of local life information and daily newspaper data will enable quick response to the information needs of the disabled.

Finally, it is necessary to actively share the lists of alternative materials held and the lists of materials that have started production, and to make it easy for people with disabilities to use them. Japan and Sweden manage lists of alternative materials produced nationwide and collect lists of materials that have started production in Japan, aiming to prevent duplication and minimize waste of resources. Services that allow

you to search for these lists of alternative materials include ‘mina search’ in Japan and ‘Legimus’ in Sweden. However, in Korea, the construction of a comprehensive list for joint use of alternative materials and the strengthening of sharing the list of materials that have started production were part of the 2024 main business plan (National Library of Korea, 2024). From this, there is no comprehensive list of alternative materials. If a comprehensive list is established and a service that allows users to search and use it is provided, it will be possible to ensure the convenience and equal access to information of users, and to quickly meet their information needs without going through librarians.

Conclusion

This study analyzed the status of libraries and institutions providing services for people with disabilities in Korea, Japan, and Sweden and proposed preemptive measures for library services for people with disabilities. The National Library of Korea for the Disabled provided customized specialized services for users. Services such as ‘Available in 3 days (DAISY)’ and ‘Mathematical Reading’ that respond immediately to urgent information needs were prominent, and a service was provided to output Braille as a non-electronic material if it was a material held by the National Library of Korea. After ratifying the Marrakesh Treaty, Japan has been actively responding to services for the disabled, such as newly revising domestic laws, and the center of this is the National Diet Library. It focuses on producing academic literature that is difficult to produce in public library as alternative materials and provides a service that allows users to receive materials held by the National Diet Library from nearby libraries through the ‘Data Transmission Service for the Visually Impaired and Others’. In addition, it conducts training for librarians providing services for the disabled. Finally, in Sweden, MTM is a separate organization from the library and is in charge of accessible media. They consistently produce Braille books for all ages, the Swedish Talking Book Model, and recorded books for reading training, which are national assets. In addition, they have incorporated publishers and newspaper companies into MTM’s organization to provide services stably, and they provide services such as publishing Swedish daily newspapers as voice newspapers, with about 100 newspapers published daily.

In order to provide proactive services for people with disabilities, libraries should develop strategies for collecting materials specifically for this group and produce alternative materials based on their information needs. For example, Korea recently conducted a study on “Basic Data for Establishing a Collection Strategy for Library Materials for People with Disabilities.” By creating a separate collection strategy, libraries can offer tailored services. Additionally, providing life-oriented materials before they are requested can help reduce the information gap. For instance, Sweden already provides audio versions of over 100 daily newspapers, and Japan offers immediate access to local life information through Sapie. Finally, a platform that integrates and manages the list of alternative materials, like Japan’s “mina search” and Sweden’s “Legimus,” should be available.

This study aimed to identify the current status of library services for people with disabilities in Korea, Japan, and Sweden, and propose measures to reduce the information gap. By analyzing the services provided in these three countries, which are considered advanced, the study proposed proactive services that libraries should provide to reduce the information gap for people with disabilities. The study can serve as a useful reference for policy-making and service operation in countries that plan to provide services for people with disabilities. However, the study has limitations, as it only focused on three countries and used information available on their webpages. Future research should expand the scope to include more countries and conduct in-depth analysis, including identifying problems, through on-site visits or interviews with librarians.

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DIGITAL TRANSFORMATION READINESS AMONG PUBLIC LIBRARIANS: A CASE STUDY IN VIETNAM

Ngo Thi Huyen[1]

Introduction

According to the Vietnam Ministry of Information and Communications (2021), digital transformation refers to the process of digitizing the entire organization, which involves adopting new processes, organizational models, methods of service delivery, or services. Digital transformation is no longer discretionary but a mandatory progression for all organizations, libraries not excluded. The digital transformation era has reshaped the traditional responsibilities of librarians through technological innovations. Human resources are therefore essential for the successful digital transformation of libraries. The Prime Minister of Vietnam authorized Decision No. 206/QD-TTg on February 11, 2021, endorsing the "Library sector digital transformation program up to 2025, with a vision for 2030". By 2025, one of the primary objectives is to ensure that all library staff in Vietnam are fully trained and retrained to enhance their knowledge and skills in modern operations (Prime Minister of Vietnam, 2021a). This highlights the essential requirement to enhance the skills of library staff to keep up with digital transformation demands.

The project "Building a learning society for the period 2021-2030" received official approval through Decision No. 1373/QD-TTg issued by the Prime Minister of Vietnam on July 30, 2021, emphasizing the involvement of public organizations in achieving the project's goals (Prime Minister of Vietnam, 2021b). The public library system is now an essential element of national goals concerning public institutions. The contribution of public libraries to the objective of establishing a learning society has been acknowledged. By 2024, Vietnam is set to have a population close to 100 million, with over 900 public libraries, encompassing libraries at all levels and reading rooms. The infrastructure of public libraries in Vietnam is less developed compared to many other countries.

Most of the literature on digital transformation is centered around educational institutions, leaving a shortage of research on digital transformation in public libraries.

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A quick Scopus database search reveals just 12 documents on digital transformation in public libraries. Specifically, there is a dearth of studies on digital transformation in public libraries in Vietnam, a nation currently undergoing significant digital advancement following Decision No. 749/QD-TTg by the Prime Minister endorsing the "National Digital Transformation Program until 2025, with a vision up to 2030" (Prime Minister of Vietnam, 2020). Understanding the readiness of public libraries in Vietnam for digital transformation is valuable for informing policy decisions and enhancing training programs in the Library and Information Science sector, as well as uplifting public library staff. The research also helps the global academic community gain more information and essential components for a deeper understanding of the public library system's practice.

This study aims to examine the level of readiness among public library staff in Vietnam for embracing digital transformation. Consequently, three research questions were devised:

1. What level of digital literacy do public library staff in Vietnam possess?
2. What is the level of awareness of digital transformation among public library staff in Vietnam?
3. What obstacles do public library staff in Vietnam come across while implementing digital transformation in their organizations?

Insight into public library practices in Vietnam during the digital transformation period can be gained through the responses to these research questions.

Literature review

Public library staff's digital literacy

UNESCO defines "Digital literacy is the ability to access, manage, understand, integrate, communicate, evaluate and create information safely and appropriately through digital technologies for employment, decent jobs and entrepreneurship." (Law et al., 2018, p. 6). In today's digital world, having digital literacy is vital for individuals to excel in their personal and professional endeavors. Many organizations and researchers have formulated digital literacy models and frameworks to recognize attributes of digitally capable individuals, like the European Digital Competence Framework for Citizens (DigComp) (Vuorikari et al., 2022), JISC's six-element digital capabilities framework (JISC, 2024), and UNESCO's global digital literacy framework (Law et al., 2018).

Public libraries often face challenges regarding digital literacy. Supporting users in fulfilling their information needs poses several challenges for public library staff, given the diversity of the user community and digital skills. The way users access web, mobile, and computer technologies, browse online resources, and interpret bureaucratic vocabulary affects their information needs (Shen, 2023). Additionally, library staff should dedicate efforts to designing initiatives that improve users' digital literacy in order to bridge the digital divide in society (Wynia Baluk et al., 2021). For this reason, library staff should be well-trained in digital literacy to effectively address information

needs and provide efficient services to users. Familiarity with various technologies, web services, and online forms is essential, in addition to comprehending the legal and ethical aspects of information interaction (Vitak et al., 2018). A study conducted by Martzoukou and Elliott (2016) reveals significant discrepancies between the training programs attended by library staff and their practical application in the workplace. This could impact their digital literacy and sense of belonging in the online world. In light of this, numerous suggestions have been made to enhance training programs and establish continuing education programs to strengthen the digital literacy of public library staff (Martzoukou & Elliott, 2016; Vitak et al., 2018).

Digital transformation in public libraries

Several studies have discussed digital transformation efforts and projects in public libraries globally. The advancement of information and communication technology makes it inevitable for public libraries to undergo digital transformation. For example, Banciu (2024) discusses the initiative in Romania to convert public libraries into digital culture centers aimed at enhancing people's digital skills.

The library's evolution towards digital integration is being recognized by the public as seen in the changes to services and resources. The expected level of digital transformation in public libraries, following recommendations to incorporate digital resources and services, does not seem to have been achieved (Vrana & Kovačević, 2023). Still, the expectations for a fully digital library model in public libraries are modest, as users persist in envisioning a hybrid library model in the near future (Vrana & Kovačević, 2023). Additionally, the absence of regional and national policies is causing a widening gap between libraries. Hence, there is a need to develop a new public library model that aligns with the current needs of society and the ongoing digital transformation process (Romero-Sánchez et al., 2021).

While acknowledging the advantages of digital transformation, it is important to also take into account its constraints. The modernization of public libraries through digital means can influence the accessibility of information, knowledge, and culture, promoting freedom and equality. This originates from the current and concerning gap between those proficient in technology and those who are not (Skøtt, 2021).

Digital transformation in Vietnam's libraries

Studies on digital transformation in Vietnam predominantly concentrate on human resources, as they are considered a crucial element in the digital transformation journey. Research findings reveal a significant discrepancy between the requirements for library digital transformation and the skills possessed by library staff.

V. T. Nguyen (2021) has pointed out the deficiencies in human resources within Vietnamese libraries, including limited information technology proficiency, insufficient continuous professional training, and a low proportion of leaders with basic knowledge in information and library science.

Recent studies indicate that library staff in higher education institutions are not adequately prepared for digital transformation (Doan & Tran, 2022; T. T. Van Nguyen, 2022). The human resources of university libraries are facing obstacles in their digital transformation journey due to staff shortages, inadequate skills, limited specialized knowledge, and a lack of proficiency in foreign languages (Hoang et al., 2022). Concurrently, school librarians present a moderate level of digital transformation preparedness (Le, 2023; P. D. Nguyen, 2022).

On the whole, the research has shed light on digital transformation in public libraries across the globe and the digital literacy of public library personnel. Ideas have been proposed to strengthen the digital proficiencies of public library staff to enable digital advancement in libraries. Research also indicates digital transformation efforts within public libraries and highlight the possible outcomes of this transition. At the same time, the public library system in Vietnam lacks sufficient research on digital transformation. Vietnam's university and school libraries encounter numerous obstacles with human resources for digital transformation.

Theoretical framework

The study used UNESCO's Digital Literacy Global Framework as a guide, which includes seven competency components: (1) Devices and software operations, (2) Information and data literacy, (3) Communication and collaboration, (4) Digital content creation, (5) Safety, (6) Problem-solving, (7) Career-related competencies (Law et al., 2018). UNESCO designed the Digital Literacy Global Framework to be applicable on a global scale and for diverse audiences. The framework includes a career-centered competency component to evaluate digital literacy within a designated subject category, thereby connecting digital skills with the responsibilities of librarians in information and library services.

Methodology

In order to address the research questions, the study utilized a mixed research approach that included two phases of quantitative and qualitative research conducted sequentially. A survey questionnaire was carried out among public library staff to gauge their digital literacy, awareness of digital transformation, and the obstacles they encounter. This was followed by conducting detailed interviews with managers of several public libraries to provide more clarity on the questionnaire survey results.

Sampling

A convenience sampling method was utilized to recruit research participants from public libraries in Vietnam, including library staff and managers.

The researcher reached out to public library staff by connecting with a network of provincial and district libraries to invite them to be part of the survey. Library staff were instructed to complete the online questionnaire, which was distributed to them through the libraries' emails. 120 questionnaires were received within the one-month survey

timeframe, after sending two reminders to encourage participation. Upon removing five invalid responses, analysis was carried out on the remaining 115 valid questionnaires.

In order to engage with public library leaders, the researcher contacted individuals with whom they had prior connections to request their participation in the study. Conducting interviews one by one, the research ceased when saturation point was achieved in the responses. In total, five interviews were held with public library managers in Vietnam.

This particular sample size is deemed suitable for the research in terms of the time and human resources required to conduct the study. Public library staff who participated in the study were predominantly female, with the majority falling between the ages of 40 and 50 and having a training background in Library and Information Science. The sample profile for the questionnaire survey is outlined in Table 1.

Table 1. Questionnaire survey sample

Surveyed sample characteristics		Number	(%) Percentage
Gender	Male	14	12,2
	Female	101	87,8
Age	30 >	7	6,1
	40 > - 30 ≤	31	27
	50 > - 40 ≤	65	56,5
	60 > - 50 ≤	12	10,4
Training background	Library and Information Science	82	71,3
	Information technology	17	14,8
	Foreign language	9	7,8
	Others	7	6,1

Data collection

With a 5-level Likert scale, the agreement or proficiency levels increase from 1 to 5. Therefore, the average value ranges are calculated as follows:

- Poor/Strongly disagree = mean score from 1.00 to 1.80 (Poor: Entirely unfamiliar);
- Fair/Disagree = mean score from 1.81 to 2.60 (Fair: Aware of it, experimented with it occasionally);
- Good/Neutral = mean score from 2.61 to 3.40 (Good: Grasp and employ fundamental functions following instructions, unable to utilize all tools and features. Lacks knowledge in customization and installation procedures.);
- Very good/Agree = mean score from 3.41 to 4.20 (Very good: Comprehend the tool's functions and applications, and tailor parameters to suit your needs);
- Excellent/Strongly agree = mean score from 4.21 to 5.00 (Excellent: Comprehend, set up, adjust, integrate various applications and tools, and adapt as needed).

The questionnaire is structured into four specific parts:

Part 1 - Digital literacy: consists of 26 questions that align with UNESCO's Digital Literacy Global Framework, allowing library staff to self-assess their proficiency in the various competencies outlined in the framework. A 5-level Likert scale ranging from Poor to Excellent is used for the questions in this part.

Part 2 - Awareness of digital transformation: involves three questions about public library staff's awareness of digital transformation, the significance of digital transformation in their roles, and the level of digital transformation at their library. An open-ended query was utilized to uncover the viewpoints of public library staff on digital transformation. Concurrently, respondents are asked two questions on a 5-level Likert scale, ranging from Strongly disagree to Strongly agree, to gauge their agreement with the library's digital transformation role and level.

Part 3 - Obstacles in digital transformation: a single multiple choice question highlights the obstacles that public library staff may face during the digital transformation process. This question permits selecting more than one answer.

Part 4 - Demographics: covers four questions on workplace, gender, age, and training background.

The main focus of the interview is to provide clarity on the findings of the questionnaire survey. Thus, the interview concentrated on three specific aspects: the digital literacy of public library personnel, their awareness of digital transformation, and the obstacles they encounter while undergoing the transformation. Prior to the interview, participants received an information sheet detailing the interview's objectives and key points. Interviews were carried out and recorded online via the Google Meet app, with a duration of 30-45 minutes for each.

Data analysis

The questionnaire survey data was analyzed by calculating average scores and standard deviations for responses using descriptive statistics.

The interviews' audio recordings were transcribed and converted into text. Through content analysis, the interview data was qualitatively examined based on three predetermined themes: digital literacy, awareness of digital transformation, and obstacles in digital transformation. Selected responses were showcased in the research results. In order to protect anonymity, study participants were assigned codes during data analysis and their names were not disclosed when presenting research findings.

Findings

Vietnamese public library staff's digital literacy

The survey results indicated that public library staff demonstrated a Good level of digital literacy, scoring an average of 3,139. *Digital content creation* (Mean = 3,688)

is where public library staff shine the most among the seven competency areas, followed by *Information and data literacy* (Mean = 3,379), *Communication and collaboration* (Mean = 3,312), *Devices and software operations* (Mean = 3,270), *Problem-solving* (Mean = 2,785), *Career-related competences* (Mean = 2,743), with *Safety* (Mean = 2,589) ranking the lowest.

Public library staff showed the most proficiency in *Developing digital content* (Mean = 4,134), but had the least success in *Protecting health and well-being* (Mean = 2,043) (Table 2).

The breakdown of competency levels is as follows: 10 competences are at a Very good level (38.5%), 11 at a Good level (42.3%), and 5 at a Fair level (19.2%) out of a total of 26 competences.

The analysis results provide insight into the digital literacy of the public library staff surveyed, revealing the following:

Digital content creation (Mean = 3,688; SD = 1,251): Public library staff demonstrate a clear understanding of the tools and features for creating and editing digital content.

Information and data literacy (Mean = 3,379; SD = 1,396): With the right guidance, public library staff members can pinpoint information needs and proficiently search for, assess, store, and organize information.

Communication and collaboration (Mean = 3,312; SD = 1,456): Public library staff can enhance communication and collaboration by recognizing digital tools and features, but they need proper guidance for effective utilization.

Devices and software operations (Mean = 3,270; SD = 1,389): When guided, public library staff can identify and utilize hardware and software tools and technologies to assist in their tasks and resolve common issues. However, they currently lack the expertise to customize and install hardware and software tools independently.

Problem-solving (Mean = 2.785; SD = 1.326): The library staff can recognize issues that require resolution in the digital realm, but they require assistance in utilizing digital tools to address these issues.

Career-related competences (Mean = 2,743; SD = 1,320): The public library staff has the ability to recognize digital technologies for managing library services. Nevertheless, it is essential to have guidelines in place for the efficient utilization of digital technologies in managing library services.

Safety (Mean = 2,589; SD = 1,229): The library staff is not well-versed in securing devices, content, personal data, and privacy in the digital space.

Table 2. Public library staff's digital literacy self-assessment results

Competence areas	Competences	Mean	Standard deviations
Devices and software operations	Physical operations of digital devices	3,518	1,571
	Software operations in digital devices	3,023	1,207
Information and data literacy	Browsing, searching and filteringdata, information and digital content	3,586	1,349
	Evaluating data, information and digital content	3,529	1,584
	Managing data, information and digital content	3,021	1,257
Communication and collaboration	Interacting through digital technologies	3,770	1,632
	Sharing through digital technologies	2,815	1,601
	Engaging in citizenship through digital technologies	3,732	1,273
	Collaborating through digital technologies	3,612	1,433
	Netiquette	3,492	1,277
	Managing digital identity	2,453	1,521
Digital content creation	Developing digital content	4,134	1,207
	Integrating and re-elaborating digital content	4,000	1,211
	Copyright and licences	3,541	1,453
	Programming	3,080	1,134
Safety	Protecting devices	3,101	1,244
	Protecting personal data and privacy	3,108	1,122
	Protecting health and well-being	2,043	1,330
	Protecting the environment	2,105	1,221
Problem-solving	Solving technical problems	3,014	1,222
	Identifying needs and technological responses	2,343	1,451
	Creatively using digital technologies	3,001	1,201
	Identifying digital competence gaps	2,600	1,533
	Computational thinking	2,970	1,227
Career-related competences	Operating specialised digital technologies for library services	2,733	1,433
	Interpreting and manipulating data,information and digital content for library services	2,754	1,208

The interview outcomes supported the results of the questionnaire survey, demonstrating that public library staff have a definite level of understanding and skill in utilizing digital tools. Nonetheless, they could benefit from more suitable guidance to utilize digital tools effectively. A library manager noted that "*while the staff may not be fully skilled in digital tools, they have a good understanding of how to use them*" or "*always require assistance to improve efficiency as they are not yet proficient in using digital tools*."

The interview findings highlight the challenges faced by library staff in maintaining safety while engaging online, particularly concerning privacy and network security. According to a library manager: "*Safety issues in cyberspace are becoming increasingly prevalent, especially for public library staff who have constraints in safeguarding themselves online*."

Awareness of digital transformation among public library staff

Findings suggest that public library staff understand the significance of digital transformation and their indispensable role in it, but their understanding of the concept is still not fully developed. They are beginning to notice changes in their libraries as digital technology is increasingly being used in library operations.

Public library staff generally grasp that digital transformation involves incorporating digital technology into library operations. Still, their knowledge is lacking as they concentrate primarily on digital tools and technology, overlooking the significance of processes and organizational models in the digital transformation journey. The survey results show that around 54.8% of public library staff view digital transformation as the rise in digital tools and technology being used in library activities, in line with the following opinion: "*Digital transformation involves the application of digital technology in library activities*." Approximately 29.6% of library staff are unsure about the difference between digital transformation and computerization, as indicated by the opinion: "*Digital transformation involves utilizing computers and software to manage library operations*." Just 7% of library staff possessed an in-depth understanding of digital transformation, covering digital tools, technologies, processes, and methods. To illustrate, consider the viewpoint that "*The revolution in libraries known as digital transformation involves a significant overhaul of technologies, processes, and methods, with a focus on adopting digital technology and adapting processes accordingly*." The remaining 8.6% conceded their inability to articulate a clear definition of digital transformation.

Despite not demonstrating a complete grasp of digital transformation, the vast majority of public library staff surveyed recognize the significance of digital transformation in libraries. The vast majority, up to 87%, firmly believe in the essential nature of digital transformation (Strongly agree), while the remaining 13% also recognize its importance (Agree). Simultaneously, 81.7% of respondents fully supported the idea that library staff are essential in driving the digital transformation process (Strongly agree), while 18.3% had a concurring sentiment (Agree).

The survey revealed that 53.9% of public library staff acknowledged the digital transformation happening in their library (Agree), with 17.4% unsure (Neutral), 14.8% disagree, and 13.9% strongly agree.

By acknowledging an incomplete understanding of the concept of transition among public library staff, the interview results aligned with the findings of the questionnaire survey. Additionally, managers concur with the survey findings regarding public library staff's understanding of the significance of digital transformation in libraries, their

involvement in the process, and their awareness of the level of digital transformation in their libraries. As per a manager, "*there has been significant emphasis on library digital transformation at both state and local levels recently, which aids library staff in comprehending their work and responsibilities*." Furthermore, there is a library manager who said: "*Despite the push for digital transformation, some public libraries lack the necessary resources. This leads to varying levels of digital transformation among libraries, a reasonable outcome.*"

Public library managers highlighted some reasons for the lack of a thorough understanding of digital transformation. They believe that the primary cause is the absence of structured and consistent continuing education initiatives to ensure that public library staff fully grasp the essential aspects of digital transformation. The manager of a public library stated: "*While training programs on digital transformation do exist, they are scattered and lack a coherent structure, leading to low effectiveness and minimal benefit for public library staff at all levels*."

Obstacles of the implementation of digital transformation in public libraries

Obstacles have been identified in the implementation of digital transformation. These include the lack of structured training sessions to address practical issues faced by libraries, inadequate and inconsistent investment in infrastructure, resistance to change among public librarians, and a lack of familiarity with digital services (Table 3).

The main difficulty encountered by library staff in the digital transformation process is the lack of training programs, as highlighted in survey results. This corresponds with the viewpoints of public library managers in explaining the factors contributing to the incomplete understanding of digital transformation among library staff, as presented in subsection 5.2.

Table 3: Obstacles of the implementation of digital transformation in public libraries

Obstacles	Total count of participants picking the option	(%)
Insufficient training initiatives for digital transformation	81	70.4
Infrastructure constraints	72	62.6
Library staff's hesitance to embrace change	34	29.6
Lacking knowledge of digital services	28	24.3

Once again, the interview results confirm the questionnaire survey findings, highlighting that these are the primary difficulties that public libraries in Vietnam are grappling with during the digital transformation journey. A public library manager said: "*We continue to send our employees to digital transformation trainings, but the impact remains uncertain due to the lack of relevance and duplication in the content.*" The focus of discussion for this manager is the absence of structure and repetition in training content. Furthermore, it is undeniable that the public library system in Vietnam has not received adequate investment considering its importance in the community. According to a library

manager: "*Public libraries have a restricted budget for their regular activities*" or "*Lack of proper investment in infrastructure, other than certain sizable provincial libraries*." Additionally, while the findings of the questionnaire indicate that the majority of public library staff recognize the significance of digital transformation and their essential contribution to it, there remains a group of librarians who are resistant to change. The unwillingness to change hampers the evolution and execution of digital transformation efforts in libraries: "*While new things are attractive to all, not everyone is prepared to confront them*" or "*Some members of the library staff resist change due to feeling that their salary does not match the effort required for new innovative activities*." Finally, public library staff have not played a role in developing the digital services necessary to showcase the transition to a digital environment. According to a public library manager: "*The absence of guidance in creating digital service systems in public libraries leaves library staff unsure about how to proceed in the digital transformation process*."

Discussion

The digital transformation of libraries, especially public ones, relies heavily on human resources. Thus, the success of the digital transformation process in public libraries is closely tied to the readiness of library staff. This study measures the readiness of public library staff for digital transformation by examining their digital literacy, awareness of the transformation, and ability to tackle challenges. Research outcomes suggest that there is a substantial amount of work yet to be done to enhance the readiness level of library staff for digital transformation activities in public libraries in Vietnam, as capacity limitations remain a challenge and the workforce's awareness of this issue is still insufficient. Not only public libraries, but studies on digital transformation readiness in university and school libraries in Vietnam have also indicated that library staff are inadequately prepared for the process (Doan & Tran, 2022; Le, 2023; P. D. Nguyen, 2022; T. T. Van Nguyen, 2022).

Past research has highlighted the necessity of enhancing information and library training programs, along with continuing education efforts (Martzoukou & Elliott, 2016; Vitak et al., 2018). This study reiterates this point due to the insufficient digital literacy of public library staff in Vietnam. The public library staff showcased an understanding of digital transformation and affirmed their proficiency in managing digital issues related to work and personal life. Nevertheless, a complete grasp of digital transformation is still lacking, along with reluctance to change and deficiencies in digital literacy. Public library staff are still lacking in digital literacy, which is evident in their inability to ensure safety in a digital environment. A major challenge in library digital transformation is the inadequate digital capabilities of library staff (Hoang et al., 2022). Continuous improvement of the digital literacy of public library staff is necessary to ensure that they can meet the changing information requirements of users who are also enhancing their digital skills (Shen, 2023; Vitak et al., 2018).

Conclusion

Research suggests that enhancing the digital transformation readiness of public library staff in Vietnam is crucial. It is evident that systematic and sustainable solutions are necessary to enhance digital literacy, increase understanding of digital transformation within, and overcome resistance to change among public library staff. Once the digital transformation readiness of public library staff is evaluated, understanding the influencing factors becomes essential for offering comprehensive solutions to address the issue. Future research on digital transformation in public libraries should take this into consideration.

The study investigates the digital transformation readiness of public library staff in Vietnam with the help of a small, non-representative sample group. Thus, the capability to transfer research findings to extensive public library communities nationally and globally is currently unachievable. Despite this, the research outcomes illustrate the multifaceted digital transformation process within the backdrop of Vietnam's active promotion of digitalization.

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AWARENESS AND USE OF ELECTRONIC THESIS AND DISSERTATIONS WITH SPECIAL REFERENCE TO GUIDELINES OF UPLOADING AND COPY RIGHT REGULATIONS: A STUDY OF SCIENTIFIC COMMUNITY LIBRARY USERS OF TAMILNADU UNIVERSITY LIBRARIES

Dr. A. Bagavathi[1]

Introduction

The Electronic Thesis and Dissertations (ETD) are E-theses repositories or digital archives of electronic theses and dissertations. The establishment of ETD is to improve and increase the accessibility of researches, which were previously hidden and locked in university libraries. With the Cloud based collective ETD network facilities of various universities, through research works initiatives like Shodhganga by institutions like Inflibnet. This also removes the location and time barrier for accessing the various research works to the research community. Institutions of learning and libraries across worldwide have adopted and supported this initiative because of the advantages of visibility and accessibility of research output that comes with it and which clears the invisibility of scholarly research. (Suber, 2008) Suber echoed that, the most invisible form of useful literature and the most useful form of invisible literature are theses and dissertations. Substantiating Suber's point, (Gul, 2015) Gul also stated that, as for as Higher Educational Institutions are concerned, theses and dissertations are highly confidential documents, and they were always put under locks, which thus restricts the scholars from accessing the researches and findings contained in them. The above situation is very frustrating and discouraging the postgraduate students and scholars in undertaking their research studies, since theses and dissertations are one of the essential sources of information which in the opinion of (Sengupta, 2014) Sengupta that, Research Thesis always contains detailed and often unexplored information, including methodology about a particular research area or concept. With this situation accessibility outside the institution thus has becomes more complicated when submitted in print format. On the opinion of (Mohee, 2016) Mohee the above situation is not pleasant. According to Mohee, just carrying out research is not enough on its own, the use and application of the research output only matters, since it is through the uptake of research that the knowledge developed is made visible and usable.

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The Need

With the limited or inaccessibility of hard copy theses and dissertations in the local Libraries, these research results are rarely indexed in major international databases; this situation further exacerbated the inaccessibility of theses and dissertations completed in the region. With this the contain local empirical data is not available in international literature. Justifying the need for open access to research, (Kleinman, 2011) Kleinman stated that, new research usually depends on prior research. Both (Christain, 2008) Christian and (Ezema, 2011) Ezema stressed that, without having a common Open access Research repository accessing 'prior research' from research generated over the years in different libraries, will be very difficult for access to scholars and students.

Currently in this information era libraries all over the world have transited to an era where web technology has become pertinent for the dissemination of scholarly information and communication. Similarly, according to Alhoori researchers may not be able to attend many related conferences or follow the vast range of publications available. In addition, they may not also access the vast amount of research information published in local journals that are not accessible online, especially in developing countries. Reputable scholars and scientists see these as a hinder to the free exchange of thoughts and idea, which is a sine qua non-condition of research. Ezema argued that, inadequate information to propel knowledge and development will in turn leads to the slow pace in socio-economic and political development of the region / country (Ezema, 2011).

Hence it is pertinent that ETD and proper utilization of ETD is essential for all Research Scholars and Post graduate students for doing better research. Similarly, for easy accessibility and retrieval of the information from the ETD, certain uniform guideline with appropriate structure has to be followed while uploading the information / document / research thesis on these repositories along with the awareness of Copy Right Regulations (Niraj Barua, November, 2006). Hence, the knowledge of ETD Submission Guidelines and Copy Right Regulations are essential for all researcher.

Research Objectives

The main objective of the study is to correlate the Knowledge and awareness of ETD Submission Guidelines & Copy Right Regulations and the usage of ETD facility by the users in the selected university libraries in Tamilnadu. Specifically, the study:

1. Identify the Knowledge and awareness of ETD Submission Guidelines & Copy Right Regulations among of Users (Faculties, research scholars and PG Students) of the selected university libraries in Tamilnadu.
2. Find the Usage of ETD facility by the Users (Faculties, research scholars and PG Students) of the selected university libraries in Tamilnadu.
3. To examine the relationship between the Knowledge and Awareness of ETD Submission Guidelines & Copy Right Regulations and the usage of ETD facility by the target group in the selected universities of Tamilnadu.

Hypothesis

The null hypothesis was tested at significance level of 0.05.

HO1: There is no Significant relationship exist between Knowledge and Awareness of ETD Submission Guidelines & Copy Right Regulations and the usage of ETD facility by the target group in the selected Universities of Tamilnadu.

Methodology

The Study adopts the correlation design for a sample population of 110 library users comprising of Faculty, Research Scholars and PG Students from 6 Universities of Tamilnadu, consisting of 3 Government Universities and 3 Private Deemed to be Universities like The Tamilnadu Dr. Ambedkar Law University, The Bharathidasan University, Anna University, SRM University, Vels University, and Sathiyabama University.

The study adopted Survey research design. A Structured, easily understandable online Questioner in Google Form was prepared, and circulated among the selected universities, through e-mail for data collection using snowball sampling method. The Questioner consists of a total of 25 Questions, which consists of 20 numbers of 2-point scale questions on ETD Submission Guidelines & Copy Right Regulations and 5 number of 4 –point scale questions on ETD Usage for data collection. A total of 110 Questioners were distributed, out of which only 91 are dully filled and found suitable for data analysis. This constitutes 83% of the total distributed questioner. The detail breakup is given Table-1.

Table-1: Questioner Distribution

Description	eMailed	eMail Bounced	Primary data	Response Not Received	Responded	Valid Questioners	Invalid Questioners
Users	110	3	107	11	96	91	5
%	100.00%	2.73%	97.27%	10.00%	87.27%	82.73%	4.55%

Limitations of the Study

The Universities were chosen based on the nature of the study which focuses on the facilities of the university libraries and among the library users a random sample of Faculty, Research Scholars and PG Students of the above Universities are chosen as respondents and others are excluded from the study.

Data Analysis

The responses received for this study were analysed using descriptive and inferential statistics.

1. The mean scores and standard deviation with the adoption of a criterion mean of 2.50 Tabulation along with Bar Chart Distribution were used for Research Objectives 1 and 2.

2. Pearson Product Moment Correlation was used for research objective 3.
3. Creswell's correlation coefficient scale was used to decide and interpret the extent or strength of the relationship of the variables, with correlation coefficient (r) of values below or equal to ±0.20, represents very low association, values of ±0.21 – 0.40 depicts low association, values of ±0.41 – 0.60 indicates moderate association, values of ±0.61 – 0.80 represents high association, and values of ±0.81 – 1.00 means very high association (Creswell, 2014).
4. Linear regression was used for hypothesis testing. The implication was that when p-value is greater than or equal to the alpha value of 0.05 was not rejected (hence, the hypothesis is accepted), while with a p-value less than the alpha value of 0.05, the hypothesis was rejected.

Result and Findings

The results are provided in line with the research objectives.

Research Objective 1

Identify the Knowledge and awareness of ETD Submission Guidelines & Copy Right Regulations among the Users (Faculties, research scholars and PG Students) of the selected university libraries in Tamilnadu.

Table-2: Awareness of ETD Guidelines and Copy Right Regulations

Sl. No	Description	Aware	Not Aware	Total	Mean	St. Dev	Remarks
1	a) Follow Standard font size	69	23	92	0.758	0.431	Aware
2	b) follow standard Pagination	45	47	92	0.495	0.503	Not Aware
3	c) follow Standard preliminary Page	53	39	92	0.582	0.496	Aware
4	d) follow standard Spacing	68	24	92	0.747	0.437	Aware
5	e) follow standard Page Order and Page Numbering	69	23	92	0.758	0.431	Aware
6	f) follow standard Title Page	67	25	92	0.736	0.443	Aware
7	g) follow standard Copyright Page (optional)	36	56	92	0.396	0.492	Not Aware
8	h) follow standard Dedication and/or Acknowledgment Pages (optional)	38	54	92	0.418	0.496	Not Aware
9	i) follow standard Table of Contents (required)	24	68	92	0.264	0.443	Not Aware
10	j) follow standard Lists: Tables, Illustrations, Charts and Graphs (optional)	28	64	92	0.308	0.464	Not Aware
11	k) follow standard Abstract (required)	67	25	92	0.736	0.443	Aware
12	l) follow standard Chapters or Main Divisions of the Document	72	20	92	0.791	0.409	Aware
13	m) follow standard appendix and Vita format	69	23	91	0.758	0.431	Aware
14	n) follow standard format for PDF naming	23	69	91	0.253	0.437	Not Aware
15	o) Aware of Plagiarism Checking	35	57	91	0.385	0.489	Not Aware
16	p) Aware of the Fare dealing approach followed in India	28	64	91	0.308	0.464	Not Aware
17	q) Aware of acknowledgment as per copyright regulations	36	56	91	0.396	0.492	Not Aware
18	r) Aware of referring citations in bibliography	57	35	91	0.626	0.486	Aware
19	s) Aware of getting permission from author/publisher for extensive use of copyright material	22	70	91	0.242	0.431	Not Aware
20	t) Aware of Acceptable Plagiarism %	24	68	91	0.264	0.443	Not Aware
	Average	**47**	**46**	**93**	**0.511**	**0.456**	**Aware**

Fig-1

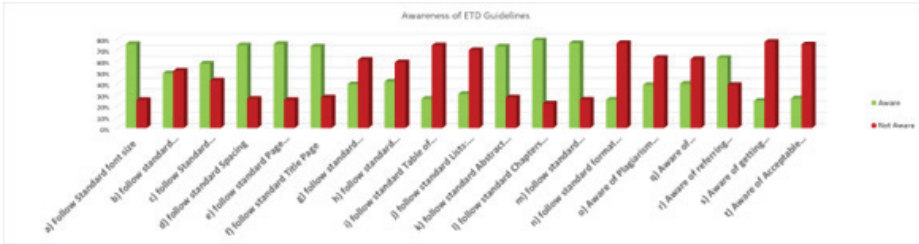


Table-2 & Fig-1 details the Knowledge and Awareness of ETD Submission Guidelines & Copy Right Regulations of the Respondents. The respondents have given their response for the 15 ETD Submission Guidelines parameters and 5 Copy Right Regulations parameters. The respondent's responses are in a 2-point scale. From the above based on the Total Average Mean Score of 0.511 with a standard deviation (Std. Dev) of 0.456 it is found that a marginal majority of the respondents have knowledge and awareness of ETD Submission Guidelines & Copy Right Regulations. Since the above is below the Total Average Mean of 0.45 set for this study. Hence, it is found that a thin marginal majority respondents have knowledge & awareness.

Further, the Mean and Standard Deviation with regard to the Knowledge and Awareness of individual parameters of the ETD Submission Guidelines & Copy Right Regulations among the majority of the respondents are given below.

Majority of Awareness Parameters

- Follow Standard font size 0.758 (0.431)
- follow Standard Preliminary Page 0.582 (0.496)
- follow standard Spacing, 0.747 (0.437)
- follow standard Page Order and Page Numbering, 0.758 (0.431)
- follow standard Title Page, 0.736 (0.443)
- follow standard Abstract (required), 0.736 (0.443)
- follow standard Chapters or Main Divisions of the Document 0.791 (0.409)
- follow standard appendix and Vita format 0.758 (0.431)
- aware of referring citations in bibliography 0.626 (0.486)

The majority of not aware parameters are as follows

- follow standard Pagination, 0.495 (0.503)
- follow standard Copyright Page (optional), 0.396 (0.492)
- follow standard Dedication and/or Acknowledgment Pages (optional), 0.418 (0.496)
- follow standard Table of Contents (required), 0.264 (0.443)
- follow standard Lists: Tables, Illustrations, Charts and Graphs (optional), 0.308 (0.464)

- follow standard format for PDF naming, 0.253 (0.437)
- Aware of Plagiarism Checking, 0.385 (0.489)
- Aware of Acceptable Plagiarism %, 0.264 (0.443)
- Aware of the Fare dealing approach followed in India, 0.308 (0.464)
- Aware of acknowledgment as per copyright regulations,0.396 (0.492)
- Aware of getting permission from author/publisher for extensive use of copyright material, 0.242 (0.431)

In spite of having less Awareness in 11 parameters of the 20 parameters and 9 of the awareness parameters, while considering the overall average of all the parameters the average Mean is 0.511 and the Standard Deviation is 0.456 which above the total average Mean of 0.45 Set for the study. Hence, marginally majority of the respondents have knowledge and awareness on ETD Submission Guidelines & Copy Right Regulations. Among the above parameters it is also found that the Knowledge and awareness of ETD Submission Guidelines is higher than the Copy Right Regulations.

Research Objective 2

Find the Usage of ETD facility by the Users (Faculties, research scholars and PG Students) of the selected university libraries in Tamilnadu.

Table-3 :ETD Usage Distribution

Sl. No	Description	Frequent Use	Occasional Use	Not Used	Not Aware	Total	Mean	St. Dev	Remarks
1	Used Institutional Repository Facility	26	16	22	27	91	2.450	1.200	Not Used
2	Used Archives Facility	10	11	15	55	91	1.740	1.050	Not Used
3	Used Inflibnet Facility	40	28	10	13	91	3.040	1.060	Used
4	Used Other National ETD Networks	26	33	13	19	91	2.730	1.100	Used
5	Used Other International ETD Networks	13	8	20	50	91	1.820	1.090	Not Used
	Average	**23**	**16**	**22**	**33**	**94**	**2.360**	**1.100**	**Not Used**

Fig-2

Table -3 & Fig-2 shows the ETD Usage Distribution responses of the respondents. Based in the various ETD facilities available on the libraries, the respondents register their responses on the usage of the ETD facility on a 4-point scale such as Frequent Use, Occasional Use, Not used and Not Aware/Not Available. The ETD facilities in the libraries were categorised into 5 such as Institutional Repository Facility, Archives Facility, Inflibnet Facility, Other National ETD Network Facility and other International ETD Network Facility. The response for with regard to the usage of this 5 ETD Facilities are tabulated in Table-3 with their Mean and Standard Deviation.

From the above it is inferred that, the total average Mean with regard to the usage of all ETD facilities is 2.360 with a standard deviation of 1.100, which is lower than the Total average mean of 2.500. This indicates that the usage of ETD facilities in the library by the respondents are lower than the total average mean.

The Inference of Table-3 with regard to response on usage of individual ETD facilities, their mean and standard deviation are given below. The most used ETD facilities and their respective Mean and Standard Deviation are

1. Inflibnet Facility, 3.040 (1.060)
2. Other National ETD Facilities, 2.730 (1.100)

Based on the responses Inflibnet is the most used and popular ETD facility. Where the Mean of the above facilities are above the Total Average Mean value of 2.500. The balance 3 ETD facilities are lease used / Not aware of the facilities and their respective Mean and Standard Deviation are

1. Institutional Repository, 2.450 (1.200)
2. Archives Facility, 1.740 (1.050)
3. Other International ETD Facilities, 1.820 (1.090)

Based on the above it is found that of the 5 ETD Facilities, the individual mean of only 2 ETD facilities are above the Total Average Mean of 2.500, which are mostly used and popular. The individual mean of the balance 3 ETD facilities are least used, having the mean value below the total Average mean value. Further, the overall Total average mean value is 2.360 with the standard deviation of 1.100 is below the Total average mean of 2.500, and hence majority of the respondent are not aware or have not used the ETD facilities of the libraries.

Research Objective 3

To examine the relationship between the Knowledge and Awareness of ETD Submission Guidelines & Copy Right Regulations and the usage of ETD facility by the target group in the selected universities of Tamilnadu.

Table-4

		Awareness	*Usage*
Awareness	Pearson Correlation	1	0.146
	Sig. (2-trailed)		0.077
	N	91	91
Usage	Pearson Correlation	0.146	1
	Sig. (2-trailed)	0.077	
	N	91	91

Correlation Matrix of Association Awareness of ETD Guidelines and The Usage of ETD Facility

Correlation is significant at the 0.01 level (2-tailed), Awareness, ETD Usage, N = Number of respondents.

From Table-4 it is interpreted that a correlation coefficient (r) of 0.146 which is positive and it is within the limit of the ±0.20. Hence there is a positive very low relationship between the two variables Awareness of ETD Submission Guidelines & Copy Right Regulations and the usage of ETD facility.

Test of Hypothesis

HO1: There is no Significant relationship exist between Knowledge and Awareness of ETD Guidelines and the usage of ETD facility by the target group in the selected universities of Tamilnadu.

Table-5: Linear Regression Analysis of the Relationship Between Awareness of ETD Guidelines and The Usage of ETD Facility

	df	*SS*	*MS*	*F*	*Significance*
Regression	1	0.473	0.473	3.317	0.077
Residual	89	18.129	0.146		
Total	90	18.602			

Df= degree of freedom, F = F-calculated, Correlation is significant at the 0.05 level (2-tailed)

The above Table-5 illustrates a p-value of 0.077, is greater than the alpha value of 0.05, Which implies that there is a very low significant relationship between the Awareness of ETD Guidelines and the usage of ETD facility of the Selected Universities in Tamilnadu. Hence, the null hypothesis that a Significant statistical relationship does not exist between the Awareness of ETD Guidelines and the usage of ETD facility in the selected university libraries in Tamilnadu was rejected.

Findings

The feedback of the respondents on the Awareness of ETD Submission Guidelines & Copy Right Regulations and the usage of ETD facility of the selected Tamilnadu Universities are illustrated in Table-2 and Table-3. The findings of the study show that there is Very Low significant positive association between the Awareness of ETD Submission Guidelines & Copy Right Regulations and the usage of ETD facility by the users of the selected Tamilnadu Universities. This is based on the obtained Correlation Coefficient of 0.146, This represents a positive and low relationship between the Awareness of ETD Submission Guidelines & Copy Right Regulations and the usage of ETD facility by the users of the selected Universities. In addition, the test of Null-Hypothesis with a p-value 0.077 indicates that the correlation coefficient is insignificant. This proves that there does not exist any significant relationship between the Awareness of ETD Guidelines and the usage of ETD facility.

Based on the result, it is clearly indicated that the library professionals have to create Awareness of ETD Submission Guidelines & Copy Right Regulations. The possessed Awareness of ETD Guidelines of the users includes Standard font size, Standard Preliminary Page, Standard Spacing, Standard Page Order and Page Numbering, Standard Title Page, Standard Abstract (required), Standard Chapters or Main Divisions of the Document of the ETD Submission Guidelines & follow standard appendix and Vita format and Aware of referring citations in bibliography of the Copy Right Regulations. Further, a significant number of users are not aware of the ETD guidelines

like Standard Pagination, Standard Copyright Page (optional), Standard Dedication and/ or Acknowledgment Pages (optional), Standard Table of Contents (required), Standard Lists: Tables, Illustrations, Charts and Graphs (optional), Standard appendix and Vita format, Standard format for PDF naming, Aware of Plagiarism Checking of the ETD Submission Guidelines & Fare dealing approach followed in India, acknowledgment as per copyright regulations, getting permission from author/publisher for extensive use of copyright material and Aware of Acceptable Plagiarism % of the Copy Right Regulations. Nevertheless, there is a very low positive association and belief that awareness of ETD Guidelines and the usage of ETD facility by the users. Even though the above contradicts by the low association, with the steady adoption of technology in library services the Awareness of ETD Guidelines shall become essential necessity / requirement for the researchers / Scholars.

However, this study clearly indicates that the selected institution libraries have wonderful ETD and ICT facilities and deliver better library services, the fullest potential of the facilities are not used by the users because of the user's inability to understand the relationship between of lack of awareness and the usage.

Conclusion

With this AI based information era, Technology is dynamically changing. Covid-19 pandemic has accelerated the technological penetration in all walks of life and the penetration was very high and advance in the research world. It breaks the barrier and boundaries, open-source research gains popularity along with parallel research. We experienced the advantage and benefits of the above through the outcome of invention of vaccine for the pandemic as the shortest span of time. Currently understanding these benefits, a lot of open-source ETD repositories are available and researchers are eager to take advantage and are exploring for new avenues of research or exploring the future possibilities of the existing research. Hence, understanding the essential of standardisation of Research Thesis and Dissertation and Copy Right Regulations is mandatory for the researchers. Having good knowledge of the ETD guidelines and Copy Right Regulation, will not only help them to prepare research thesis without plagiarism and other copy right issues and upload their Thesis and Dissertations hassle-free. This also helps them to utilise not only the ETD facilities of the library but also the other open-source ETD repositories.

The findings of the study state that, there is an insignificant relationship between Awareness of ETD Guidelines and the usage of ETD facility in the selected Tamilnadu Universities. This can be inferred from the findings that there is non-significant positive very low relationship between Awareness of ETD Guidelines and the usage of ETD facility. Since these ETD and copy right regulations Awareness Knowledge Skillsets are not applied regularly and are applied depending upon the need they become insignificant or non-significant. In general, it is concluded that there is very low positive non-significant relationship between the Awareness of ETD Guidelines and the usage of ETD facility.

Hence the following recommendations are stated

1. Make it mandatory for Researchers on the Awareness training program on ETD Submission Guidelines & Copy Right Regulations.
2. Intensify efforts on periodical refresher programs to the faculties and the researchers on ETD guidelines, developments on Copy Right Regulations and update the current development on Research Repository.
3. The Academic institution management and authorities should emphasis and encourage the library professionals as information literacy Experts and ambassadors, and utilise their services not only for the above internal training purpose.
4. The Academic institution management and authorities should emphasis and encourage the library professionals to acquire and upgrade knowledge and skillsets on ETD, its guidelines, IPR etc., through Scholarships, sponsoring programs, organising programs etc.
5. Encourage the Library function and services through adequate financial support and encourage the library professionals to come out with innovations in order to deliver better and more Digital Library Services.
6. The Academic institutions should upgrade and include Digital Library Skills as part of their curriculum for Library and Information science courses.

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INTELLECTUAL PROPERTY RIGHTS AND COPYRIGHT IN DIGITAL ENVIRONMENT

R. Ramesh[1] & S.K. Asok kumar[2]

Introduction

The rapid growth of digital technology advances such as the development of micro processors, mass storage graphics, communication network and increasing computer literacy and use of internet have significantly impacts the scope and nature of traditional intellectual property protection & information management. It poses a new era of opportunity and challenges for national and international intellectual property protection. The intellectual property in India is important at all levels of statutory, administrative and judiciary. India ratified the agreement establishing the world trade organization. This agreement inter alia contains an agreement on trade related aspects of the intellectual property rights, which came into force on the 1st January 1995. It lays down the minimum standards of protection and the enforcement of the intellectual property rights in the member countries with a view to reduce the distortions and impediments in the international trade. Trips provided for the norms and the regulation in respect following areas of the intellectual property copyrights and the related rights, trademarks, geographical indications, industrial designs, layout designs of the integrated circuits, protection of the undisclosed information (trade secrets), p aten.ts and plant varieties

Intellectual Property Rights

The term Intellectual Property broadly refers to property rights vested in the intangible. The property rights associated with real property i. e. land and personal property i.e. everything of oneself are fairly straightforward; the owner of such property has a right to possess it, to prevent others from possessing it and to preserve its integrity.

WIPO defines intellectual property as "creations of the mind, inventions, literary and artistic works, and symbols, names, images, and designs used in commerce." According to WIPO, "Intellectual property is divided into two categories: Industrial Property, which includes invention (patents), trademarks, industrial designs, and geographic indications of source; and copyright, which includes literary and artistic

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works such as novels, poems and plays, films, musical works, artistic works such as drawings, paintings, photographs and sculptures, and architectural designs. Related rights to copyright include those of performing artists in their performances, producers of phonograms in their recordings, and those of broadcasters in their radio and television programmes."

An intellectual property law protects the entities which have no physical forms, it includes names and logos attached to products, inventions and original works of authorship. Intellectual property rights (IPR) refers to the legal rights given to the inventor or creator to protect his invention or creation for a certain period. These legal rights confer an exclusive right to the inventor/creator or his assignee to fully utilize his invention/creation for a given period. Intellectual property refers to any intellectual creation, such as literary works, artistic works, inventions, designs, symbols, names, images, computer code, etc. Intellectual property law exists to protect the creators and covers areas of copyright, trademark law, and patents.

Historical development of IPR

It is not a modern concept but it is been present since the development of civilization. From civilization we have always given recognition to talented people, those who are intellectually capable of creating innovations and they have always got recognition and respect in the society. Accordingly, the financial and commercial benefits come out of those inventions. In the year 1421, the world's first modern patent was awarded to an Italian inventor. It was the year 1970 when "The Status of Anne" 2 empowered authors with renewable 14 years of protection for their original works. During the early 1800s, the idea of global protection of intellectual property rights floated among the legislative bodies. In the year 1966, WIPO (World Intellectual Property Organisation) came under the United States. Now it supervises all international agreements and Trade-Related Aspects of Intellectual Property Rights (TRIPS) have been controlled by WTO (World Trade Organization) come under United Nations.

Types of Intellectual Property (IP)

It is a broad term that describes the laws that protect certain products of peoples' imagination and creativity, is intangible property, is an 'economic' right

The main forms of IP include

- Copyright
- Patents
- Designs
- Trademarks
- Circuit layouts
- New plant varieties
- Confidential information

Victoria University's Intellectual Property Regulations provide the framework for the management of intellectual property at Victoria University.

Copyright Law

This law gives a legal framework for the use and management of a range of works, including text, artistic works, dramatic works, musical works, films, broadcasts, and published editions. Copyright gives the owner exclusive rights to reproduce publish in print or electronic form perform the work in public, communicate to the public, and adapt or modify their work. This includes emailing.

As the copyright owner, you can transfer any or all of these rights to users or a third party. Generally, copyright lasts for 70 years after the death of the creator or 70 years after the first publication of a manuscript. For research and study purposes you can rely on the 'fair dealing' exception which allows you to copy a "reasonable amount", namely one chapter or 10% of work and reproduction of images for your private use. This exception does not apply when you publish your work; in that case, permission is required to use works protected by copyright. Victoria University's Copyright Policy provides a framework for university staff and students to use third-party copyright material for educational and research purposes. General copyright information can be found at the Australian Copyright Council. The ACC provides Factsheets on a range of topics such as Copyright and Research, Moral rights, Duration, and the law regarding the use of third-party copyright (for example, using quotations) or using material such as logos, etc.

Copyright as a Barrier to Libraries and Education

Copyright law is increasingly acting as a barrier to libraries and information services. Digitization projects are being hampered because it is often difficult to get permission to make the material available in digital form. Negotiation even for out-of-print material can be a long and painful task. If libraries are unable to preserve our cultural heritage, it is lost for future generations. The different rules apply to different formats Instead all formats should be equal in terms of exceptions that apply to their use. Distance learning programs which are incorporated into course materials and other uses where permission from the right holder is usually required are hampered by digitization. This is because the copyright owners are untraceable, so-called orphan works.

Patents

A patent is a recognition for an invention, which satisfies the criteria of global novelty, non-obviousness, and industrial application. There are three types of patents: utility, design, and plant. Utility and plant patent applications can be provisional and non provisional. Provisional applications may not be filed for design inventions.

Patent applications: the three criteria

Novelty. This means that your invention must not have been made public – not even by yourself – before the date of the application. Inventive step. This means that your product or process must be an inventive solution.

Industrial applicability.

Section 3(i) of the Indian Patents Act makes patent ineligible "any process for the medicinal, surgical, curative, prophylactic diagnostic, therapeutic or other treatment of human beings or any process for a similar treatment of animals to render them free of disease or to increase their economic value or that of their products". Two recent Madras High Court decisions, in respect of two separate appeals filed by the same Appellant, Chinese University of Hong Kong [CMA (PT) No. 14 of 2023 and CMA(PT) No. 1 of 2023] have deliberated upon the scope of "diagnostic" under Section 3(i) of the Patents Act, 1970. In both cases, the Court held that the word "diagnostic" in Section 3(i) of the Patents Act, should be construed, to consider processes that uncover pathology for the treatment of human beings, as being patent ineligible.

Designs

In IP terms, the design of a product comprises the novel and distinctive features of its shape, configuration, pattern, or ornamentation, which give a product a unique visual appearance. It does not include how a product works, its material composition, or its internal structure. Anything that anyone creates is their intellectual property. Copyright law is the law that protects our Intellectual Property Rights from unauthorized copying and misuse. Design copyright is the way to protect your original creation from infringement. Section 16 of the Design Act If the owner of a design shows it to someone else under conditions where it would be dishonest for that person to use or share the design, or if someone other than the owner shares the design dishonestly, it won't count as making the design public in a way that would ruin the design's copyright.

Trademarks

Trademarks, patents, and copyrights are different types of intellectual property. The USPTO grants patents and registers trademarks. The U.S. Copyright Office at the Library of Congress registers copyrights. Use the IP Identifier to learn what kind of intellectual property.

This indicates a logo, symbol, product name, business name, slogan, or other eligible piece of IP that is used in commerce as a trademark. It is usually associated with a mark that is not registered at the national or regional IP office of the territory where it appears.

Trademark defined under Section 2 (zb) of the Trade Marks Act, 1999, "trade mark means a mark capable of being represented graphically and which is capable of distinguishing the goods or services of one person from those of others and may include

the shape of goods, their packaging, and combination of colors." A mark can include a device, brand, heading, label, ticket, name, signature, word, letter, numeral, shape of goods, packaging, or combination of colors or any such combinations. The trademark prevents unauthorized use of an individual's or company's product or service without their permission.

Trademark Rules

With effect from 6 March 2017,[6] the new trademark rules came into existence. The intention is to simplify the whole trademark registration process and make it hassle-free and quick. Some of the features of the new rules are sound marks are made registrable; 3D marks are made registrable; e-filing is promoted; provisions about the well-known mark; separate fees structure for an individual/startup/small enterprise and others; expedited processing of application; hearing via video conferencing; and the number of forms has been cut down to 8 from the existing around 75 forms.

Circuit layouts

The means of the Semiconductor Integrated Circuits Layout-Design Act, 2000 is to protect Intellectual Property Rights (IPR) in the area of Semiconductor Integrated Circuit Layout Designs and for matters connected therewith or incidental thereto.

The main focus of the SICLD Act is to provide routes and mechanisms for the protection of IPR in Chip Layout Designs created and matters related to it. The SICLD Act empowers the registered proprietor of the layout design with an inherent right to use the layout design, commercially exploit it, and obtain relief in respect of any infringement. The initial term of registration is 10 years; thereafter it may be renewed from time to time. Department of Information Technology The Ministry of Communications and Information Technology is the administrative ministry looking after its registration and other matters.

An Integrated Circuit is a product having transistors and other circuitry elements, which are inseparably formed on a semiconductor material or an insulating material or inside the semiconductor material and designed to perform an electronic circuitry function.

Layout design means a layout of transistors, and other circuitry elements and includes lead wires connecting such elements and expressed in any manner in a semiconductor integrated circuit. A semiconductor integrated circuit is a product having transistors or other circuitry elements that are inseparably formed on a semiconductor material or an insulating material or inside the semiconductor material and designed to perform an electronic circuitry function. Commercial exploitation of semiconductor integrated circuits layout design means to sell, lease offer exhibit for sale, or otherwise distribute such semiconductor integrated circuits for any commercial purpose.

Application of the Act to protect a layout design, subject to the following conditions-

- It is original
- It has not been commercially exploited for more than 2 years from the date of application for the registration.
- It is inherently distinctive and capable of being distinguishable from any other registered layout design.

New plant varieties

Plant variety protection provides legal protection of a plant variety to a breeder in the form of Plant Breeder's Rights. Plant Breeder's Rights (PBRs) are intellectual property rights that provide exclusive rights to a breeder of the registered variety. To recognize and protect the rights of farmers in respect of their contributions made at any time in conserving, improving, and making available plant genetic resources for the development of new plant varieties. Two types of intellectual property rights (IPRs) play a major role; Plant Breeders Rights (PBRs), developed between 1900 and 1950; and Patent Rights which emerged with the rise of modern Biotechnology.

Confidential information

Confidential information is any type of information that you regard as confidential. Confidential information has value because you know the information, and others do not. Trade secrets and know-how are subsets of confidential information. Confidential information is information that can be legally protected and provides a business advantage to the owner of that information because it is kept secret.

How is IPR obtained?

IPR can be obtained in one of two ways: by application or by automatic derivation. Where an application procedure is involved, this usually follows the steps set out in the following sequence:

- File application.
- Search carried out to ascertain originality.
- Examination carried out.
- Objections raised / No objections raised.
- Deal with objections, if any.
- Grant / Registration.

E.g.: - Patents, Registered Designs and Registered Trademarks.

Automatic derivation of IP can occur by the creation of an original work, e.g.: - a drawing, design document, prototype or the creation of a reputation in a particular area. Where rights arise automatically, these rights are usually limited to the prevention of reproduction or a misrepresentation being made. E.g.: - Copyright, Unregistered Design Right and unregistered Trademarks.

Role of Librarian in the Current Digital Environment

As librarians, our role is to prevent disobedience of IPR issues by online users. Librarians do not have direct control over digital content and it is difficult for them to have a permanent check on the activities of online users for how much text from the original literature has been copied by infringing copyright act. The librarian should be well-versed in the issues related to the infringement of Intellectual Property Rights. Librarians can promote the use of open-access material which is somehow free from copyright issues. Digitization of content is a tedious and time-consuming process. Before digitization, copyright permissions must be sought from the concerned persons to avoid any critical situation in the future. Relevant copyright warnings with necessary instructions should appear before any text is opened or downloaded from the website of libraries. The basic work is to spread awareness regarding copyright issues so that unauthorized copying can be stopped and thus infringement can also be minimized. Libraries must have the liberty of not permitting to access any of the material without considering copyright issues. Librarians can be invited to give information regarding the part of original literature which can be copied. Mass communication media like radio, TV, magazines, and newspapers must be used to create awareness about Intellectual property rights (IPR) issues to the masses. Seminars and meetings can be arranged to demonstrate the proper use of Intellectual Property Rights.

Conclusion

While IPR has become a big and critical issue in the developed countries, it is perhaps, in stage of infancy in developing countries like India. Basically, copyright issues relate to compliance on the one hand and exploitation on the other. This is partly due to large scale application of ICT, the arrival of Internet on the scene facilitating downloading of information indiscriminately, and financial / legal implications of copyright / IP. In the near future, it would be desirable if not essential for institutions, especially, academic and industrial, to formulate a policy covering all aspects of IPR and ensure it covers material in or converted to electronic form, highlighting issues, such as, ownership and protection of copyright, compliance and exploitation of copyright, third party copyright,, revenue sharing, legal implications, transfer of ownership and licensing as well as raising user awareness, copyright with reference to teaching and course materials, research publications, etc. Individual perceptions about ownership among the academic community are different . While older staff believes that they own copyright of their publications, the younger staff believes that the institution will take ownership of all outputs. This brings about the issue of Management Control and Academic Freedom. In the changing teaching environment where distance learning and learning online has become a reality thanks to the application of a range of ICTs, copyright has become a big issue, It is necessary that institutions should allocate resources to Copyright Management.

The due diligence needed to assert will not only be to respect the intellectual property rights in the resources being managed but also to defend the rights of users to exercise their constitutional and legal rights to make use of these resources. Today, one

may need to think about a tiered system of digital copyright protection, where stronger controls are allowed in exchange for the fact that the copyright owner is not able to use the available law as an effective deterrent to copyright theft. The socio-economic development of a country depends to a large extent on the creativity of the people and creative works cannot be encouraged without effective administration of copyright laws. While IPR has become a big and critical issue in the developed countries, it is perhaps, in stage of infancy in developing countries like India. In the near future, it would be desirable if not essential for institutions, especially, academic and industrial, to formulate a policy covering all aspects of IPR and ensure it covers material in or converted to electronic form, highlighting issues, such as, ownership and protection of copyright, compliance and exploitation of copyright, third party copyright,, revenue sharing, legal implications, transfer of ownership and licensing as well as raising user awareness, copyright with reference to teaching and course materials, research publications, etc.

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THE ROLE OF DIGITAL PRESERVATION AND INSTITUTIONAL REPOSITORIES IN THE AGE OF OPEN ACCESS FOR INNOVATIVE RESEARCH

Jenny Prisca Barla[1] & Shivarama J[2]

Introduction to Digital Preservation

With technological breakthroughs, preserving cultural heritage, scientific research, scholarly articles, etc, has become efficient. Technology helps decrease the gap between physical printed and electronic resources and helps in long-term preservation and usability in the future.

Digital preservation serves as essential for prolonging the life cycle of machine-readable information and protecting them against tangible loss, hardware, and software obsolescence-activities such as file backups and storage device degradation. It is a process that allows data to be preserved in digital format and ensures the information's usability, durability, and intellectual integrity.

Aspects of Digital Preservation

1. **Medium Preservation –** means preserving the storage device, where both born digital and digitized data is stored. Regular backup is essential to avoid any damage.
2. **Technology Preservation –** updating the technology i.e. hardware and software, from old to new to avoid technological obsolescence. It is done to avoid dependency on digital materials, which might become inaccessible and unusable.
3. **Intellectual Preservation –** preserving the integrity of digital information and safeguarding accidental damaging data through tampering and modifying.

Tools and Requirements for Digital Preservation

E-Image scanner – A specialized microfilm scanner device transforms microfilm and microfiche documents into high-resolution digital pictures in the most computer-readable formats.

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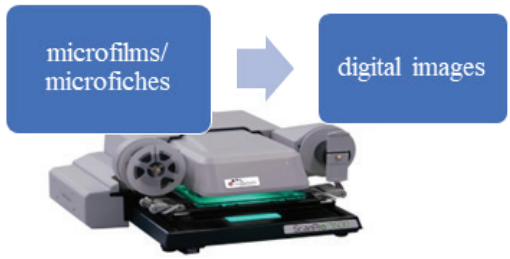


Figure 1: E-Image Scanner to convert microfilms to digital images(e-ImageData 2022, January 12)

High-Resolution Camera Setup – As per international standards, a structured, simple, managed, and easy-to-retrieve process is done to digitize magnetograms. This process has saved time and money and improved the efficiency.

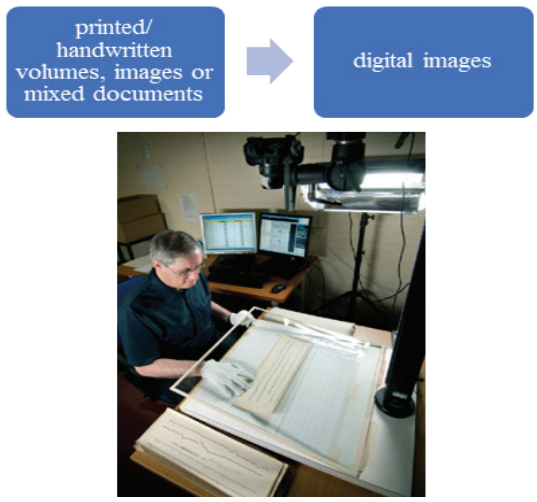


Figure 2: High-resolution camera Setup to convert documents into digital images (Reay et al., 2010)

Storage Media – To store different formats, different storage devices are used. According to Tharushika, 2021, computer storage consists of two types: primary storage devices and the other is secondary storage devices. Primary storage devices are the internal memory of a computer device. Examples of primary storage devices include RAM or ROM. Whereas Secondary storage devices are memory storage that are external to the computer system. They provide permanent and long-term storage features, some examples are hard disks and CDs.



Figure 3: Storage Devices (Tharushika, 2021)

OCR tool – An Optical Character Recognition tool or Software (OCR) is a technology that enables converting an image file directly to text document. It recognizes texts and characters from the image and analyzes them with the fonts available in the databases.



Figure 4: Working of an OCR Software (Emma, 2020)

Importance of Digital Preservation for Research Innovation

1. Preservation of Cultural Heritage - The process of digital preservation ensures the adequate maintenance and protection of significant cultural heritage resources over an extended period.
2. Wide Access -Through digitization, national cultural assets are easily accessible to a global audience online, facilitating increased diffusion and comprehension of cultural artifacts.
3. Preservation of Originals - Digitization serves to safeguard valuable historical materials, such as documents, by creating surrogate copies for user access, thus protecting the originals from deterioration.
4. Improved Resource Accessibility - Digitization enhances resource accessibility by providing multiple copies for simultaneous utilization, reducing user waiting times, and enabling access from any location with an internet connection.
5. Enhancing Research and Knowledge - Digital preservation fosters research and the expansion of cultural knowledge through widespread online access to materials, facilitating factual verification and the eradication of misinformation.

Limitations in Digitizing

The transition from print to electronic formats and preserving the digital collection with challenges.

1. Lack of technical skills among collection managers and preservation experts
2. The increasing complexity of digital goods, such as text, photographs, music, and video, and their dependency on software (e.g. database storage).
3. Absence of widely accepted standards that will ensure access over time;
4. The rising amount of digital items and diverse document standards and formats.
5. Inadequate preservation planning and consideration of long-term access requirements in digital product development.
6. Intellectual property rights may prevent systematic duplication of digital artifacts for preservation purposes.
7. Unstable storage media (e.g., diskettes with a limited life duration); Planning Digital Preservation

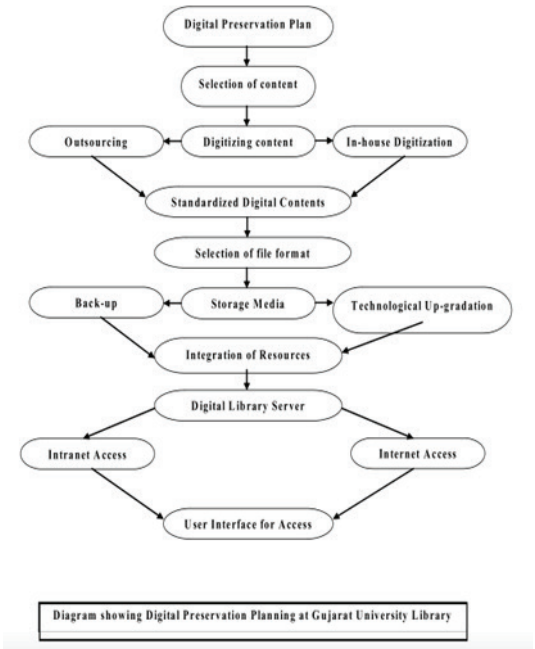


Figure 5: Planning for Digital Preservation of Special Collections (Parekh, Y. R., & Parekh, P., 2009)

The above Figure 5, depicts a thorough digital preservation plan to ensure the long-term accessibility and usability of the library's digital collections.

1. Selection of Content – The selection of content pertains to the process of selecting which digital materials will be preserved. Considerations may include the value, uniqueness, and format of the content.
2. Outsourcing vs In-House - The decision between Outsourcing and In-house

digitization determines whether the library will utilize an external service or its internal staff to convert physical materials into digital formats.

3. Standardized digital contents – Standardizing digital contents guarantees that the digitized materials conform to common file formats and technical specifications, facilitating storage and access over time.
4. Selecting File Format - The selection of file format plays a vital role in ensuring the long-term preservation and accessibility of the digital content.
5. Backup and Technological Upgrade - The creation of backups on various storage media is essential for safeguarding against data loss. Regularly updating storage technologies and software is imperative to ensure continuous access to digital content.
6. Integration of Resources - Integration of Resources involves consolidating different digital collections and resources within the library for streamlined access. The Digital Library Server functions as the primary repository for the storage and management of digitized materials.
7. Intranet and Internet Access - Both Intranet and Internet Access are available for users to retrieve digital content through the library's internal network and the Internet.
8. User Interface - A user-friendly interface permits researchers and patrons to effortlessly search, browse, and retrieve digital resources from the library's collection.

Open access

Access to information and knowledge is paramount in today's rapidly evolving world. Open access initiatives have emerged as powerful drivers in bridging the information gap within our knowledge-centric society. These initiatives aim to make research and information freely accessible, irrespective of financial constraints. This introduction provides an overview of the open access concept and its multifaceted role in enhancing accessibility to research, empowering global collaboration, and enabling informed decision-making. It sets the stage for a comprehensive exploration of open access, its historical evolution, types, benefits, and challenges, all contributing to a more equitable and informed world.

Open access is defined as “to provide free of charge and unhindered access to research and its publications without copyright restrictions (Kanjilal & Das, 2015).”

Advancements in technology and development in the World-Wide-Web have made storage, retrieval, and dissemination of the E-journal and processing of digital information efficient. The number of publications has increased with the exponential growth in research and development.

Open Access is an internet-based environment that makes scholarly communication available in the public domain for consumption without hindrance or subscription.

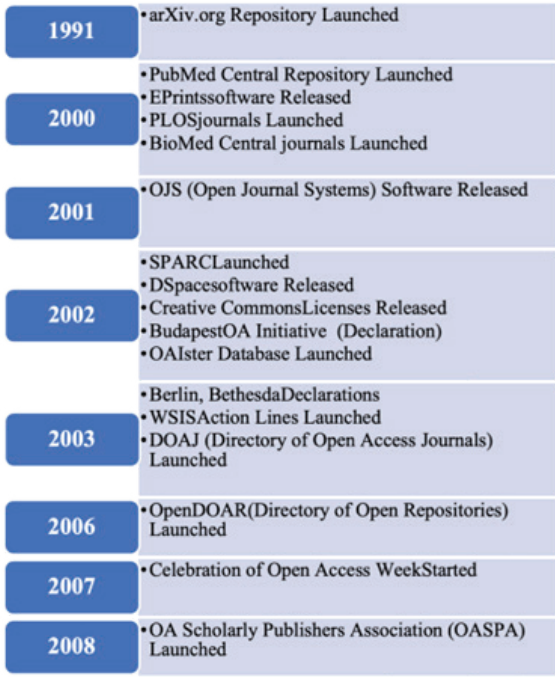


Figure 6: Open Access Timeline

Benefits of Open Access

Open access (OA) is a publishing model that aims to make research and information profusely available to its users. It plays an essential role in bridging the knowledge gap in several ways:

Access - Open access removes financial barriers, allowing anyone with an internet connection access to research articles, journals, and academic resources. This accessibility is essential for individuals and institutions with limited financial resources.

Global Reach - OA publications are available worldwide, making research and knowledge accessible to researchers, students, and professionals in developed and developing countries. This global dimension encourages international cooperation and the sharing of different perspectives.

Public Access - OA benefits the general public by providing access to research findings, health information, educational resources, and cultural materials. It empowers people to make informed decisions and contribute to solving critical problems.

Interdisciplinary research - OA encourages interdisciplinary research by making it easier for researchers from different fields to access and build on each other's work. It promotes innovation and the development of new ideas.

Research Implications - OA publications often have greater visibility and impact because they are available to a broader audience. Researchers benefit from increased exposure and citation opportunities.

Information Sharing - OA helps reduce the information gap between institutions and individuals who can afford traditional subscriptions and those who cannot. It promotes equal access to information resources.

Types of Open-Access

Green – open access to journals, delivered regardless of the journal's business model.

Gold – open access to repositories and self-archiving.

Approaches to Open-Access

- **Hybrid OA –** In Hybrid Model, after receiving certain article processing charges (APC) from the authors, the publishers publish open-access articles in toll-access scholarly journals.
- **Delayed OA –** In the Delayed model, publishers offer free access after a specified period from 6 months to 2 years.
- **Short-term OA –** Publishers offer free access until a specified period from 6 months to 1 year. Afterward, contents are available only to subscribers
- **Selected OA –** Publishers offer free access to selected content only.
- **Partial OA –** Publishers offer free access to the contents of particular sections but not review papers. Others are only available to subscribers only.

Benefits of Open Access to Different Significant Groups

Researchers

- **Better visibility** - OA publications are more widely available and visible, which increases readership and citations.
- **Global reach** - Researchers can share their work with a global audience, promoting collaboration and international recognition.
- **Meeting funding mandates** - OA helps researchers meet the requirements of funding agencies and institutions that require open access to funded research.
- **Rapid Dissemination** - OA enables quick sharing of research results and faster responses to emerging issues.

Academic and research institutes

- **Improved reputation** - Institutions can showcase the work of researchers on OA platforms, thus improving their global reputation.
- **Cost Savings** - Lowering subscription costs for traditional journals can result in significant cost savings for libraries and institutions.
- **Support for researchers** - OA initiatives and repositories give institutional support to researchers to pursue OA practices.

Public and Society

- **Access to Information** -The public will have free access to scientific and scientific information that promotes education and informed decision-making.
- **Implications for health care and policy** - OA research in medicine and public policy fields can benefit society through improved health care and policy making.
- **Scientific communication** - OA facilitates scientific communication and allows researchers to connect directly with the public through their research.

Academic Publishing Ecosystem

- **Innovation** - OA publications encourage innovation in publishing models, platforms, and technologies.
- **Diverse Content** - OA encourages the publication of diverse research content, including negative results and interdisciplinary work.
- **Alternative Metrics** - OA platforms often offer alternative metrics that complement traditional citations and provide new ways to measure impact.

Open Access Initiatives

- **Berlin Declaration –** The Berlin Declaration was published on 22 October 2003. They believed that the dissemination of knowledge is not completed if it is not available for all readers to read. It suggested disseminating information through not only classical methods but also by using internet support and providing open access.
- **Budapest Open Access Initiative –** The initiative was started in 2002 by Budapest. The BOAI focuses on self-archiving in institutional repositories and open-access journals. BOAI is a "statement of principle, a statement of strategy, and a statement of commitment(Budapest Open Access Initiative, n.d.)." The primary goal of BOAI is to provide freely available literature for readers to download, use, read, copy, print, and distribute.
- **OA2020 initiative –** Open-Access 2020 is a global initiative endorsed by many institutions, researchers, libraries, and organizations committed to accelerating the closed scholarly journals to transfer into universal open access. It provides a model to preserve the publishing services upon which researchers rely and the 21st-century digital environment depends.
- **OAI-PMH –** It stands for Open Access Initiative Protocol for Metadata Harvesting. It was founded in 2002 by the National Science Foundation. It is a mechanism for harvesting metadata records from repositories. It is web-based and uses HTTP to send requests and XML to respond. The service provider communicates with the data provider using the six verbs i) Identify, ii) ListMetadataFormats, iii) ListSets, iv) ListIdentifiers, v) ListRecords, and vi) GetRecord.

Challenges

- Sustainability - The financial sustainability of OA models is problematic because publishers have to cover costs. Various OA models have been proposed, such as article processing (APC) and institutional support, but they require careful management.

- Quality control - Some critics argue that OA publishing lacks the rigorous peer review processes associated with traditional publishing, which can affect the quality of published research. However, many OA journals adhere to high editorial standards.
- The Digital Divide - Although OA publications are available online, the digital divide (unequal access to the Internet and digital devices) can still limit access for some individuals and communities.
- Copyright and Licensing - OA content often comes with open licenses that allow reuse and distribution, but understanding and managing these licenses can be difficult for authors and users.

Institutional Repository

- An Institutional Repository is a web-based database of scholarly materials of an institute. It collects, stores, and disseminates the intellectual output of the institute. The Budapest Open Access Initiative (BOAI), in 2002, stated that scholarly articles should be available in the public domain and free subscription. This helped disseminate intellectual output and increase scholarly materials.
- Since the early 2000s, institutional repositories have channelized scholarly communication by providing access to scholarly research. It is also beneficial in increasing the visibility and prestige of the institute by showcasing the quality of research they've done. It helps reduce the economic burden of academic and research libraries by sharing information.
- Implementing Universal interoperability among IRs is an ideal and envisioned area for improvement.

Benefits of Institutional Repository

1. Long-term preservation of digital materials.
2. It serves as an indicator of the quality of an institute or university.
3. It gives access to the entire university's intellectual output, and one doesn't need to search through individual departments.
4. Citation rate increases for articles. Both in the case of open-access journals and local institutional repositories.
5. A boost from institutes such as several colleges and universities enacted the policies to house locally generated intellectual in writing to be stored in institutional repositories for accrue benefits and visibility.

Self-archiving

Self-archiving can be defined as a convenient and efficient mechanism to allow authors to store their intellectual output in a platform to make the knowledge available for all scholarly purposes. This helps scholars, faculty, and student to preserve their research products digitally for the future.

With the increase in scholarly publications, authors can also share their reports to receive peer reviews. Self-archiving helps keep librarians and information professionals

up-to-date with firsthand knowledge. It also helps authors get to familiarize themselves to difficulties or various options.

Tips for self-archiving

1. Deciding on which version to share – preprint, postprint, or publisher's PDF.
2. Identifying and analyzing policies of journals for submission.
3. Selecting from various self-archive locations – disciplinary repositories, institutional repositories, general repositories, academic social networking sites, or personal websites.
4. To include correct citations while submitting any manuscript.
5. Setting a release date before publishing so the articles will be out on a specific date. This depends on journals' policy.

RoMEO color codes to highlight self-archiving policies

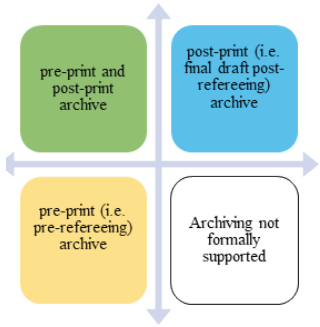


Figure 2:

Figure 7: SHERPA RoMEO's Color Code Policy

Though the colors are popular, they no longer give a clear view as the open-access policies have become complicated

Open access movements: a global perspective

First five-country groups with most numbers of records in OA registries.

N°	Country	Indicator	N°	Country	Indicator	N°	Country	Indicator
SHERPA/RoMEO			DOAJ			ROAR		
1.	United States	576	1.	United Kingdom	1554	1.	United States	844
2.	United Kingdom	314	2.	Indonesia	1508	2.	United Kingdom	257
3.	Portugal	172	3.	Brazil	1390	3.	Germany	250
4.	India	124	4.	Spain	722	4.	Japan	231
5.	Germany	101	5.	United States	708	5.	Spain	185
Open DOAR			ROARMAP			Berlin Declaration		
1.	United States	575	1.	United States	143	1.	Germany	116
2.	United Kingdom	284	2.	United Kingdom	120	2.	Italy	84
3.	Germany	237	3.	Germany	75	3.	Spain	61
4.	Japan	235	4.	Turkey	54	4.	United States	37
5.	Spain	146	5.	Spain	39	5.	Switzerland	30
Budapest Open Access Initiative			SHERPA Juliet			OA2020 Initiative		
1.	United States	131	1.	United Kingdom	64	1.	Germany	28
2.	India	107	2.	United States	16	2.	China	19
3.	Turkey	83	3.	Canada	14	3.	United States	16
4.	Russian Federation	52	4.	Ireland France Belgium	6	4.	Norway	9
5.	United Kingdom	44	5.	Sweden	by 5	5.	Netherlands	7

Figure 8: First five-country groups with the most records in OA registries. (Moskovkin et al., 2021)

First five-country groups with maximum increase in the numbers of record in OA-registers.

N⁰	Country	Growth %	N⁰	Country	Growth %	N⁰	Country	Growth %
SHERPA/RoMEO			DOAJ			ROAR		
1.	Russian Federation	38.71	1.	Ukraine	185.19	1.	Iran	66.67
2.	Portugal	33.33	2.	Indonesia	146.00	2.	Colombia	26.15
3.	Netherlands	13.04	3.	China	87.32	3.	Indonesia	19.82
4.	United Kingdom	12.14	4.	Turkey	86.70	4.	Argentina	16.33
5.	France	11.11	5.	Russian Federation	82.89	5	Romania	15.38
Open DOAR			ROARMAP			BerlinDeclaration		
1.	Netherlands	85.71	1.	Japan	150.00	1.	Russian Federation	100.00
2.	Iran	70.00	2.	Poland	133.33	2.	Germany	18.37
3.	Romania	66.67	3.	Switzerland	80.00	3.	Spain	17.31
4.	Indonesia	59.68	4.	Argentina	40.00	4.	Switzerland	11.11
5	Colombia	56.82	5.	Russian Federation Ukraine	33.33	5.	France	4.35
BudapestOpenAccessInitiative								
1.	France	61.54						
2.	Turkey	50.91						
3.	Switzerland	50.00						
4.	United States	45.56						
5.	Poland	40.00						

Figure 9: Country groups with a maximum increase in records in OA-registers. (Moskovkin et al., 2021)

OA-repositories & OA-Journals

- ROAR – Registry of Open Access Repositories was created by EPrints in 2003. It is a searchable international database indexing the creation, location, and growth of open-access institutional repositories and their contents.
- OpenDOAR – OpenDOAR stands for Directory of Open Access Repositories. It is a UK-based website and lists all open-access repositories, including academic ones. The University of Nottingham has maintained it under the SHERPA services since 2015.
- DOAJ – It stands for The Directory of Open Access Journals. It was launched in 2003 and is maintained by Infrastructure Services for Open Access (IS4OA). The motto of DOAJ is to "increase the visibility, accessibility, reputation, usage and impact of quality, peer-reviewed, open access scholarly research journals globally, regardless of discipline, geography or language.(DOAJ, n.d.)"

OA-Policy

SHERPA RoMEO – Stands for Rights Metadata for open-access. It was initiated by the Joint Information Systems Committee (JISC). It aggregates and analyses open-access policies and summarizes publishers' policies, copyrights, and policies regarding self-archiving for individual journals.

ROARMAP – Stands for Registry of Open Access Repository Mandates and Policies. It is a searchable international database of policies. Created by EPrints and a companion of ROAR. Its mandates are classified in terms of strength and effectiveness.

SHERPA Juliet – JISC also initiates it under the umbrella of SHERPA services. It provides researchers and libraries with the latest information concerning funders' policies and conditions. It is a single database for searching all required pieces of information.

OA-Initiative

- Berlin Declaration – The Berlin Declaration was published on 22 October 2003. They believed dissemination of knowledge is not completed if it is not available for all readers to read. It suggested disseminating information through not only classical methods but by using internet support and providing open-access.
- Budapest Open Access Initiative – The initiative was started in 2002 by Budapest. The BOAI focuses on self-archiving in institutional repositories and open-access journals. BOAI is a "statement of principle, a statement of strategy, and a statement of commitment(Budapest Open Access Initiative, n.d.)". The primary goal of BOAI is to provide freely available literature for readers to download, use, read, copy, print, and distribute.
- OA2020 initiative – Open-Access 2020 is a global initiative endorsed by many institutions, researchers, libraries, and organizations committed to accelerating the closed scholarly journals to transfer into universal open access. It provides a model to preserve the publishing services upon which researchers rely and the 21st-century digital environment depends on.
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OA-Implementations

- PubMed Central – The National Center for Biotechnology Information of the National Library of Medicine launched PubMed Central in 2000. It creates, manages, and supports a digital life sciences journal content repository.
- BioMed Central – It was founded in 2000 and has been owned by Springer, now Springer Nature, since 2008. It offers open access to peer-reviewed biomedical research. Copyright is retained by authors who publish in BMC journals.
- Role of the Library in Bridging the Information Gap :
- Contribute to the academic community by creating institutional repositories for all digital materials generated from research and academic accomplishments, extending beyond just the published works.
- Enhance the research data and published article search process by refining and packaging the results to optimize the user experience.
- Offer a platform that enables scholars to archive and publish their research findings independently.
- Undertake a publisher's responsibility by issuing e-journals and promoting and disseminating them.
- Establish and administer institutional repositories to ensure the institution's research output is preserved and accessible.

Conclusion

Digital preservation is essential for preserving cultural heritage, scientific research, scholarly articles, and more. It bridges the gap between physical and electronic resources, ensuring long-term preservation and usability. Digital preservation protects against physical loss, hardware and software obsolescence, and data deterioration. UNESCO guidelines emphasize preserved digital materials' ongoing value, access, and authenticity. Reiterate the importance of digital preservation: By implementing digital preservation strategies, we extend the life cycle of machine-readable files and safeguard them from potential loss or obsolescence.

Digital preservation ensures information's long-term usability, durability, and intellectual integrity. It allows for the continued access and retrieval of essential elements in authentic digital materials. Open access initiatives are crucial in closing the information gap in our knowledge-driven society. They provide free and open access to research and information, promoting global collaboration, interdisciplinary research, and broader public engagement. While open access has evolved over the years, with various models and significant milestones, it faces challenges related to sustainability, quality control, the digital divide, and copyright issues. Despite these challenges, open access remains a powerful force for democratizing knowledge and accelerating its dissemination, ultimately contributing to a more equitable and informed global community.

Open access is based on the simple principle that users like to read, download, share, print, or copy information for free. Using the open repositories made specifically to publish and share scholarly communications makes librarians value themselves. Libraries from institutes or universities provide features like institutional repositories where all the intellectual output from the institute can be stored and disseminated. In the era of open access, the functions of digital preservation and institutional repositories serve a twofold purpose. These platforms not solely enable a wider reach to research outcomes, but also endorse cooperative and multidisciplinary initiatives. Through the conservation of various types of digital academic work, these repositories actively contribute to the preservation and progression of scientific innovation.

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INSTITUTIONAL REPOSITORIES AND METADATA

Yashashwini, H L[1]

Introduction

Institutional repositories are organized collections of research output in the form of research articles, papers, journals theses, and dissertations. In recent years, As institutes grappled with modern digital advancements and the transformation of resources towards the digital format, they needed a way to manage their research output where the research papers, journal articles, thesis and dissertations, reports, teaching and learning material for better ability to preserve the important documents. Metadata commonly referred to as data about data has been attracting much attention as a key to the solution for efficient management of increasingly diversifying, production workflow and ever-multiplying distribution output of digital format. Metadata is expected to facilitate information sharing between respective infrastructures and devices to keep up with diversifying media, users, and utility environments and realize accessible usable content. In short proper mobilization of metadata may provide the standardized technological elements, enabling the integration of production, distribution, and content access paradigms. The open-access philosophy was firmly activated in 2002 when the Budapest open access initiatives (BOAI) were introduced. It took quickly in the field of the medical and scientific community it offered an alternative root to research literature.

Institutional Repository

Due to the above reasons, MIT launched a project titled DSpace to build and develop a stable and sustainable framework for the collection of organization of institutional publications, enabling them to manage their resource (Dspace 2000). Dspace and other technical solutions emerged during this period, surrounding the idea and building on the idea to develop a tool to manage the research outcome mainly because they were institutional in scope. Through such inventions and technological additions more and more institutes are now developing their repository for archival and preservation purposes. Through OAI-PMH harvesting protocols, some are also enabling open access to their repositories., which is a yet another revolutionary step towards the open access movement as well. Institutional repositories, essentially serve as the database collection for an institute, where all the research outcome is stored, collected, managed, analyzed and preserved for archival purposes. Institutional repositories serve as one-stop solutions for all the content management systems for institutes where all their

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publications can be stored and accessed from one place as well. Over the past few years, we witnessed the emergence of scholarly communication and publication models in the form of institutional, or digital, repositories (Johnson 2002) defined a digital IR as 'any collection of digital material hosted, owned or controlled, or disseminated by a college or university, irrespective of purpose or provenance'. SPARC has been a key important publication. A university-based IR is a set of services that a university offers to the members of its community, for the management and dissemination of digital materials by created the institution and its community members (Lynch, 2003). IRs increase an institution's visibility and prestige.

Implementation of IR in some of the academic institutes in India

Institutional Repositories promote research visibility for institutes by helping them cross the boundaries of its output to only one institute and expanding it to the whole globe. This helps in creating a greater research impact overall. The process of digitization has begun with the emergence of various digital and imaging technologies. High-quality images are therefore capture of physical texts through the tools like digital software Dspace, E-prints, and so on. In India for several years, universities have generated valuable knowledge through R&D activities. These are in the form of theses, dissertations, project reports, courseware, pre-prints, etc. In these are hidden a huge amount of valuable data and material which is probably not available in any published resource. Unfortunately, these are inaccessible in the absence of appropriate mechanisms Thus, for universities/institutions, IRs are marketing tools, communicating available expertise and quality by showcasing the output of faculty and research scholars, public service projects, and other activities and collections. IRs also complement existing metrics for gauging institutional productivity and prestige. While the increased visibility reflects a high quality of scholarship, this demonstration of value can translate into tangible benefits, including attracting funding from public and private sources increasing the institution's status and reputation. IRs in universities generally include pre-prints of journal articles, seminar papers, technical reports, research data, theses, dissertations, work in progress, important print and image collections, teaching and learning materials, and materials documenting the history of the institution. Table 1 describes the some of the important repositories in India and its characteristics

Table 1 Some of IR in India

Institutions	URL	Software	Coverage	Metadata	No.of Collection
Indian Institute of Management Kozhikode	http://dspace.iimk.ac.in/	DSpace	Engineering Health and Medicine Science Social Sciences Technology	OAI-PMH	24600
Gurugovind Singh Indraprastha University	http://www.ipu.ac.in/	DSpace	Multidisciplinary	OAI-PMH	7500

Indian Institute of astrophysics	https://www.iiap.res.in/	DSpace	Astronomy	OAI-PMH	10800
Indian Institute of science	https://iisc.ac.in/	Eprints	Science & Technology	OAI-ster	19600
INFLIBNET	https://www.inflibnet.ac.in/	DSpace	Multidisciplinary	OAI-PMH	24000
NAL	https://www.nal.res.in/	DSpace	Aero Engineering	OAI-PMH	6800
National Chemical Laboratory	https://www.ncl-india.org/	DSpace	Chemistry and Biological Science	OAI-PMH	18000
Raman Research Institute	https://www.rri.res.in/	DSpace	Physics and astrophysics	OAI-PMH	7900
University of Hyderabad	https://uohyd.ac.in/	DSpace	Multidisciplinary	OAI-PMH	14000
National Institute of Technology, Rourkela	https://www.nitrkl.ac.in/	DSpace	Engineering & Technology	OAI-PMH	24000

Figure-1 DSpace@IIMK

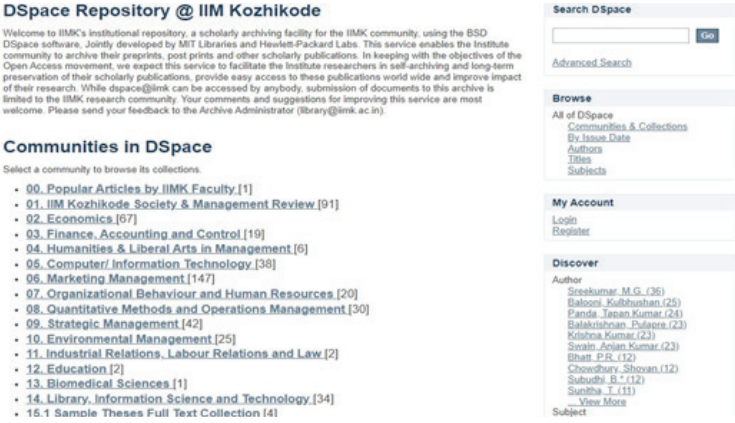


Figure-2 ETD@IISc

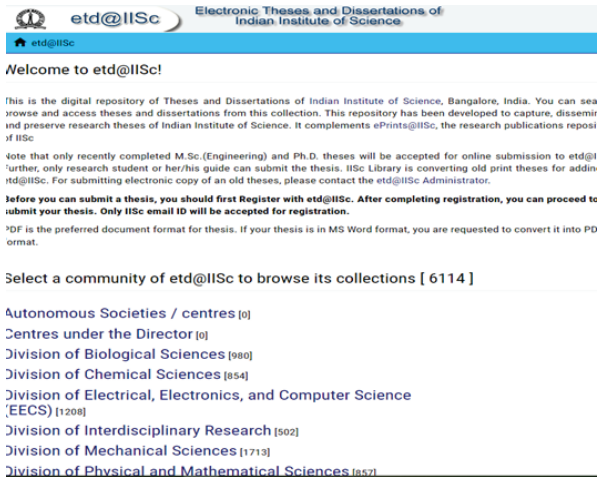
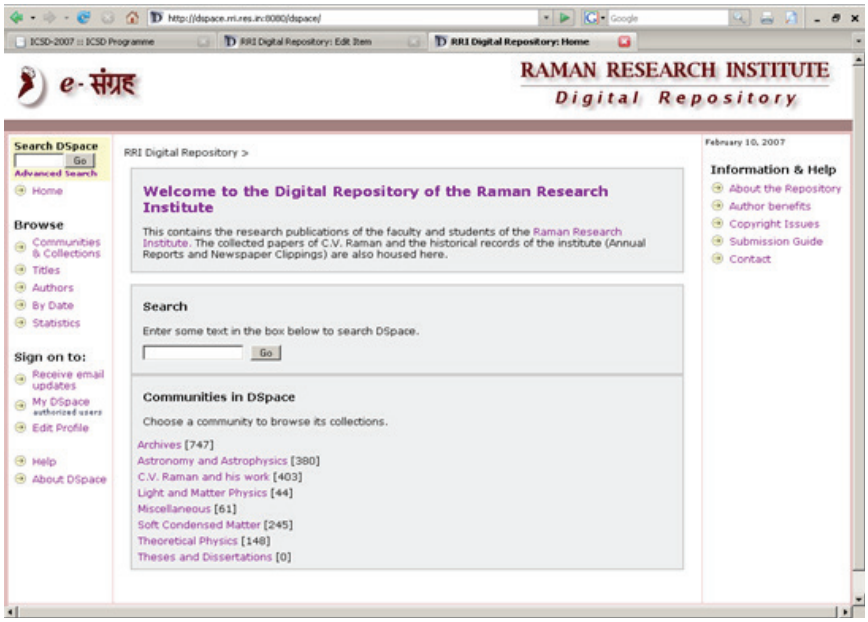


Figure-3 DSpace@RRI



Metadata for Digital Preservation

In the ever-expanding space of the internet, metadata is the glue that holds everything together. Metadata is relevant for both digital and physical resources. Libraries and information professionals have been using and working with metadata since almost the start of the profession. It includes user registration, Document submission, approval of documents; Archiving; dissemination & administration. In this study we identified 10 important repositories in India using DSpace and E-prints substantial portion of research being carried out in these institutions is accessible to enhance the visibility of the scholarly output of these institutions. Figure 1 describes the content and features of the information at hand. They are descriptive and outlining in nature, examples are title, subject, keywords, description etc., these include rights management and intellectual property rights or access. Metadata aids in the tagging and identification of resource type, subject, and usage. It functions as an overall tool for content management, archival space, management, and analysis space organization of institutional collections. Navigating through these various policies of open access can become difficult and that is where the metadata helps users to search for information

Conclusions

Institutional repositories to help institutions to manage their resources and also allow for its to a worldwide audience, expanding their reach and audience. This helps in the promotion of the institute at the global level. Helps in reputation in building repository. Open access repositories have grown tremendously over the years both in terms of count and content. This research study exemplifies the insights into the open-

access repositories of Asian nations and shows the trend in terms of software, content, type, development, etc. The findings drawn will aid in a mindful decision-making process regarding the type of content to put in the repository, whether or not to enforce self-archiving, and other policy issues that will support the expansion and efficacy of the open-access repositories. It will reflect the best practices which are already in the run. In addition to that, the mapping of the policies stated publicly will encourage the repositories to develop their own policy if it does not exist. IRs is an excellent piece of research output of universities and institutions and national importance and to provide sustainable management for digital content.

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LIBRARY 3.0: CONNECTED DEVICES POWERING MODERN INFORMATION HUBS

Abhijith R S[1] & Dr. B. Mini Devi[2]

Introduction

With the proliferation of connected devices and the limitless possibilities of the internet, Library 3.0 is a revolutionary movement. Libraries are becoming more than just physical repositories of books; they are becoming dynamic centres of information that filter and guide users across the vast world of the internet. Information access, librarian duties, and user experience are the primary areas this paradigm change affects(Ozeer et al., 2019). Creating user-friendly online platforms and utilising sophisticated search features are two ways libraries put the user experience first. Information access transcends physical location by enabling unmatched access to a worldwide reservoir of information, dismantling geographic boundaries, and democratising knowledge. As information curators, educators, and adept digital navigators, librarians' jobs are changing from being custodians of physical collections.Libraries have several opportunities and challenges in the digital age, including the digital divide, information overload, and digital preservation. This article explores the fundamental ideas of Library 3.0 and looks at how it affects user experience, information access, and the changing role of librarians in the digital age. It also explores how libraries are changing in the modern world.

Increased Access with Library 3.0

With the advent of Library 3.0, customers can access an extensive range of digital resources and no longer face physical limitations while seeking information. Users can democratise access to knowledge by using an internet connection to access online databases, e-books, and other digital resources around the clock. Beyond its physical holdings, Library 3.0 provides access to scholarly journals, historical archives, official records, and multimedia materials, including audiobooks and online courses. Since audiobooks and ebooks are now available in nine out of ten US libraries, people can learn about new topics thanks to this enormous information collection(Keller, 2023) Library 3.0 serves various users' needs, including children for instructional materials, casual readers for ebooks and audiobooks, and students for academic study. People are empowered to actively participate in the learning process and create a better informed

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and involved society due to the democratisation of knowledge. Library 3.0 is a huge step forward in the availability of information, enabling people to take an active role in their education.

Users may visually explore complex topics with multimedia content and are motivated to complete courses and evaluate their knowledge with gamified activities. Additionally, Library 3.0 allows users to direct their learning paths by letting them select the learning formats they want to utilise, modify the difficulty level of the exercises, and monitor their development over time. Libraries can establish online discussion boards and forums where users can interact, exchange materials, and hold conversations thanks to collaboration via social media and online communities. This change turns libraries from static information repositories into dynamic hubs for active learning and knowledge generation, enabling users to take an active role in education.

Librarians in the Digital Age

Librarians are now multifunctional information navigators, IT gurus, and educators, thanks to Library 3.0. These days, they are working as expert information curators, sorting through the enormous amount of digital data to provide dependable, high-quality resources for users. They also evolve into technical guides, helping users navigate online databases and resources,comprehending and using different e-readers and ebook platforms. Leaders in digital literacy, librarians offer instructional programs and workshops on efficient search techniques, assessing the reliability of information critically, and spotting and avoiding false information. They set the standard for creating cutting-edge linked device library services, including virtual and augmented reality experiences, online book clubs, author conversations, and carefully chosen online learning courses.

Library 3.0 strongly emphasises training, evaluating the reliability of information, and making the most of technology for learning and study. It also emphasises the effective use of Internet resources. Libraries remain essential portals to knowledge and learning in a world increasingly defined by technology because librarians embrace these evolving roles and provide extensive training programs. This helps people become informed and involved citizens in the digital age(Chigwada & Ngulube, 2023).

Opportunities and Obstacles for Library 3.0

Libraries in the digital era face great potential and formidable obstacles due to Library 3.0's concentration on digital resources and user-centric design. Here's a summary of some essential things to think about:

Opportunities

By removing geographical restrictions and facilitating access to information and resources for people from all backgrounds, Library 3.0 improves access to digital resources, democratising information and advancing educational fairness. Research and learning may become dynamic, captivating journeys that facilitate better understanding

and inspire people to explore new realms of knowledge through interactive platforms, multimedia information, and augmented learning experiences. Librarians are becoming information curators, technological guides, and instructors of digital literacy, which helps them better meet the demands of users in the digital environment and enable people to be astute information consumers. Libraries may promote community and cooperation beyond geographic borders by using social media to conduct online gatherings, conversations, and book clubs. Furthermore, by providing people with the required skills, maker spaces and digital literacy seminars can encourage innovation and entrepreneurship in local communities.

Obstacles

Libraries must combat the digital gap by providing public access to computers, digital literacy training programs, and various resources, including audiobooks and ebooks. Unequal access to technology and the internet makes the digital divide worse. The vast amount of online information can be intimidating. Therefore, libraries should train patrons in critical thinking and information literacy to help them explore internet resources effectively and avoid falling for disinformation. To guarantee the long-term accessibility and security of digital resources, maintain user data protection, and ensure the continuous availability of digital collections, libraries must invest in solid data storage solutions, digital preservation plans, and cybersecurity measures. Investments in technology infrastructure, electronic resources, and librarian training programs are required as part of the shift to a digital library paradigm. For Libraries to cover these expenses and guarantee the long-term viability of Library 3.0, they must create sustainable funding mechanisms.

Libraries can ensure they remain relevant and influence the digital age by seizing the potential presented by Library 3.0 while being aware of the difficulties. Prioritising user demands, making technological investments, and creating all-encompassing plans for data protection, digital inclusion, and information literacy are all necessary. In the upcoming decades, Library 3.0 will be able to redefine libraries from book repositories into dynamic centres for education, innovation, and community involvement.

The Developing Potential of Library 3.0

A revolution in the library sector, known as Library 3.0, will make libraries more dynamic centres that support a broader spectrum of users' demands and encourage social innovation. Libraries have evolved from places where people go to obtain knowledge to where people can learn the skills they need to succeed in the digital age. To promote innovation, creativity, and entrepreneurial thinking, maker spaces, coding classes, and workshops on digital literacy should all be included.

Coding classes, robotics workshops, and adult-specific digital literacy training are among the growing educational offerings. By offering lifelong learning opportunities, these programs enable people to close the digital divide and acquire in-demand skills for the digital labour market. Libraries are also beginning to incorporate virtual reality (VR)

activities, which turn learning into an immersive and exciting process. Virtual reality (VR) technology can completely transform education and increase accessibility and interactivity for students of all ages.

Additionally, libraries are acknowledged as social hubs and community centres. They sponsor e-sports competitions, genealogy seminars, movie screenings, and book discussions to promote community involvement and cross-cultural interchange. In the newly developed digital era, libraries have become community centres thanks to these activities that foster a feeling of place and belonging.

A dynamic vision for libraries in the twenty-first century, Library 3.0 embraces technology, grows its offerings, and promotes innovation. The potential of Library 3.0 will grow along with technology, guaranteeing that libraries will continue to have an influence and be relevant for years to come(Walczak, 2020).

Future of Library 3.0

Innovations in technology are driving a dynamic evolution of the idea of Library 3.0. It allows libraries to adopt new resources and platforms to enhance their lifelong learning and community involvement goals. Immersion learning using augmented reality (AR), which may animate and personalise library resources, and chatbots driven by artificial intelligence (AI) that can serve as virtual reference assistants are just a couple of the innovative possibilities for Library 3.0. Through time, these chatbots can become more proficient and intuitive by learning from user interactions and enhancing their responses.

The Internet of Things (IoT) can change physical library environments by responding instantly to user requirements. When space is total, sensors can sense it and immediately change the temperature or lighting to provide maximum comfort. When materials must be refilled, smart shelves may notify librarians and track book availability. A more dynamic and engaging library experience may be fostered by integrating IoT technology to build intelligent libraries that are functional and sensitive to user requirements and preferences. In the radiant prospects of Library 3.0, libraries will serve as dynamic centres for innovation, creativity, and knowledge creation in the digital era rather than merely serving as informational repositories.

Conclusion

The shift from physical book repositories to dynamic hubs for information access, education, and community participation in the digital age is known as Library 3.0, and it represents a massive change for libraries. Libraries enable people through technology by providing a wide range of digital resources, removing geographical restrictions, and democratising information access. Librarians are becoming technology navigators and information curators who help users navigate the complexity of the digital world. Online communities focused on learning and knowledge creation are fostered by social media and other online platforms that enable user engagement and collaboration.Programs

for digital literacy and maker spaces provide people with even more tools to become digitally literate. Libraries are essential in closing the digital divide because they provide training in digital literacy, public computer access, and a wide range of resources to meet different requirements. Library 3.0 highlights the timeless importance of libraries by utilising technology to enhance their essence, empower people, encourage a passion for learning, and guarantee that knowledge is always available to everyone—rather than displacing actual books.

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DISASTER AND DIGITAL PRESERVATION OF PRINT COLLECTIONS FOR FUTURE LIBRARY COLLECTION BUILDING: A STUDY IN UNIVERSITY LIBRARIES OF ASSAM

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Introduction

University libraries invest a substantial amount annually to select, collect, process, and preserve various forms of print collections to meet the needs of different types of users in the parent organisation. Print collections are the materials that have been printed and can be produced in hard copy. In general, print collections include all publications printed on paper in books, newspapers, magazines, journals, newsletters, etc. In addition, theses and dissertations, annual reports, technical reports, manuscripts, government publications, back volumes and rare collections also occupy an important place in university libraries. A university library generally collects and preserves all these print collections to cater to the needs of different users of different academic and research activities. A rich and balanced collection of print resources always attracts different categories of users.

Indeed, print library collections are often precious, either for the information they contain or their physical beauty. However, by nature, these library resources, especially print resources, are susceptible to disasters and a disaster, such as a fire or a flood, could be calamitous (Morgan, 1996, p .9). Print information resources may get lost and damaged because of floods or fire. The fire is caused by negligence or a faulty electric system, flooding from burst pipes, following heavy rain, or an earthquake (Arora, 2011); (Iloa et al., 2018).

In addition to these, Malewar and Kanholkar (2018) viewed library staff, readers, fungus dust, light and darkness as potential threats that can cause disaster to library print collections.

The activities of insects, termites, rodents, and roof leakages constitute major threats to the safety of library print resources (Abareh, 2014).

Damage to libraries and information centres damages the country's information

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infrastructure and can stunt its growth and development. Disasters in libraries destroy valuable information, which is too essential for the development of future generations (Chakrabarti & Pramanik (2017, p.213). In order to keep these information sources safe from any possible loss, damage, and deterioration for future generations, preventive and curative measures have become an integral part of library management.

No library is indeed free from disaster, be it natural or manmade disasters. It can occur anywhere, at any time and location, and may cause significant loss and damage to library print materials. As we know, Assam is prone to a variety of natural and manmade disasters. Common threats to the region include earthquakes, floods, fires, thunderstorms, and socio-political unrest, which has become a recurring issue. Therefore, the likelihood of hazards occurring in university libraries within Assam is considerably high. Library's valuable print resources may get lost and damaged anytime because of floods, fire and other possible threats. In view of the above, library professionals must take proactive initiative and preventive measures to keep print materials safe and secure for future generations.

"Preventive and curative care are the two elements of preservation. If preventive measures are effective and well executed, the necessity of curative treatment can be avoided for a long (Pal, 2014, p.126)".

Paul and Shanmugam (2017) defined preservation as "protecting cultural property through activities that minimize chemical and physical deterioration and damage that prevent loss of information content. The primary goal of preservation is to prolong the existence of cultural property (p. 63)".

Preservation is an essential aspect of library administration. Its goal is to ensure that information remains usable as long as desired. The essential feature of preservation is that it is a massive operation focused on efficiently managing the library collection as a source of information. (Pal, 2014, p.123).

While studying the preservation and disaster management of commonly used collections at Nigerian university libraries, Ishola (2017) discovered that libraries have no formal preservation and conservation policy. As a result, creating a culture of preservation and conservation in such libraries is impossible, which puts information materials, particularly those that are often utilised, at great risk of becoming extinct.

Therefore, Ilo, Nkiko, Izuagbe, and Furfuri (2019) rightly stated that integrating disaster preparedness measures into preserving and conserving information resources would enhance their effectiveness and ensure their long-term sustainability. Therefore, it is advised to utilise various preservation strategies while investigating how librarians perceive disaster preparedness. This is essential to ensure the successful preservation and conservation of library resources in Nigerian university libraries.

It is, therefore, the duty and responsibility of library professionals to keep these information resources safe, in original and useable conditions, as long as it is desired.

The advancement of ICT has brought a significant change in library day-to-day activities. Technology has brought a dramatic change in library resource maintenance and information content preservation, too. Today, with the help of technology, the library's valuable information sources can be kept safe and usable from any possible deterioration, loss and damage. Digitisation is one way to prevent old and rare print materials from any potential lost damage and deterioration. Digitisation is the process of converting physical data into digital format using software or by hand. Therefore, effort should be made to convert valuable print information sources from original materials to more durable digital formats. The digitalisation of historical, critical, and uncommon documents has not only given rise to a new platform for preservation but also allowed libraries to extend access to these resources that are difficult to access, and thus, it has eliminated the panic of lost and damaged valuable print resources from any potential threats and disaster.

However, due to a lack of awareness of the possible causes of loss and damage to print collections or due to proper preventive and curative measures at the appropriate times, most of the time, print materials lose their effectiveness, quality, or condition. Thus, these resources lose their ability to perform their intended function. In order to keep these information sources safe from any possible loss, damage, and deterioration for future generations, preventive and curative measures have essentially become an integral part of library management.

Objectives of the study

i. To discover library professionals' awareness about potential disasters and other possible threats to print collections.

ii. To investigate the availability of formal or written preservation policy for print collections in university libraries in Assam.

iii. To investigate difficulties the library professionals faced in planning and implementing digital preservation in their respective libraries.

Methodology

For this study, the researcher used a survey method, and the Google form questionnaire was the primary tool for data collection. The researchers used both primary and secondary sources of information for this purpose. Further, descriptive statistics were used in this study to summarise the data. The data obtained through various methods are analysed using simple percentages. Further, tables and figures are to be used to present and interpret relevant data provided by the respondents.

Limitation

For this study, the researcher selected three university libraries in Assam and due to time constraints, other central, state, and state private universities were excluded from this survey. Nature, threat, characteristics, and management of print and electronic

information resources are entirely different. It is true that, by nature, print information resources are very susceptible and may get lost and damaged because of natural and manmade disasters. To protect these print collections from horrendous natural disasters for future generations, the focus of this study will be limited only to print collections in the university libraries of Assam.

Value

This study will help to discover library professionals' awareness about potential disasters and other possible threats to library print collections in Assam. Further, this study will help to access the present state of digital preservation of the print collection, the difficulties library professionals faced while planning and implementing digital preservation of historic, important, and uncommon print documents in their respective libraries and realise the importance of digitisation of print collections in university libraries of Assam.

Findings and analysis

Table 1. Questionnaire Distributed and Responses Received.

Sl. No	University Libraries Covered under this study	Number of Questionnaires Distributed	Numbers ofResponse Received	Percentage of Responses
1	Central Library,Tezpur University	24	14	58.33%
2	K.K. Handique Library, Gauhati University	10	9	90%
3	Lakshminath Bezbarua Library, Dibrugarh University	10	7	70%
	Total	44	30	68.18%

In order to conduct this research, a total of 44 questionnaires were distributed to library professional staff working in various capacities at three different university libraries in Assam, and out of those 44 questionnaires, 30 respondents responded to our questionnaire, of which three are university librarians and librarians in charge and others are supporting professional library staff of these three university libraries. The rate of response is 68.18%.

Table 2. Awareness about the Potential Natural Disaster in the context of Assam

Sl. No	Awareness about the Potential Natural Disaster in the context of Assam.	Yes	No	Total Responses Received & Percentage
1	Earthquake	31 (77.5%)	9 (22.5%)	40 (100%)
2	Fire	30 (75%)	10 (25%)	40 (100%)

3	Flood water	25 (62.55)	15 (37.5%)	40 (100%)

Table 2 shows that the library professionals are very much concerned and aware of potential disasters and other possible threats that may lead to disaster for print collections in the context of Assam. 31(77.5%) and 30(75%) of respondents revealed that earthquake and fire are the greatest threats to print collections in university libraries in Assam, followed by flood water, with 25 (62.55) respondents.

Table 3. Awareness about the other possible Threats to Library Print Collections in the context of Assam

Sl. No	Awareness about the other possible Threats to Print Collections	Yes	No	Total Responses Received and Percentage
1	Biological agents (rodents, fungi, insect etc.)	34 (85%)	06	40 (100%)
2	Water leakage. (For example, plumbing defects, broken pipes, leaking roofs, water from faulty air conditioning system etc.)	30 (75%)	10 (25%)	40 (100%)
3	Power failure/Faulty electrical wiring/short circuit	30 (75%)	10 (25%)	40 (100%)

In addition to these natural disasters, Table 3 shows that 34(85%) mentioned that biological agents such as rodents, fungi, insects, etc., are other possible threats to print collections, followed by water leakage (for example, plumbing defects, water from burst pipes, roof leakages, water from a faulty air conditioning system, etc.) and faulty electrical wiring, short circuits due to human negligence with 30(75%) of respondents.

Table 4. Availability of a Formal Preservation Policy for print collections.

Sl. No	Availability	Form of availability	Yes	No	Total Responses Received and Percentage
1	Digital Preservation policy for print collections	Written/Formal	0	3(100%)	3 (100%)

Regarding the availability of a digital preservation policy for print collections, Table 4 shows that none of the university libraries in Assam covered under this study was well-equipped with a formal digital preservation policy.

In Table 5, 38(95%) respondents admitted that print information resources are very susceptible and may get lost or damaged due to natural and other possible threats. Therefore, 32(80%) respondents intend to write and implement a digital preservation policy for print collections in their respective libraries for future library collection building.

Table 5. Library Professionals' Attitude towards Digital Preservation of Print Collections,

Sl. No	Library Professionals' Attitude towards Digital Preservation of Print Collections.	Agree	Disagree	Total Responses Received and Percentage
1	Print information resources are very susceptible and may get lost or damaged due to natural and other possible threats. In this situation, do you agree that a digital preservation for print collections is an important part of university library management and future library collection building.	38 (95%)	02 (5%)	40 (100)
2	Do you intend to write and implement one?	32 (80%)	08 (20%)	40 (100)

Table 6. Challenges encountered by University Library Professionals during the Planning and Implementation of Digital Preservation for print collections.

Sl. No	Challenges encountered by University Library Professionals during the Planning and Implementation of Digital Preservation for Print Collections.	Yes	No	Total Responses Received and Percentage
1	Inadequate facilities and equipment in the library for digital preservation	33 (82.5%)	07 (17.5%)	40 (100%)
2	Lack of adequate well-trained skilled, library staff to plan and implement digital preservation for print collection.	35 (87.5%)	05 (12.5%)	40 (100%)
3	Lack of sufficient funds to plan and implement disaster management.	24 (60%)	16 (40%)	40 (100%)
4	The authority does not consider it a priority.	23 (57.5%)	17 (42.5%)	40 (100%)

Table 6 shows the challenges encountered by library professionals during the planning and implementation of digital preservation policy for print collections in university libraries in Assam. Four problems were raised during the survey, and library professionals were asked to give their opinions. The lack of adequate, well-trained, skilled library staff to plan and implement disaster management for the digital preservation of print collections has been identified as one of the major challenges faced by library professionals in Assam. 35 (87.5%) of respondents responded in favour of this option. 33(82.5%) of respondents mentioned that the non-availability of adequate facilities and equipment in the library was a barrier. In addition to these, 24 (60%) and 23 (57.5%) revealed that lack of sufficient funds to plan and implement and non-supporting attitude of the authority as major challenges faced by library professionals while planning and implementing digital preservation for print collections in the university libraries of Assam.

Findings of the study

1. The library profession in Assam exhibits significant concern and awareness regarding potential disasters and threats that could put print collections at risk. A

substantial majority of respondents, 31(77.5%) and 30(75%), respectively, identified earthquakes and fire as the greatest threats to print collections in university libraries within the region. Apart from these natural calamities, 34(85%) mentioned that biological agents such as rodents, fungi, insects, etc., are other possible threats to print collections, followed by water leakage (for example, plumbing defects, water from burst pipes, roof leakages, water from a faulty air conditioning system, etc.) and faulty electrical wiring, short circuits due to human negligence with 30(75%) of respondents.

2. It was found that none of the university libraries in Assam covered under this study were well equipped with a digital preservation policy for print collections. The lack of a formal digital preservation policy for print collections is common in all three university libraries in Assam.

3. 3. In Table 5, 38(95%) respondents admitted that print information resources are very susceptible and may get lost or damaged due to natural and other possible threats. Therefore, 32(80%) respondents intend to write and implement a digital preservation policy for print collections in their respective libraries for future library collection building.

4. 4. Lack of adequate well-trained skilled library staff to plan and implement has been identified as one of the major challenges faced by library professionals in Assam. 35 (87.5%) of respondents responded in favour of this option. In addition to these, 33(82.5%) of respondents mentioned that the non-availability of adequate facilities and equipment in the library was a barrier and 24 (60%) and 23 (57.5%) revealed that lack of sufficient funds to plan and implementation and the non-supporting attitude of the authority as the challenge faced by the library professionals while planning and implementing digital preservation for print collections in the university libraries of Assam.

Recommendations

Based on the findings of the survey, the following suggestions are made

All important, historic, and uncommon print materials must be preserved in digital format, if possible, because materials that are not accessible online will lost and damaged forever if no precautions are taken.

The non-availability of a formal preservation policy for print collections is a common problem at all three state universities in Assam. Therefore, steps must be taken to design and develop a formal preservation policy, irrespective of size. The availability of a formal preservation policy in each library helps the safekeeping and continuation of our rich cultural heritage and also helps with future library collection building.

To create awareness among the library staff, all university libraries should take the initiative to organise seminar workshops and conferences on different aspects of disasters and digital preservation of print collections. This will help the library staff

become aware of the impact of disasters on print collections and realise the importance of digital preservation of print collections in the library.

It is observed that most state universities in Assam have a shortage of library professionals. For the successful execution, implementation, and survival of any preservation policy, adequate library personnel are required. Therefore, the university authority must take the necessary steps to appoint adequate numbers of library staff. For better awareness and to gain first-hand knowledge on disaster and digital preservation, the head of each academic institution should allow library staff to attend seminars, conferences, workshops and training programmes on disaster, disaster management and digital preservation.

Finally, the focus should be on enhancing library electronic resources rather than print sources. The cost of damage to a print collection is much higher than the cost of damage to electronic resources. Secondly, the materials in digital form are more secure and have a durable life. The resources at a remote server or website are more accessible and secure. Further, it will help librarians face pandemic situations like COVID-19 and provide the maximum possible services to patrons soon.

Conclusion

Indeed, many disasters cannot be completely prevented. However, adequate preparedness helps to prevent, and prevention helps to minimise the loss and damage to the print collections. Thus, we can minimise recovery costs, enabling the university libraries to buy more new print materials by cutting the replacement costs of lost and damaged materials. This helps future library collections build print collections. Therefore, steps should be taken to digitise rare books and manuscripts so that these valuable resources can be preserved without loss and damage as long as they want. It will help meet the information needs and provide services to the user's communities when required. Therefore, effort should be made by every university library to preserve old, rare and uncommon documents for future generations by converting valuable print information sources from original materials to more durable digital formats, regardless of the scale of its holdings.

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THE EVOLVING LANDSCAPE OF DIGITAL PRESERVATION: ADDRESSING CYBER SECURITY THREATS IN THE ARCHIVAL CONTEXT

Greeshma S S[1] & Alka Raj G[2]

Introduction

The emergence of digital technology has completely changed the archiving industry, enabling the storage of vast amounts of data in a more efficient and accessible way. But as a result of the change, there are now significant cyber security risks. Because electronic archives contain sensitive and important information, they are increasingly a prime target for cyber-attacks. Therefore, it is imperative to build strong defenses against future attacks against these digital assets.

Organizations must ensure that their technical assets are protected against digital threats, as cybercriminals can exploit weaknesses in digital technology. Implementing access control, authentication, and encryption technologies can help achieve cybersecurity by protecting networks and data from malicious or illegal access. Organizations may also consider purchasing cyber insurance, which can provide financial protection against damages caused by a successful attack on a system. Educating staff about cyber security threats is also important, as more informed staff will adopt sound information security measures. Due to the sharp increase in cyber-attacks, companies must be aware of cyber security threats and the best ways to completely prevent them (Saeed et al., 2023).

Every week there are major cyber-attacks or data breaches that threaten the financial security and privacy of millions of Internet users, or intelligence-related cyberwar crimes that put entire societies at risk (Donaldson & Bell, 2018). For example, in the 2017 Equifax data breach, nearly 147 million people were exposed to sensitive personal information, including Social Security numbers and dates of birth. Yahoo also had numerous data breaches between 2013 and 2016 that compromised the usernames, email addresses, passwords and security questions of approximately 3 billion user accounts. The Marriott International Data Breach, which occurred between 2014 and 2018, compromised the personal data of approximately 500 million hospitality industry customers, including credit card information and passport numbers. Additionally, in the 2019 Capital One data breach, nearly 100 million customer records, including names,

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addresses, credit information and Social Security numbers, were accessed without authorization. These events highlight the ever-present and dynamic nature of cyber security risks, highlighting the vital need for data protection in archival environments such as digital preservation.

Digital Collection

Digital collections are selected digital resources or materials available in electronic form, such as documents, photographs, videos, audio recordings and datasets. Libraries, archives, museums, educational institutions, government agencies and other organizations establish and maintain them to preserve and provide valuable cultural, historical, scientific or educational materials. Digital collections cover a wide range of topics and questions and serve a variety of interests and research needs.

Digital collections fall into several categories, including digital libraries, digital archives, image galleries, sound libraries, video archives, data repositories, digital museums, digital exhibitions, and special collections. Benefits of digital collections include increased coverage, preservation and conservation, searchability and discoverability, improved user experience, and collaborative research and interdisciplinary discovery. The specific functions and accessibility of digital collections depend on the organization and platform that hosts them. Some digital collections may be freely available to the public, while others may require registration, subscription, or institutional membership for full access.

Due to the abundance of resources, simplicity, flexibility, enhanced research capabilities, interdisciplinary learning opportunities and long-term access to information, digital collections have grown in importance in academic research, teaching and learning. Researchers can access and study resources remotely, allowing them to collaborate across geographic boundaries, allowing students to interact with digital collections at their own pace. Ultimately, digital collections have transformed academic research, teaching, and learning by increasing access to resources, fostering interdisciplinary collaboration, and improving research capacity. They have become indispensable tools for researchers, teachers and students in the digital age (Aregbesola & Nwaolise, 2023).

Balance of Traditional and Digital Security

Traditionally, theft and damage prevention are considered forms of archival security. The development, organization, and description of collections, as well as access, preservation, security, and preservation in a secure, nondestructive environment, is the province of archivists and librarians. They must make plans to protect the goods against possible theft, misuse and disasters. Proper locks, doors, lighting, cameras, alarms, surveillance, disaster preparedness and protocols are all necessary for physical security. Advanced protocols, alarms and modern security systems have simplified the maintenance of analog collections. Because reading rooms are the places where collections are most vulnerable to theft or physical damage, archivists have traditionally been responsible for security there. However, with the growing number of archives and

libraries managing digital data, digital collections, and digitized versions of existing analog collections, new security concerns have emerged (Donaldson & Bell, 2018).

The security paradigm in archival science is shifting from physical security to broader digital collections. Computing (CS) has evolved from mainframes, punch cards, and single-process computing to distributed memory architectures with large storage, multi-user capabilities, and network communication. CS considers digital information security protection, attack protection, risk assessment and planning. They often characterize security in terms of confidentiality, integrity and availability (CIA), which are the three main principles/requirements of any system. Archivists already use these concepts to manage scholarly access to physical collections. Archivists are still learning how to protect themselves from digital theft because computer science has more knowledge and digital security has a longer history than archival science. Combining security concepts from archival science and computer science can help archivists understand potential threats to their digital content and facilitate security discussions (Donaldson & Bell, 2018).

Regulatory and Ethical Aspects of Digital Libraries

Legal and ethical aspects of digital libraries are crucial for the responsible management, distribution and use of digital materials. Here are some important points to consider.

Copyright and Intellectual Property: Digital libraries often acquire copyrighted works. Comply with copyright laws and obtain permissions before digitizing and distributing copyrighted content. Libraries must adhere to ethical values and properly acknowledge authors and inventors.

Privacy and data protection: Digital libraries may collect and retain user data such as search history, usage patterns, and personal information. Libraries must have strict confidentiality and security standards to protect user privacy and comply with data protection laws such as the EU General Data Protection Regulation (GDPR) and the California Consumer Protection Act (CCPA).

Ease of access: Digital libraries should be accessible to all users, including the disabled. Libraries must adhere to accessibility standards such as the Web Content Accessibility Guidelines (WCAG) to ensure that digital materials are accessible to a wide range of people.

Content Curation and Filtering: Libraries may need to implement content filtering to meet legal and ethical standards for their resources. Libraries, especially children's and educational institutions, play an important role.

Digital Preservation: Digital libraries have an ethical responsibility to preserve digital resources and make them available to future generations. To protect digital collections from loss or degradation, libraries should use measures such as file format migration, metadata management and regular backups.

Open Data and Licenses: Digital libraries provide free and unrestricted access to scientific and educational publications. Libraries can use open access publishing methods and licenses such as Creative Commons to encourage the reuse and distribution of digital content while protecting authors' rights. Data and algorithms should be used ethically: Libraries should be transparent about data collection, analysis and use. Ethical considerations include maintaining the fairness of algorithms, avoiding misleading and protecting user privacy.

Digital Security: Effective cyber security measures are critical for digital libraries to prevent data breaches, hacking and other security issues. This means encrypting sensitive information, updating software and security updates, and training employees and users on cybersecurity best practices. Digital Rights Management (DRM): Libraries may encounter digital content protected by DRM, which restricts user access, copying and modification. Libraries must balance the legal and ethical implications of DRM with users' rights to access and use digital content.

Moral Principles for Collection Development: Libraries must select digital assets based on ethical ideals such as diversity, equity, and inclusion. The library strives to include diverse perspectives and underrepresented voices in its digital collections (Saha, 2024).

Cybersecurity Threats to Digital Collections

Cybersecurity threats abound in digital collections, including online databases, archives, and libraries. Here are some of the more common threats that can affect these digital collections:

1. **Data breaches:** Data breaches are unauthorized access to private information. Such breaches could expose research materials, private information or anything copyrighted in digital collections. Hackers often use system bugs to gain this unauthorized access (Boulton, 2017).

2. **Malware attacks:** Digital collections are vulnerable to malware such as worms, viruses and ransomware. This malware can compromise all availability and integrity, cause disruption, or damage or corrupt data. Ransomware attacks, which encrypt data and require payment to unlock it, are particularly troublesome (Boulton, 2017).

3. **Social Engineering and Phishing**: Phishing attacks exploit the identities of trusted sources to trick users into revealing private information (Boulton, 2017). Phishing messages, texts or web pages can be used to target digital collection managers and researchers. According to Ajie (2019) and Boulton (2017), social engineering techniques have the ability to force people to reveal login credentials or other sensitive information.

4. Denial of Service (DoS) Attacks: DoS attacks make a system unusable for authorized users by flooding it with resources. These hackers can disrupt access to digital collections by the public, students or researchers, preventing them from accessing

important resources. Attacks known as Distributed Denial of Service (DDoS) are very powerful because they involve many systems flooding the target (Boulton, 2017).

5. **Insider Threats:** Insider threats come from people who work inside a company and abuse their right to access digital assets. These can be volunteers, contractors or employees who accidentally or intentionally breach confidential information. Insider threats are particularly important because of their approach (Boulton, 2017).

6. **Zero-day vulnerabilities:** These are undetected software bugs for which there are no patches or fixes available from the manufacturer. Before they are identified and fixed, cybercriminals exploit these vulnerabilities and gain unauthorized access to digital collections (Kaspersky, n.d.).

7. **Third Party Risks:** Digital collections often rely on third party vendors or service providers for content management, data storage and maintenance. The security of the digital collection may be at risk due to weak security protocols or security flaws in certain third-party platforms. It is very important to ensure that partners follow strict cyber security procedures.

8. **Loss or corruption of data:** Unintentional data loss or corruption can be caused by power outages, natural disasters, software or hardware failures, or human error (Ajie, 2019). The institution's ability to support academic activities may be hampered by identity theft, financial fraud, degradation of research integrity, and disruption of library services caused by this loss.

9. **Reputational damage:** a breach of cyber security can seriously damage the reputation of an academic library and its institution. Disclosure of violations can undermine the trust of students, teachers and other stakeholders (Ozavize & Abedo, 2020). The reputation of an educational institution can be damaged by the perception of inadequate security measures, which would discourage potential donors, teachers and students. Restoring a damaged reputation can be difficult and time-consuming.

10. **Legal Consequences:** An academic library may face legal consequences in the event of a cyber-security breach. Depending on the jurisdiction, the facility may have different data protection and privacy regulations.

A library or other organization may be subject to fines and penalties for violating the law when personal information is at risk (library & Library, 2022). In addition, affected parties may sue for damages for the loss or misuse of their personal data, which would subject the agency to costly and time-consuming litigation.

Develop mature data security practices

Developing strong data security measures is essential to protect digital collections and sensitive data. Here are the main steps to help your organization establish strong information security practices:

1. Assess and manage risks: - Conduct periodic risk assessments: identify and assess threats, vulnerabilities and impacts. The evaluation of digital collections must continue and focus on all aspects of the organization's information system.- Implement a risk management strategy: develop a strategy to reduce identified risks, including preventive measures, detection measures and action plans.

2. Define security policies and procedures: - Develop a comprehensive security policy: Create and maintain a clear and comprehensive policy that reflects the expectations and requirements of interested parties. The policy must cover data protection, access control, incident response and compliance with applicable laws. - Use Standard Operating Procedures (SOP): Establish SOPs for daily security operations to ensure that security procedures are applied consistently and effectively.

3. Access control and authentication: - use strong authentication methods: use multi-factor authentication (MFA) to improve the security of access to digital collections. Make sure your password is secure and change it regularly.- Enable Access Control: Enable Role-Based Access Control (RBAC) to restrict access to sensitive information based on user roles and responsibilities. We check and update access rights regularly.

4. Safety Training and Awareness:- Regular Training: We provide safety and training programs for all employees including managers, researchers and volunteers. It focuses on understanding anti-phishing, secure phishing and social engineering attacks.- Promoting a culture of information security awareness: Promoting a culture of information security awareness so that everyone in the organization understands their role in protecting information assets.

5. Use advanced security techniques: - Use firewall and intrusion detection systems (IDS): Deploy firewalls to protect network perimeters and use IDS to monitor suspicious activity. - Encrypt sensitive data: Ensure that sensitive data is encrypted in transit and at rest, protecting against unauthorized access.- Update and patch your system regularly: Keep your computer and system up to date with the latest security features to protect against known vulnerabilities.

6. Develop a disaster preparedness and recovery plan: - Develop a disaster preparedness plan: Prepare a detailed disaster response plan that includes response, removal and recovery. Make sure your plan includes communication protocols and roles/ responsibilities.- Conduct regular training and simulation: Test your incident response plan through training and simulation to determine readiness and identify areas for improvement.- Establish backup and recovery procedures: implement backup and restore procedures for to ensure this is assured. that your digital collections are quickly restored if data is lost or corrupted.

7. Security training and accounting monitoring: - Continuous monitoring: continuous monitoring tools that monitor and analyze network traffic, system logs and user actions for signs of security breaches. - Conducting regular audits: We conduct information security audits to assess the effectiveness of our security controls and compliance with our policies. Use audit results to improve your security practices.

8. Third Party Activity: - Vendor Security Assessment: Evaluate the security practices of third party vendors and service providers to ensure they meet your security standards. - Create clear contracts: Include information security requirements and expectations in your customer contracts, including requirements for security controls and audits. By systematically addressing these areas, agencies can develop mature security measures that effectively protect their digital collections and sensitive data from a wide range of cyber threats.

Challenges and future directions

Implementing cybersecurity best practices in digital libraries is a challenge in academic libraries in developing countries. Below are some of the main challenges and next steps to address them.

Challenges

Limited resources: financial and technical constraints. Developing countries often suffer from limited financial and technical resources, which makes educational activities difficult. Libraries are investing in proper infrastructure, tools and cybersecurity knowledge (Ajie, 2019).

Lack of Experience: Lack of Qualified Professionals: Cyber professionals often lack the skills and knowledge to implement and maintain online security operations. This has made it difficult to develop and implement a cyber security strategy for academic libraries (Warren, 2018).

Outdated Technology: Dependence on Legacy Systems: Many academic libraries in developing countries use outdated technology, including legacy systems and systems. These systems have known vulnerabilities that can be exploited by cyber-attacks, making it difficult to secure digital collections (Etse and Boateng, 2019; Warren, 2018).

Lack of awareness and training: Inadequate training programs: There may or may not be training and education programs related to cyber security. Library staff may not be trained in the latest cyber security threats, precautions and best practices, increasing the risk of data breaches (A. Khan et al., 2021; Warren, 2018).

Legal and Regulatory Issues: Mature Legal Framework: In developing countries, cybersecurity laws and legal frameworks are less mature, leading to uncertainty about the responsibilities, data protection and requirements of academic libraries (Etse and Boateng, 2019).

Connectivity and Infrastructure Limitations: Internet and Infrastructure Issues: Limited Internet connectivity and unreliable infrastructure make it difficult to implement and manage cybersecurity measures, including proper software updates, patch management, and access to threat intelligence resources.

Increased Targeting: Exposed Vulnerabilities: Academic libraries in developing countries are targeted by cybercriminals due to vulnerabilities and fewer security

measures compared to libraries in developed countries. Libraries are increasing their efforts to strengthen their online security.

Advanced Insights

Artificial Intelligence (AI) and Machine Learning: Automated Threat Detection: AI and machine learning analyze large volumes of data to identify patterns, clusters and detected security breaches, and you can automate your response. These technologies can help monitor network traffic in real time, detect malicious activity, and provide protections (Artificial Intelligence and Machine Learning in Cybersecurity | Apriorit, n.d.).

Blockchain Technology: Improving Data Integrity: Blockchain provides a scalable platform that can improve data integrity, privacy and authentication methods. It enables secure and transparent transactions, protects intellectual property rights and prevents unauthorized access or alteration of sensitive information (Zhang, 2019).

Zero Trust Architecture (ZTA): Transparent access control: ZTA identifies all users, devices and network components as potential threats, uses multi-factor authentication, micro-segmentation and continuous security monitoring. level ZTA implementation can provide secure access control, isolate sensitive data and reduce the impact of potential data breaches (Mattsson, 2022).

User Behavior Analysis (UBA): Monitoring of user activity: UBA analyzes user behavior patterns to identify anomalies and information security risks. By monitoring user activity, libraries can detect unauthorized access attempts, suspicious activity, or compromised accounts. UBA systems can provide early warning and generate alerts for further investigation (What is user engagement? | CyberArk, n.d.).

Cloud Security and Privacy: The Cloud Security Duty: As academic libraries increasingly use cloud services, proper security practices are essential. Technologies such as encryption, access control, secure APIs, and data loss prevention (DLP) solutions are critical to protecting sensitive data and complying with privacy laws (Palo Alto Networks, n.d.).

Internet of Things (IoT) Security: Mitigating IoT Risks: The widespread use of IoT devices such as smartphones, lamps and self-service systems in libraries presents a new security challenge. Implementing strong security protocols, device authentication, and regular patching are key to reducing potential vulnerabilities and preventing unauthorized access (What is IoT security? Defining and Challenging IoT Security, n.d.).

By meeting these challenges and using new technologies, academic libraries in developing countries can strengthen their cybersecurity practices and better protect their digital collections.

Conclusion

The changing landscape of digital preservation requires a proactive cybersecurity approach to electronic archiving. Organizations can significantly improve their privacy and data security by identifying vulnerabilities and implementing comprehensive procedures. The proposed framework, which includes organizational practices, policy guidelines and technology management, creates a robust architecture for the protection of digital archives. The adoption of these technologies would enable businesses to effectively protect themselves against cyber security threats while ensuring the integrity and confidentiality of their valuable data in the digital age.

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PRESERVATION AND CONSERVATION MEASURES AND TECHNIQUES FOR MANUSCRIPTS AND RARE MATERIALS IN LIBRARIES

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Introduction

Manuscripts and rare materials are immensely valuable cultural and historical resources that must be preserved. High-value, high-risk commodities of national importance should be prioritized. The goal should be to reduce handling of the originals in order to meet security and preventive preservation goals. Manuscripts and rare materials are rare and contain valuable information that is not easily accessed elsewhere. Numerous manuscripts and unique materials from the ancient era contribute to the preservation of the nation's cultural legacy. The manuscripts referred in this study represents unpublished handwritten documents such as palm leaves, bark, letters, diaries, and rare materials from the National Library of India (NLI), Kolkata, such as printed and published books, monographs, periodicals, newspapers, religious texts, paintings, illustrations, magazines, and Tibetan xylographs. In case of rare materials books that are published or printed earlier to 1860 are place in the Rare Book Division of NLIK. Pre-1860 Indian publications and printings are one of the main requirements to be included in the Rare Book Division, according to the National Library of India.

The NLIK is the largest library in India in terms of volume and public archives. It plays an important role as an assistant in the study of various fields of knowledge and on the other hand as a preserver of the cultural heritage of our vast country. In addition to its regular collection, the library holds around 13,256 volumes of historically significant manuscripts and rare materials in various forms, which draw in researchers and visitors from all over the world. The National Library of India, Kolkata has preserved and made accessible to the public a vast number of manuscripts and rare materials in its Rare Book Division.

In the case of preservation and conservation processes, there is no set time period for implementing them. Whenever required NLI, Kolkata always keep updating their measures and techniques (Table-2) & (Table-3) for preservation and conservation of manuscripts and rare materials.

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Factors of Deterioration of Manuscripts and Rare Materials

Deterioration is a change of original state of any material by interaction between the object and the factors (Table-1) of destruction. The different types of deterioration of the paper-based materials are reflected in wear and tear, shrinkage, cracks, brittleness, warping, bio infestation, discoloration, abrasion, hole, dust and dirt accumulation etc. Generally, library materials are susceptible to deterioration by the following factors:

1. Environmental (climatical Factors) factors like light, heat, humidity and moisture, dust and dirt, water.
2. Biological factors: Microorganisms, insects and rodents.
3. Chemical factors
4. Human factors and
5. Disasters
6. Ageing

Table-1: Major Factors of Physical Deterioration/ Damaging Reaction in Manuscripts and Rare Materials

Sl. No	Factors		Major Causes	Deterioration/ Damaging Reaction	Resultant Effect
1.	Environmental factors	Light	• Sunlight • Ultraviolet	The light intensity, duration, and distance from the source	The paper became brittle and yellow as the ink and dye faded.
		Heat	Over the standard range of 5° to 40°C	High temperatures cause cellulose paper to become brittle.	Material tends to disintegrate as it loses flexibility.
		Humidity	Weather with high humidity (over 70%)	Causes the spread of biological and chemical effects	The effect is a weakening of the paper fibres and the book binding.
		Moisture	Elevated moisture content any type of humidity	Hastens the degeneration of chemical and biological damages.	Fungus growth causing yellowish stains on papers
		Particles of Dusty Soil	Particles are dispersed and layered.	Moisture-induced degradation centres are caused by dust particles.	Fungi causes acid production and deteriorates paper.
2.	Chemical factors	Water	Water is a universal solvent that dissolves dirt, as does air (gases).	The library items were dampened by window leaks and water supply roof leaks.	The gases in the air can cause papers to become discoloured, degrade, and have other chemical effects.

3.	Biological factors	Microorganisms (Fungi and Algae)	Fungi grow in dormant mode with humidity exceeding 60%.	Favourable conditions include normal, high humidity, and low temperatures.	Fungal consumption of gum, glue, and paper binding materials
		Insects	Silver Fish, Cockroaches, Book Worms	The binding materials are mostly damaged, causing irreversible damage.	Craters in books, holes like tunnels, and paper cuts
		Termites	Termites that live on the ground and in wood	Very risky for irreversible damage to library materials	Termites entirely destroyed paper wood due to the consumption of cellulose by the woods.
4.	Natural disaster	Seismic	An earthquake naturally occurs.	It leads to building damage. Library Building in Seismic Zones: Lightweight	The lighter-weight library shelf design
		Rainwater Strom	Water floods are caused by sudden heavy rains.	The lower ground level and basement were completely flooded.	It caused harm to books and materials in the library by wetting them down.
		Sky Thunders	It effects the building and electricity supply.	Damage to electricity feeders is affected.	Short circuits, fire, and sparks harm the library
5.	Human factors	Human Ignorance	Careless handling and storage can result in damages.	It requires careful handling and a complicated setup.	Library materials were damaged due to negligence.
6.	Ageing	Produce timing	Due to ageing the papers and manuscripts become very delicate and hence results easy physical damage.	It requires the restoration, careful handling	Paper become rusty, yellowing, loses the binding, inks vanishes, torn.

Importance of Preservation and Conservation

To sustain regular programming and keep the library operating as effectively as possible, materials conservation and preservation are required. Manuscripts and rare materials can only be access habitually if they are in good physical condition. Preservation and conservation are necessary to keep things safe and of the best calibre. It is used to delay the causes of deterioration in order to preserve library items for use by current and future generations of users.

The NLI, Kolkata, which is at the pinnacle of all Indian libraries, is highly worried about the long-term viability of its library materials. For this reason, the library

has set up a number of sections and divisions, including Administrative, Professional, and Conservation divisions. These divisions comprised the Computer Centre, Rare Books, Indian Languages, Foreign Languages, General Professional, and Preservation and Reprography, amongst other sections. Each section within the library works collaboratively to prevent the degradation of its resources.

Preservation and Conservation

The processes of preservation and conservation methods are employed to safeguard the manuscripts, rare materials and all the library's artefact from further deterioration and breakage. Although preservation is the process of doing all required efforts to stop and slow down degradation, conservation entails accurately identifying the degraded material, taking early remedial action, and providing sufficient prevention against further decay. In addition, two primary components go into the preservation of library materials:

The preventive measures

The term "preventive measures" refers to any indirect (direct or indirect) activities that are meant to extend the life of intact cultural property elements. Safeguarding against potential physical, chemical, biological, and other danger is included, along with regular supervision, dusting, and all necessary housekeeping and maintenance.

The Curative measures: Curative procedures include any direct actions taken with the goal of extending the life of cultural property, whether it is damaged or not. It may require fumigation, laminating, patching, repairing, deacidification, and other chores, depending on the physical condition of each particular document.

Preservation and Conservation Measures and Techniques Adopted by the NLIK:

The NLIK adopted the principles of preservation and conservation measures for preservation and conservation of manuscripts and rare materials from the effect of various deteriorating factors. The major preservation and conservation measures for manuscripts and rare materials in NLI, Kolkata are stated below:

Table-2: Major Preservation and Conservation Measures for Manuscripts and Rare Materials In NLI, Kolkata – Precautions and Remedies

Sl No.	Effective Factors	Preservation and Conservation Measures for Manuscripts and Rare Materials In NLI, Kolkata
1	Light Exposure	Avoid exposing books, documents, and library materials to direct sunlight. Use sun filter glass, lead bulbs (light levels 50 Lux), acetate foils, and aluminium foils to reduce UV radiation.
2	Temperature	The ideal temperature range for maintaining air conditioning in library spaces and heat-resistant multistorey buildings is between 22° and 27°C. The NLIK has central air conditioning facility.
3	Ageing	Manuscripts and rare materials are digitized, microfilming, binding and avoided rough handling which can prevent more damage due to the age.

4	Air / Wind	Green building landscape libraries can reduce the impact of wind direction, tsunamis, thunderstorms, and high velocity air in coastal city libraries.
5	Relative Humidity	Optimal RH range: 30–40%; use of dehumidifier; silica gel treatment.
6	Atmospheric Gases	Dangerous natural and industrial gas pollution Avoid the areas around Metropolitans: SO2, NO2, NH3, and CO Techniques for deacidification and anti-acidification for books, documents, and paper are helpful.
7	Materials - Paper	By using caution when handling and preventing misuse, the inherent brittleness and tarnish of paper materials can be mitigated.
8	Materials – Wooden	Chemical application with a spray every so often Pesticides using Library Consultant assistance: DDT, Para Dichlorobenzene, Pyrethrum, Dieldrex Kerosene, Oil of creosote for termite control It guards against several microorganisms, fungi, termites, and rodents. Fungicides: Chlorophenol, Mercuric Chloride, etc.
9	Materials – Magnetic/ Digital/ Electronic	Keep magnets away from magnetic disc, digital, computer data, CDs, and other library instrument sections.
10	Infrastructure Green Building	Environmentally friendly, well-landscaping, green building architecture with fire, storm, and pollution safety features.
11	Design and Landscape	The Library Building site is satisfied by the foundation and design. Avoid low-lying, damp areas; high, light-filled platforms with air. The NLIK has a well-designed state of the art building for all the stakeholders.
12	Human factor (Handling, Stock, Caretaking Electric Circuit)	suitable sustaining library materials with care, especially manuscripts and rare materials and other regulations should be followed by electric equipment and circuits to prevent short circuits and other problems.

For this study visited NLIK and consulted with the concerned technical experts to get a better understanding of the various techniques applied for the preservation and conservation of manuscripts and rare materials at NLI, Kolkata. The library uses the following techniques for preservation and conservation of manuscripts and rare materials:

Table-3: Major Preservation and Conservation Techniques for Manuscripts and Rare Materials In NLI, Kolkata

Sl. No.	Techniques	Equipment	
1.	Digitization	Devices for digitization of manuscripts and rare materials	Hybrid Camera (for scanning)
		Software used for Digitization	DSpace
		Stored digitized manuscripts and rare materials	In Cloud server (provided by National Virtual Library of India)
			Hard disk
		Reading the digitized manuscripts and rare materials	Through website (Uploaded in Ministry of Culture, Government of India)
		Reading the digitized manuscripts and rare materials (in house)	Computer (Designated place for reading all scanned document through Hard disk)

2	Microfilming	Hybrid Camera (for scanning)	
		Microfilm camera	
		Camera	
		Developing machine	
		Printing/ Enlarge Machine	
		Auto Developer machine	
		Microfilm Printer	
		Microfilm reader	
		Microfilm scanner	
		Printer cum reprographic machine	
3	Freezing	Freezing Chamber	
4	Fumigation	Fumigation Chamber	
		Vacuum Fumigation Chamber	
5	Deacidification	Aqueous and non-aqueous deacidification	
6	Binding	Covering material include the boards and the materials used in covering these boards. (leather, cloth and paper). Sewing material (thread, thread gauze and tapes). Adhesives (paste, glue and gum). Decoration material (the dust cover and lettering material).	
7	Mending	Cloth, malmal or long cloth, paper, cutter, paste, wax or glassine paper.	
8	Lamination	Paper and Cloth Lamination Equipment	
9	Control Pest	Pesticides, Insect Repellents used in the NLIK (Naphthalene, Thymol crystals,)	

Conclusion: In this work different measures and techniques (Table-2) and (Table-3) for the preservation and conservation of manuscripts and rare materials at NLIK has been portrayed the various factors effecting the materials are also analyzed ((Table-1). The NLIK has been adopting different modern techniques (Table-3) like Chemical, non-chemical, Digital, Microfilming for the purpose. The NLI in Kolkata, is very concerned about the sustainability of its collection materials and always try to bring up-to-date their measures and techniques for preservation and conservation of manuscripts and rare materials for the assistance of future age group.

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OVERCOMING BARRIERS IN DIGITAL LIBRARIES AND DRIVING DIGITAL TRANSFORMATION: STRATEGIES FOR SUCCESS

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Introduction

The digital era has transformed libraries, shifting them from traditional physical collections to digital formats to meet evolving user needs. Digital libraries offer unprecedented access to vast knowledge repositories anytime, anywhere, marking a significant change in information curation, access, and use. Despite facing challenges like technological limitations, organizational inertia, financial constraints, and user adaptability issues, the benefits are substantial, including enhanced accessibility for remote or underserved areas and improved user experiences through personalized services and advanced search capabilities. Embracing digital transformation ensures libraries' long-term sustainability and relevance. This paper explores these barriers and proposes strategies such as investing in digital infrastructure, fostering innovation, securing sustainable funding, and implementing user-centric design to help libraries successfully navigate the digital transformation, enhancing their accessibility and user experience in the digital age.

Introduction to Digital Library Transformation

Transitioning from Physical to Digital Libraries to Overcome Challenges and Drive Innovation

Evolution from physical to digital libraries

The progression from traditional brick-and-mortar libraries to digital platforms is reshaping the accessibility and reach of information resources.

Challenges faced

Overcoming technological limitations, organizational inertia, financial constraints, and fostering user adaptability are key hurdles in the digital library transformation journey.

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Benefits of digital libraries

Digital libraries offer enhanced accessibility, improved user experience, and ensure long-term sustainability, revolutionizing the way information is accessed and utilized.

Literature Review

The shift from traditional to digital libraries is a complex process that has been extensively studied across various academic disciplines. This literature review synthesizes key research findings on the barriers to digital library transformation and the strategies proposed to address these challenges. The review is organized around four primary barriers: technological limitations, organizational inertia, financial constraints, and user adaptability issues.

Technological Limitations

Technological advancements are crucial for the development of digital libraries, yet they also present significant challenges. According to Chisenga (2006), many libraries struggle with outdated infrastructure that cannot support modern digital applications. This includes inadequate bandwidth, obsolete hardware, and a lack of integrated digital platforms. Moreover, Borgman (2003) emphasizes that interoperability issues between different systems can impede the seamless access and sharing of digital resources. Studies by Huwe (2012) and Lippincott (2015) further highlight the importance of adopting cutting-edge technologies such as cloud computing, artificial intelligence, and advanced data analytics to enhance the functionality and user experience of digital libraries.

Organizational Inertia

Organizational inertia refers to the resistance to change within library institutions. This resistance can stem from various factors, including a lack of digital literacy among staff, rigid hierarchical structures, and a cultural preference for traditional methods. Davis and Parker (2007) note that successful digital transformation requires strong leadership and a commitment to change management. Furthermore, Shiri (2003) suggests that continuous professional development and training programs are essential to equip library staff with the necessary skills and knowledge to manage digital resources effectively.

Financial Constraints

Financial constraints are a pervasive issue that affects the ability of libraries to invest in digital transformation. A study by McClure and Bertot (1998) found that limited budgets often force libraries to prioritize short-term needs over long-term digital initiatives. This sentiment is echoed by Smith (2001), who argues that sustainable funding models are essential for the successful implementation of digital libraries. Strategies such as public-private partnerships, grants, and fundraising campaigns have been proposed to address these financial challenges (Arms, 2000; Deegan & Tanner, 2002).

User Adaptability Issues:

The transition to digital libraries also requires users to adapt to new ways of accessing and interacting with information. Research by Tenopir (2003) indicates that while some users readily embrace digital tools, others may struggle due to a lack of digital literacy or resistance to change. Khoo et al. (2008) highlight the importance of user education and support services in facilitating this transition. Additionally, user-centric design principles, as discussed by Norman (2013), play a critical role in ensuring that digital libraries are accessible and intuitive for all users.

Proposed Solutions

The literature suggests several strategies to overcome these barriers. Investing in robust digital infrastructure is fundamental, as highlighted by Weibel and Traugott (2006). This includes upgrading hardware and software, ensuring high-speed internet access, and adopting interoperable digital platforms. Creating a culture of innovation within libraries is also crucial. As Lynch (2002) points out, this can be achieved through leadership development, staff training, and encouraging experimentation with new technologies.

Securing sustainable funding is another key strategy. According to Besser (2004), libraries should explore diverse funding sources, including government grants, private donations, and collaborative funding models. Finally, implementing user-centric design principles can enhance the usability and accessibility of digital libraries. Krug (2014) emphasizes the importance of designing digital interfaces that are intuitive and easy to navigate, while also providing comprehensive user education and support services.

Importance of Study

The study of overcoming barriers in digital libraries and driving digital transformation is of critical importance in today's rapidly evolving information landscape. The shift towards digital libraries offers numerous benefits, including increased accessibility, enhanced user experiences, and improved resource management. However, achieving these benefits requires a deep understanding of the challenges and the development of effective strategies to address them.

Enhancing Accessibility

One of the primary advantages of digital libraries is their ability to provide equitable access to information. Unlike traditional libraries, which are limited by physical space and operating hours, digital libraries can be accessed from anywhere at any time. This is particularly important for users in remote or underserved areas who may not have easy access to physical library facilities. By identifying and addressing barriers to digital transformation, this study contributes to making information more universally accessible, thereby promoting educational and informational equity.

Improving User Experience

Digital libraries have the potential to offer significantly enhanced user experiences compared to traditional libraries. Advanced search capabilities, personalized recommendations, and multimedia resources can transform how users interact with information. However, realizing these benefits requires overcoming technological and user adaptability challenges. This study provides valuable insights into how libraries can implement user-centric design principles and leverage technology to create intuitive and engaging digital platforms.

Ensuring Long-Term Sustainability

For libraries to remain relevant and sustainable in the digital age, they must successfully navigate the transition to digital formats. Financial constraints, organizational inertia, and technological limitations can hinder this process. By examining these barriers and proposing practical solutions, this study helps libraries develop strategies to secure sustainable funding, foster a culture of innovation, and invest in necessary digital infrastructure. This, in turn, ensures that libraries can continue to serve their communities effectively in the long term.

Supporting Academic and Professional Development

Digital libraries play a crucial role in supporting academic and professional development by providing access to a wide range of scholarly resources and learning materials. Understanding the challenges associated with digital transformation allows academic institutions and professional organizations to better support library initiatives that enhance research capabilities and lifelong learning opportunities.

Scope of Study

The scope of this study encompasses a comprehensive examination of the barriers to digital transformation in libraries and the development of effective strategies to overcome these challenges. The study is designed to provide a holistic understanding of the multifaceted nature of digital library transformation and is structured around several key dimensions.

Technological Barriers

The study will explore various technological challenges that libraries face in their digital transformation journey. This includes an analysis of outdated infrastructure, interoperability issues, cybersecurity concerns, and the integration of emerging technologies such as artificial intelligence and cloud computing. The study will also examine the impact of these technological barriers on the accessibility, usability, and functionality of digital libraries.

Organizational Barriers

Organizational inertia and resistance to change are significant obstacles in the digital transformation of libraries. This study will investigate the internal factors that contribute to organizational resistance, such as a lack of digital literacy among staff, entrenched traditional practices, and insufficient leadership support. It will also evaluate the effectiveness of change management strategies and professional development programs in fostering a culture of innovation and adaptability within library organizations.

Financial Barriers

Financial constraints are a critical barrier to the successful implementation of digital libraries. The study will assess the financial challenges libraries face, including limited budgets, high costs of digital infrastructure, and the need for sustainable funding models. It will explore various funding strategies such as public-private partnerships, grants, fundraising campaigns, and collaborative funding initiatives, providing insights into how libraries can secure the necessary resources for their digital transformation efforts.

User-Centric Barriers

User adaptability and the acceptance of digital library services are crucial for the success of digital transformation initiatives. This study will analyze the barriers related to user adaptability, such as digital literacy levels, resistance to change, and preferences for traditional library services. It will also evaluate the effectiveness of user education programs, support services, and user-centric design principles in facilitating a smooth transition to digital library services.

Advantages of Overcoming Barriers in Digital Libraries and Driving Digital Transformation:

Enhanced Accessibility: Digital libraries break down physical barriers, enabling users to access information remotely, thereby promoting inclusivity and expanding access to knowledge for diverse populations.

Improved User Experience: Digital transformation empowers libraries to offer personalized services, advanced search capabilities, and interactive multimedia resources, enhancing user satisfaction and engagement.

Efficient Resource Management: Digital libraries streamline collection management, reduce physical space requirements, and facilitate remote access to resources, leading to improved resource utilization and cost-effectiveness.

Global Reach: Digital libraries transcend geographical boundaries, allowing libraries to reach users worldwide and collaborate with institutions, researchers, and communities on a global scale.

Innovative Services: Digital transformation encourages libraries to innovate by adopting emerging technologies, such as artificial intelligence, virtual reality, and augmented reality, to create immersive and interactive learning experiences.

Data-driven Decision Making: Digital libraries generate valuable data on user behavior, resource usage, and engagement metrics, enabling libraries to make informed decisions, optimize services, and tailor offerings to meet user needs.

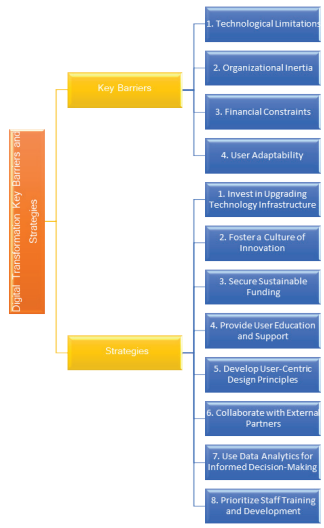
Sustainable Practices: Digital libraries promote sustainability by reducing reliance on paper-based materials, minimizing carbon footprints associated with transportation, and embracing environmentally friendly practices such as digitization and digital preservation.

Collaborative Opportunities: Digital transformation fosters collaboration among libraries, consortia, and cultural heritage institutions, enabling resource sharing, collaborative digitization projects, and knowledge exchange initiatives.

Continuous Improvement: Digital libraries facilitate continuous improvement through user feedback mechanisms, data analytics, and iterative development cycles, ensuring that services remain responsive to evolving user needs and technological advancements.

Long-term Viability: By overcoming barriers to digital transformation and embracing innovative strategies, libraries position themselves for long-term viability, relevance, and sustainability in an increasingly digital and interconnected world.

Here's a small chart titled "Key Barriers and Strategies for Digital Transformation in Libraries":



Conclusion

Libraries face numerous challenges in digital transformation, including technological, financial, organizational, and user adaptability issues. Despite these barriers, the potential to revolutionize library services and enhance accessibility is significant. This paper highlights these challenges and proposes strategies to overcome them. Effective leadership, clear vision, and stakeholder engagement are crucial. Investment in technology infrastructure must be paired with robust staff training to build digital literacy. User-centric design ensures digital services are accessible and responsive, while collaboration with other institutions can enhance resources and innovation. Data-driven decision-making allows for continuous improvement. Sustainability and scalability are vital for long-term success, requiring adaptable funding models and solutions. Ultimately, a multifaceted approach addressing both technical and human factors is essential. By implementing these strategies, libraries can navigate digital transformation, enhance their value, and ensure equitable access to information and lifelong learning.

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MASTERING DATA CARPENTRY FOR OPEN ACCESS PUBLICATIONS UNLOCKING THE OA RESEARCH POTENTIAL

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Introduction to Open Access

Open access refers to the free, unrestricted online access to research outputs such as journal articles and books. OA content is accessible to everyone without any access fees (Tennant et al., 2016). However, OA goes beyond free access; it also entails providing reuse rights. In its purest form, OA means that content is digital, online, free of charge, and largely free of copyright and licensing restrictions. This publishing model shifts the responsibility of publishing costs to authors, typically supported by their institutions or funding agencies, who retain copyright ownership (Suber, 2003). Publishers manage the peer review process and publish directly online, making content freely accessible to the public. OA publishers leverage technology to streamline publishing processes. The goal of OA is to provide unrestricted access to information devoid of financial motives. Users are granted rights to copy, use, distribute, transmit, and display the work publicly and create derivative works with proper attribution to the author (Abdelrahman, 2021).

In contrast to traditional subscription-based models where authors transfer copyright to publishers for profit, OA allows authors to retain copyright and license reproduction rights. Common licenses include Creative Commons (CC) licenses, such as the permissive CC BY license, which requires attribution for use, including derivatives and commercial purposes (Abdelrahman, 2021; Stodden, 2009). Some publishers, like Elsevier, use an "author nominal copyright" approach for OA articles, where authors retain copyright in name only while transferring all rights to the publisher (Morrison, 2017; Phan, 2022). OA can help the research to reach new readers, not just those with easy access to a research library. Publishing OA can help policymakers, non-government agencies, the media, educators, and practitioners implement your research.

The different types of OA publishing available

Gold OA: In this model, articles are freely accessible on the journal's website immediately upon publication. A Creative Commons license is typically applied to Gold OA papers. The Version of Record will be the final, peer-reviewed paper. Gold OA

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does not charge readers to access a paper; instead, an article processing charge (APC) is often charged to cover the publishing and distribution costs, for which the author is not always responsible. An institution or funder may pay the APC (Darbier, 2020; Hunter & Alessandrini, 2017).

Hybrid OA: These journals operate under a subscription model where some articles can be made OA if authors pay an APC. This model differs from Gold OA because institutions (libraries or subscribers) still pay for subscriptions, leading to dual revenue for publishers—once through subscriptions and again through APCs for OA articles (Armato & Baldock, 2015; Pinfield et al., 2016).

Green OA: Green OA makes the author responsible for making an article freely available and archiving it, whether through an institution's repository, a personal website, or another public archive (Darbier, 2020). Some versions of Green OA papers may not have been copyedited but may have been peer-reviewed:

- **Pre-publication Green:** Refers to the version of your work before it has been submitted to a journal, sometimes called the pre-print version.
- **Post-publication Green:** Refers to the final draft of your work that has been accepted for publication by a journal before it has been copyedited, typeset, and proofread. It is also referred to as the post-print version.

Diamond OA: In Diamond OA models (or platinum), authors, institutions, and funders do not pay OA fees, and the material is freely accessible to read online. The publisher will pay any fees applied during the publication process. Diamond OA models are popular with university presses accounting for publishing costs in their budgets (Charlesworth Author Services, 2022; Dufour et al., 2023; Moore, 2019).

Bronze OA: The book is free to read and/or download on the publisher's website, but it is not published under an open license that permits sharing or reuse. The author does not retain the copyright. The publisher can, therefore, withdraw access at any time, and the book cannot be freely shared elsewhere. 'Bronze' is often used to make content free to read for a brief period at some point after publication, but since there is no open license, it is not OA (Open Access, 2023; Piwowar et al., 2018)there is an unmet need for large-scale, up-to-date, and reproducible studies assessing the prevalence and characteristics of OA. We address this need using oaDOI, an open online service that determines OA status for 67 million articles. We use three samples, each of 100,000 articles, to investigate OA in three populations: (1.

What Significance Does OA Hold?

Access to Research & Increased Impact: OA publishing allows more scholars, policymakers, practitioners, clinicians, and the general public to view, cite, and share the work. This broad accessibility means the research can influence current practices, methodologies, and policies directly.

Improved Community Engagement: Many community organizations, clinicians, and practitioners lack access to subscription journals or the funds to pay for expensive copyright fees. By making research freely available, OA publishing helps translate academic findings into policies, treatments, funding allocations, and decision-making processes.

Accelerated Research Progress: Research is increasingly conducted by large, diverse teams across various institutions and geographic regions. Copyright agreements can inhibit the open sharing of publications. OA publishing ensures equal access to vital information, facilitating collaboration and progress.

Financial Considerations: Library budgets have stagnated while the cost of journal subscriptions continues to rise. Institutions often end up funding research and purchasing it back through journal subscriptions. OA publishing can alleviate this financial burden by providing free access to published research (Brown University, 2024).

The Carpentries

The Carpentries (https://carpentries.org/index.html) is a nonprofit organization that teaches researchers foundational computational and data science skills through instructional workshops. It aims to empower individuals in academia, research, and industry by providing training in essential computing skills.

The Carpentries encompasses three main initiatives: Software Carpentry, Data Carpentry, and Library Carpentry. Each initiative focuses on different aspects of data-driven research, offering workshops and training sessions to equip individuals with practical, hands-on experience in programming, data management, and data analysis (Hennesy et al., 2022; Pugachev, 2019).

Concept Data Carpentry

Data Carpentries (https://datacarpentry.org/), an organization under the umbrella of "The Carpentries", is an initiative to build the foundational skills researchers need to work more effectively with data. Its mission is to provide high-quality, hands-on training workshops to teach researchers the fundamental concepts, skills, and tools necessary for data management and analysis (Pawlik et al., 2017). These workshops cover various topics, including data organization, data cleaning, data visualization, and statistical analysis using open-source tools such as R, Python, and SQL. By emphasizing real-world applications and collaborative learning, Data Carpentries equips participants with the confidence and competence to manage their data more effectively.

Key Components

Key Steps in Data Carpentry for OA

Data Collection

- Gather raw data from databases such as Scopus, Web of Science, Open Alex, or PubMed.
- The data collection process includes variables measured, methods used, and any relevant metadata.

Data Cleaning

- Removing errors and inconsistencies
- Ensuring data integrity

Data Organization

- Structuring data for easy access and understanding
- Using standardized formats and metadata

Data Analysis

- Using strong statistical and computational methods
- Documentation of the analysis procedures

Data Visualization

- Creating clear and informative visual representations
- Using tools and techniques

Tools and Techniques

Data Carpentry involves several tools and techniques to manage and manipulate data effectively. These are:

Data Cleaning

OpenRefine: OpenRefine (https://openrefine.org/) is a powerful, open-source software that simultaneously visualizes and manipulates large quantities of data. Previously known as GoogleRefine, it was released as open-source software in 2013 and is now maintained by a diverse international community. Although it looks like a spreadsheet, it operates like a database, offering enhanced discovery capabilities beyond programs like Microsoft Excel. Journalists, librarians, and researchers value OpenRefine for its powerful capabilities to work with messy data (Ham, 2013). It can be used to explore, clean, and link data on a large scale. Its functions include data normalization, column reorganization, faceting and clustering, tracking operations, and exporting data (Miller & Vielfaure, 2022).

Python: Python is widely used for data-cleaning tasks using libraries like Pandas (https://pandas.pydata.org/). Pandas is a robust data manipulation library that offers high-performance, user-friendly data structures and analytical tools in Python (Gupta & Bagchi, 2024). It enables users to import, clean, transform, and analyse structured data efficiently. Pandas offers flexible data structures, such as Data Frames and Series, along

with a wide range of functions for data cleaning, preprocessing, and exploration (Chen, 2017; Musleh et al., 2020).

Data Integration

APIs: Application Programming Interfaces (APIs) are essential for data integration. They enable communication and data exchange between different software systems, facilitating access to data from web services and other online sources. This makes it possible to integrate external data sources into your analysis pipeline(Delinea, 2024; Goodwin, 2024).

Database Management Systems (SQL, NoSQL): SQL databases (e.g., MySQL, PostgreSQL) and NoSQL databases (e.g., MongoDB) are used for storing and managing structured and unstructured data, respectively. They provide efficient data retrieval, storage, and integration capabilities (AltexSoft, 2023; Taipalus, 2024).

Data Analysis

Python (NumPy, SciPy): NumPy (https://numpy.org/) and SciPy (https://scipy.org/) are two closely related open-source Python libraries widely used for scientific and mathematical computing. These highly mature packages provide numerical functionality that meets or exceeds that of commercial software like MATLAB. NumPy (Numerical Python) is the fundamental package for numerical computing using Python (Ranjani et al., 2019). It supports large, multi-dimensional arrays and matrices and a collection of mathematical functions to operate on these arrays. SciPy is built on top of NumPy and offers additional functionality for scientific and technical computing, extending the capabilities of NumPy (Barba, 2021).

R*:*R (https://www.r-project.org/about.html) is a programming language and software environment specifically designed for statistical computing and graphics. It offers a comprehensive set of tools for data analysis, including statistical tests, modelling techniques, and visualization (Kopyt, 2020). R remains popular in academic settings due to its extensive features and the fact that it is freely available in source code form under the terms of the Free Software Foundation's GNU General Public License. It compiles and runs on Unix platforms and other systems, including Linux, Windows, and macOS (Giorgi et al., 2022; Robinson, 2023).

Data Visualization

Tableau: Tableau (https://www.tableau.com/) is a powerful tool for creating interactive and shareable dashboards. It connects directly to data sources and allows users to create various visualizations without requiring extensive programming knowledge(Ashwin Patel, 2021; Stirrup et al., 2016). Tableau, an American company, started in 2003; in June 2019, Salesforce acquired it (Biswal, 2024).

Matplotlib, Seaborn: Matplotlib (https://matplotlib.org/) and Seaborn (https://seaborn.pydata.org/) are the most well-known data visualization libraries in Python, Matplotlib,

and Seaborn. Matplotlib enables users to generate visualizations like histograms, scatter plots, bar charts, pie charts, and more (Whitfield, 2023). Seaborn is another useful visualization library that is built on top of Matplotlib. It provides data visualizations that are typically more aesthetic and statistically sophisticated (Waskom, 2021).

ggplot2: ggplot2 (https://ggplot2.tidyverse.org/) is an R package for producing statistical, or data, graphics. Unlike most other graphics packages, ggplot2 has an underlying grammar, based on the Grammar of Graphics (Wilkinson, 2005) These tools collectively support the entire data carpentry process, from cleaning and integrating data to analysing and visualizing insights, enabling effective management and utilization of data resources.

Benefits of Data Carpentry

Efficient Data Management and Analysis: Data Carpentry provides training on how to handle data efficiently. It includes techniques for data management and analysis, ensuring that participants can work with data more effectively and produce reliable results.

Essential Data Skills: The training covers fundamental skills needed for data work. It includes techniques for cleaning data to remove errors, organizing datasets for better accessibility, and preparing data for analysis. These skills are crucial for anyone working with data.

Beginner-Friendly Training: The training is designed for beginners, making it accessible to individuals without prior programming or data management experience. This approach lowers the barrier to entry for learning data skills.

Improved Data-Handling Capabilities: Individuals can enhance their ability to handle and analyse data by participating in Data Carpentry workshops. This improvement can improve performance in tasks involving data in their respective fields.

Applicability Across Various Fields: The skills taught in Data Carpentry are valuable in various fields such as science, business, and education. This broad applicability makes it valuable training for professionals in different sectors.

Promotion of Reproducible Research: Data Carpentry emphasizes the importance of reproducible research practices. It means training participants to conduct research in ways that others can replicate and verify, thereby enhancing the reliability and credibility of their work.

Community-Driven Learning: The workshops foster a community-driven approach, allowing learners to connect with peers and share knowledge. This collaborative environment enhances the learning experience and helps build a supportive network.

Confidence with Data Tools: Through the workshops, participants gain practical experience and confidence in using powerful data tools such as R, Python, and SQL. This practical experience helps build confidence in using these tools for various data-related tasks.

Related Work

Few Titles for References

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Conclusion

OA represents a significant shift in scholarly publishing, promoting free and unrestricted access to research literature while empowering authors with copyright ownership and reuse rights. It enhances global knowledge dissemination, facilitates broader community engagement, and accelerates research progress across disciplines. The various OA models, including Gold, Hybrid, Green, Bronze, and Platinum, offer diverse pathways for researchers to share their work openly, thereby democratizing access to critical information. Furthermore, initiatives like Data Carpentry are pivotal in equipping researchers with essential data management and analysis skills. By promoting efficient data handling through tools like Python, R, and OpenRefine. Data Carpentry enhances research reproducibility, fosters interdisciplinary collaboration, and empowers individuals across academia, industry, and beyond. OA and Data Carpentry contribute to a more inclusive and impactful research environment, empowering individuals and institutions worldwide to engage more effectively with research and data-driven practices.

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SECTION V

LIS SERVICES AND PRACTICES

EXPERIENCES AS AN INTERNATIONAL OPEN ACCESS JOURNAL IN LIS: THE CASE OF 11 YEARS of JISTaP

Dong-Geun Oh[1], Eungi Kim[2] & Jisuk Yeo[3]

Introduction

As the Journal of Information Science Theory and Practice (JISTaP) celebrates its 11th anniversary, we reflect on its remarkable journey and growth. Published by the Korea Institute of Science and Technology Information (KISTI), JISTaP has become a leading international open access journal in English from a non-English speaking country. Through JISTaP, KISTI has supported the academic community in various ways, enhancing scientific knowledge in South Korea. JISTaP itself has become a best practice model for managing international scholarly journals in the fields of national science and technology.

Researchers eagerly publish their work in reputable journals and read articles from domestic and foreign sources, leading to an increase in scholarly journals due to demand and profitability. For instance, Elsevier's profits soared to more than £900 million with a 36.8 percent profit margin in 2017 (Matthews, 2018). However, this growth has also led to the rise of "pay and publish" predatory journals, exploiting researchers' need for easy publication and career advancement" (Oh et al., 2018). Researchers prefer to publish their research in well-known journals. However, most influential journals are based in Europe and North America (Kim, 2023), posing challenges for scientists from other regions, especially in the field of library and information science (LIS).

Until recently, South Korea lacked an international journal indexed in Scopus. Although JISTaP became indexed in Scopus in 2017, the journey was challenging, and JISTaP faced numerous obstacles. After being added to Scopus, JISTaP worked tirelessly to be indexed in the Web of Science. To reach new heights, we realized the need for sophisticated and focused efforts and support. JISTaP employed various strategies to overcome challenges and establish itself as a major player in the international LIS journal landscape.

Effective journal publishing requires strategic planning and meticulous management. We had to address editorial quality, contributor diversity, publication language, and technical infrastructure. Internationalization poses unique challenges, such

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3 Keimyung University, South Korea

as attracting a diverse range of contributors and publishing in English. An international journal based in an Asian country must balance the Western-oriented knowledge system with the local academic context, integrating both global and domestic perspectives to maintain relevance and credibility (Huang & Miao, 2021).

JISTaP's experience in journal publishing offers valuable lessons for newly established and domestic journals seeking international recognition. As many Asian countries strive to increase the number of journals published within their borders, it is crucial to learn from successful models and apply best practices. Leveraging the lessons learned and adopting a forward-thinking approach will help these domestic journals enhance their visibility, impact, and contribution to the broader scholarly community. Understanding JISTaP's strategic growth plan should help other LIS journals develop their own roadmaps for achieving similar milestones, such as inclusion in major databases and moving to open access. Therefore, based on JISTaP's 11 years of publishing as an international LIS journal, this paper aims to provide insights into transforming a domestic journal into a globally recognized journal and offer practical guidance for non-English speaking countries seeking to raise their academic publication standards.

JISTaP as a LIS Journals Published in South Korea

To elevate a domestic Korean journal to international status, the Korea Institute of Science and Technology Information (KISTI) proposed transforming it into an English-language publication. With this vision, JISTaP was launched in 2013, and by 2018, it was officially indexed in Scopus. This transformation followed a strategic plan outlined in a one-year feasibility study, summarizing the background, history, and key aspects from the collective perspective of the editorial team and stakeholders (reported in Rhee, 2019). Prior to JISTaP, the journal inherited the Journal of Information Management, established in 1963. The Journal of Information Management, published by KISTI as a Korean-language journal, released 915 articles over 50 years, averaging 21 articles per year (Choi, 2013). The significant involvement of universities and KISTI in the journal's publications underscores the importance of institutional support in advancing research and promoting high standards in scholarly communications. This model can inspire similar journals to foster institutional partnerships.

Table 1 shows various LIS journals indexed in the Korea Citation Index (KCI). KCI indexes and offers citation analysis for academic journals published in South Korea. It is widely used in South Korea to recognize the quality of journals published in the country. This table presents key metrics such as publisher type, language, indexing status, founding year, and publication frequency. As shown, JISTaP has its roots in the Journal of Information Management, established in 1963, which was one of the oldest LIS journals already indexed in KCI. Unlike this journal, we decided to publish JISTaP in English, which was essential for reaching a broader international audience.

Table 1. JISTaP Compared to Other LIS Journals Indexed in KCI

Publisher	Type	Title	Lang	Status	Est.	Freq
Research Institute for Knowledge Content Development & Technology	U	International Journal of Knowledge Content Development & Technology	Eng	I	2011	Qtr
Korea Institute of Science and Technology Information	G	Journal of Information Management => JISTaP (in 2013)	Eng	I	1963	Qtr
Korean Council of Science Editors	S	Science Editing	Eng	I	2014	Bi
The Modern Bibliography Review Society	S	The Modern Bibliography Review Society	Kr	CI	2010	Bi
Institute of the Information & Archival Science	U	Records and Information·Cultural Research	Kr	I	2015	Bi
Korean Society of Archival Studies	S	The Korean Journal of Archival Studies	Kr	I	2000	Qtr
Institute of Culture Convergence Archiving	U	Journal of D-Culture Archives	Kr	I	2018	Bi
Korean Society of Bibliography	S	Journal of Studies in Bibliography	Kr	I	1985	Qtr
Korean Society for Information Management	S	Journal of the Korean Society for Information Management	Kr	I	1984	Qtr
Korean Society of Archives and Records Management	S	Journal of Korean Society of Archives and Records Management	Kr	I	2001	Qtr
Korean Library and Information Science Society	S	Journal of Korean Library and Information Science Society	Kr	I	1999	Qtr
Korean Society for Library and Information Science	S	Journal of the Korean Society for Library and Information Science	Kr	EI	1970	Qtr
Korean Biblia Society for Library and Information Science	S	Journal of the Korean Biblia Society for Library and Information Science	Kr	I	1972	Qtr

* Notes: CI: Candidate for Indexing; EI: Excellent Indexed; Est.: Established Year; Freq: Publication Frequency; G: General Institution; I: Indexed; Lang: Language; Pub: Publisher; Qtr: Quarterly; S: Academic Society; Bi: Biannual; Idx: Indexing Status; Type: Publisher Type; U: University-affiliated Research Institute

JISTaP and Other LIS Journals Published in Asia

SCImago Journal & Country Rank (SJR) provides Scopus-indexed journals and their metrics on a yearly basis (SCImago, n.d.). According to the SJR portal, in 2023, there are only a limited number of LIS journals published in Asia that are indexed in Scopus, reflecting the region's under-represented position in the global LIS landscape (Table 2). In contrast, globally, there are 262 LIS journals indexed in Scopus. As shown, JISTaP is ranked as a Q3 journal with an h-index of 8 and published 24 documents in 2022. Despite being indexed in Scopus for only a few years and being an open access journal, JISTaP has a competitive standing among LIS journals published in Asia.

For instance, open access journals like the Annals of Library and Information Studies (India, Q3) have a higher h-index of 17 but only published five documents in

2022, reflecting a well-established impact but lower recent publication activity. The DESIDOC Journal of Library and Information Technology (India, Q3), a non-open access journal, has a stronger h-index of 19, with 55 documents published, indicating a notable publication output. The Malaysian Journal of Library and Information Science (Q2, non-open access) shows an impressive h-index of 29 with 13 documents published, showing its strong influence in the field. The Journal of Educational Media and Library Sciences (Taiwan, Q4, open access) has an h-index of 9 with six documents published, demonstrating notable impact despite a lower quartile ranking. It should be noted that the non-open access status of these journals is according to the categorization shown in the SJR portal, which is based on Scopus data.

Nonetheless, ensuring high standards in article review and selection has been paramount in JISTaP's journey towards becoming an internationally recognized journal, as evidenced in this table. This commitment to quality highlights JISTaP's dedication to maintaining high scholarly standards and contributing significantly to the global LIS field.

Table 2. Scopus Indexed LIS Journals Published in Asia

Title	Q	HI	TD 2022	Country	Publisher	Coverage	T Y
Annals of Library and Information Studies	3	17	5	IN	National Institute of Science Communication and Information Resources (NISCAIR)	2011-2023	OA
Data Analysis and Knowledge Discovery	3	9	140	CN	Chinese Academy of Sciences	2019-2023	N
DESIDOC Journal of Library and Information Technology	3	19	55	IN	Defence Scientific Information & Documentation Centre (DESIDOC)	2012-2023	N
IAFOR Journal of Literature and Librarianship	4	2	16	JP	The International Academic Forum (IAFOR)	2019-2023	OA
Journal of Educational Media and Library Sciences	4	9	6	TW	Tamkang University	2005-2023	OA
Journal of Information and Knowledge Management	2	27	109	SG	World Scientific	2002-2023	N
Journal of Information Science and Engineering	3	42	80	TW	Institute of Information Science	1993-1994, 1996-2023	N
JISTaP	3	8	24	KR	Korea Institute of Science and Technology Information	2017-2023	OA
Journal of Library and Information Science in Agriculture	3	5	82	CN	Chinese Academy of Agricultural Sciences	2019-2023	N
Journal of Library and Information Studies	3	3	15	TW	National Taiwan University, Department of Library and Information Science	2019-2023	OA
Journal of Library Science in China	2	8	50	CN	Editorial Office of Journal of Library Science in China	2019-2023	N
Journal of Scientometric Research	2	8	67	IN	Phcog.Net	2019-2023	N

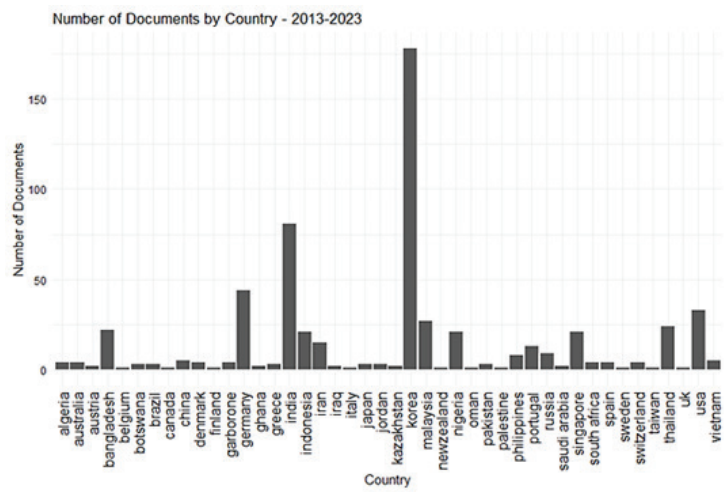
Library and Information Science	4	6	4	JP	Mita Society for Library and Information Science	1980-2023	N
Libres	4	14	0	SG		1996-2022	OA
Malaysian Journal of Library and Information Science	2	29	13	MY	Faculty of Computer Science and Information Technology	1996-2023	N
Pakistan Journal of Information Management and Libraries	3	12	2	PK	Department of Information Management, University of the Punjab	2014-2022	OA
Wacana	3	6	26	ID	Faculty of Humanities, University of Indonesia	2015-2023	OA

* Note. Q: Journal Quartile; HI: h-index; TD2022: Total Documents published in 2022; TY: type of journal; OA: open access; N: non-open access. In Scopus, journals are considered OA if registered as Gold or Subsidized OA in the DOAJ (doaj.org) or ROAD (road.issn.org) (Elsevier, 2023). Country abbreviations are as follows: IN: India; JP: Japan; TW: Taiwan; KR: South Korea; SG: Singapore; PK: Pakistan; ID: Indonesia; MY: Malaysia; CN: China.

Reliance on Contributions from Asian Countries

Figure 1 shows the distribution of authors from different countries who published in JISTaP from 2013 to 2023. South Korea leads overwhelmingly with over 175 papers, underscoring the journal's strong national base. Other notable contributors include India and Germany. North American countries, like the United States, are present as the fourth most contributing country, but to a much lesser extent. These trends suggest JISTaP's strong presence in South Korea but limited international diversity. To enhance its global impact and reputation, JISTaP needs to attract more authors from underrepresented regions, particularly Oceania, South America, and Africa. This could involve targeted outreach and forming strategic partnerships with institutions and researchers in diverse regions. Increasing international contributions would balance the geographical distribution of authors and enhance the journal's appeal and scholarly influence worldwide.

Figure 1: Distribution of Authors by Countries



Note. The data represents published documents by country from 2013 (Vol. 1) to 2023 (Vol. 10).

JISTaP's Journey to Growth

Table 3 illustrates JISTaP's progress from its inception until today. This journal's journey began by laying a strong foundation from 2013 to 2014. Launching a new international journal required careful consideration of several factors, such as funding, attracting international editorial board members (as exemplified in Oh, 2020 and Oh et al., 2019), and cultivating an international author and reader base. This establishment phase presented significant challenges, particularly in publishing high-quality articles in a timely manner. JISTaP had to gain recognition and trust within the LIS community, which was unfamiliar with the new journal. However, continuous collaboration with KISTI members, invested in the journal's success, played a crucial role in trying to achieve the initial goal of Scopus indexing. The reviewers and editorial members diligently worked towards this milestone.

Building on its foundation, JISTaP entered the consolidation phase (2015-2017). Priorities included maintaining Scopus indexing, actively engaging the editorial board, and increasing outreach efforts, such as participating in academic conferences and events. Enhancing the rigor of review processes, consistently publishing quarterly issues, and maintaining high publication quality were key during this phase, solidifying JISTaP's position and visibility within the academic community. A significant achievement during this time was the stabilization of submissions, making it easier to publish relatively high-quality articles consistently.

Since 2018, JISTaP has entered the expansion phase, aiming for inclusion in prestigious indices such as the Web of Science, improving citation rates, and diversifying the editorial board. This phase focuses on targeting higher rankings in academic indices like SSCI, broadening and strengthening the reviewer pool, and implementing strategic editorial practices to amplify impact. These comprehensive efforts have significantly boosted JISTaP's reputation and influence globally, reflecting its commitment to excellence and innovation. At its current expansion stage, JISTaP is widely recognized as a reputable open access journal in LIS. Recent bibliometric studies by Garg (2020) and Sharma et al. (2021) underscore JISTaP's standing and influence in the international LIS community. These studies highlight the journal's growing impact and its importance as a platform for scholarly communication and research dissemination.

Table 3. JISTaP's Evolution: Key Initiatives and Milestones

Phase	Time Period	Key Initiatives and Milestones
Establishment	2013-2014	• Establish foundational journal principles • Try to achieve inclusion in Scopus • Transition to an open access publishing model • Collaborate closely with the KISTI research team

Consolidation	2015-2017	• Try to achieve inclusion in Scopus • Expand and actively engage the editorial board • Increase journal visibility and outreach efforts • Enhance the rigor of the review processes • Consistently publish quarterly issues • Uphold the high quality of JISTaP publications
Expansion	2018-onward	• Sustain Scopus indexing • Pursue inclusion in additional prestigious indices such as Web of Science • Attain higher rankings in academic indices (e.g., SSCI) and elevate the journal's quartile standing • Broaden and strengthen the reviewer pool • Elevate publication quality standards • Diversify and enhance the composition of the editorial board • Increase the number of papers published per issue • Implement strategic editorial practices to amplify the journal's impact • Improve citation rates of published papers

Reflecting on Strategic Growth and Challenges

JISTaP's journey over the past decade is a testament to its strategic vision and dedication to academic excellence. By reflecting on past achievements and challenges, JISTaP can refine its strategies to enhance its influence in the global LIS landscape. These reflections will guide future growth, ensuring that JISTaP remains a leading publication, fostering knowledge dissemination, and making significant contributions to the academic community. The following are key aspects of JISTaP's growth and the challenges it faced over the past decade:

On Going Strategic Promotion Was Necessary

Over the past 11 years, promoting JISTaP has been essential to its growth and success. Strategic promotional efforts, combined with effective resource allocation and funding, have significantly increased visibility, attracted high-quality submissions, and fostered a vibrant scholarly community. Various promotional activities, including participation in academic events, collaboration with editorial board members, and attendance at international conferences such as those held by the International Library and Information Science Society (I-LISS), have expanded JISTaP's global reach. Leveraging social media platforms such as LinkedIn and distributing promotional materials such as L-holders has further amplified the journal's engagement within the international scientific community.

The JISTaP editorial team has played a key role in driving these promotional efforts, enhancing the journal's credibility, and attracting potential authors and readers. By actively promoting at academic conferences, effectively using social media, and strategically managing promotional activities, the editorial team has significantly raised JISTaP's profile and influence in the scientific world. Despite the challenges of balancing promotional tasks with editorial duties, managing time and resources effectively has been crucial. Looking ahead, focusing on promotional efforts, and using resources wisely will remain essential. Continued collaboration with international scientific institutions will

help share knowledge and further enhance JISTaP's global presence. Building on the work of the past 11 years, JISTaP is set to continue as a leading reputable journal.

JISTaP Needed Robust Publishing Platform

The development and integration of a robust online platform for submission, review, and publication have been crucial for JISTaP's success. KISTI developed ACOMS in 2001 to support academic societies (Choi, et al., 2007). When JISTaP was launched, ACOMS was chosen over open-source systems to tailor it to specific workflows. Later, ACOMS+ (AccessON Peer Review Management System Plus) was developed to enhance the publishing environment by promoting open science. ACOMS+ supports open peer review, open access publishing, self-archiving, online quantitative/qualitative evaluation, and peer reviewer invitations (Chung et al., 2024). Although JISTaP currently doesn't utilize the open peer review feature of ACOMS+, its integration with ACOMS+ should improve the visibility and dissemination of published research, aligning JISTaP with global open science trends. JISTaP's continuous focus on improvement and addressing performance concerns demonstrates its commitment to technological innovation in academic publishing. This commitment will likely lead to faster publication times, a wider range of submissions, and ultimately, a stronger platform for disseminating high-quality research.

We Strengthened Our Ethical Standards

As the scholarly landscape has evolved, maintaining rigorous publication standards and international engagement has become essential for JISTaP's success. Initially, we underestimated the importance of ethics in the publication process, but it soon became evident that upholding ethical standards was necessary for JISTaP's integrity. Ensuring authorship and originality, combating plagiarism and dealing with conflicts of interest were paramount to promoting credibility. Implementing a fair peer review system was crucial for the credibility and reliability of JISTaP's published research. Our commitment to transparency and accountability meant taking swift action against malpractice, such as issuing corrections or retractions, to maintain trust. Reflecting on the past decade, addressing authorship, originality, conflicts of interest, and ethical conduct in peer review was instrumental in shaping JISTaP's ethical framework. Indexing databases closely scrutinize these ethical standards, underscoring their importance. We continue to prioritize ethical publishing practices and encourage all stakeholders to adhere to our comprehensive Research and Publication Ethics guidelines.

Becoming in Indexed in Scopus was Crucial

Becoming indexed in Scopus has remained a cornerstone of JISTaP’s success in recent years. This focus on Scopus indexing has been a strategic element contributing to JISTaP's sustained management and viability. Gasparyan (2011) pointed out that increasing visibility and quality through increased publication rates, enhanced indexing,

and higher citation metrics is necessary to ensure the journal's survival and growth in the competitive academic landscape. This point is especially applicable for domestic journals seeking international recognition, as securing indexing in major databases provides global visibility and impact. For JISTaP, being indexed in Scopus also served as a milestone that validated a journal's quality and relevance on an international scale. This achievement enables domestic journals to transcend geographical boundaries, positioning them as valuable contributors to the global academic community.

Our Editorial Board Members and Reviewers Played Key Roles

The cornerstone of JISTaP's success over the past decade has been the concerted efforts of its authors, editorial board members, and reviewers. With members from 15 unique countries, the editorial and consulting teams demonstrate the journal's international reach and diversity, and their invaluable feedback has been crucial in shaping JISTaP's path. Their critical assessments, targeted suggestions, and strategic recommendations have significantly improved the journal's overall performance, guiding its evolution to meet the changing needs of the academic community. Looking ahead, the leadership roles of key editorial figures and the continued involvement of board members and reviewers will be essential for driving JISTaP's future growth and strategic initiatives. Their ongoing contributions uphold the journal's standards of quality and integrity, reinforcing its competitive edge in an increasingly dynamic publishing environment. As JISTaP enters its next development phase, these reflections serve as a testament to its resilience, adaptability, and unwavering commitment to excellence.

Challenges Remain

JISTaP's success over the past decade has come with its share of challenges. First, the journal's h-index of 8 and the publication of 24 documents in 2022 indicate steady growth but also highlight the potential for increasing its influence relative to more established journals. A notable reliance on contributions from South Korean authors may limit its international appeal and diversity. To enhance its global scholarly impact and recognition, JISTaP has been aiming to attract more submissions from diverse regions. We also recognize a need for more rewards for these efforts. JISTaP needs to find ways to incentivize reviewers, whose contributions have been vital for the journal's development, as they are often also contributors to JISTaP.

Second, while the ACOM+ system has proven effective, there is room for enhancement in its functionality. Editorial management systems are essential for managing the workflow of manuscript submissions, peer review, and decision-making. However, specialized tasks such as detailed proofing, formatting, typesetting, and comprehensive post-publication analytics often require additional tools. In today's competitive publishing environment, contributors expect a seamless workflow from submission to publication, with journals efficiently handling the specific aspects of the publishing process. To meet these expectations and further solidify its position as a leading LIS journal, JISTaP must continue to innovate and improve its systems and processes.

Third, the editorial team should aim to secure more highly qualified editorial board members and reviewers, as the number of article submissions has increased recently. Good reviews can enhance the quality of the articles and effectively screen out unqualified, low-quality, or fake submissions, as suggested above. Considering the competitive landscape today, we should also strive to shorten the time to final publication, as most authors expect their articles to be published as soon as possible after submission.

Lastly, JISTaP needs to distinguish itself by fostering innovative research competition from established journals and countering aggressive marketing by large commercial publishers. This can be achieved by enhancing its visibility through targeted marketing efforts and maintaining a high standard of academic integrity. Despite performing well within its category, JISTaP has the potential for growth in both published document count and impact. Leveraging its open access status and continued focus on quality will elevate its influence in the global LIS landscape. Embracing new publishing technologies and maintaining quality will help JISTaP become a leading journal in LIS.

Conclusion

As we celebrate the 11th anniversary of JISTaP, the journal occupies a strategic position among Korean LIS journals. Supported by KISTI as an institutional open access journal, JISTaP has been experiencing enhanced visibility and accessibility, mainly through platforms like ACOMS+ and networking opportunities within South Korea's scientific community. This institutional backing has significantly bolstered the dissemination of research findings and broadened its audience reach. However, the absence of such support poses challenges for many domestic journals published in South Korean and other Asian countries, prompting a need to explore alternative strategies for sustainability and impact.

One potential approach involves seeking collaborative funding opportunities or forming partnerships with institutions or organizations that advocate for open access publishing initiatives. Embracing open access models and cultivating strong partnerships could enable Asian LIS journals to establish a symbiotic environment conducive to collective growth. For example, journals could collaborate on joint special issues focusing on specific themes in LIS or coordinate participation in scientific events. ACOMS+, developed by KISTI to support Korean domestic journals, can invite journals that have not yet been supported by the publishing support system to upgrade their processes, as KISTI has already completed the English version. Furthermore, exploring shared marketing strategies or developing a central directory of Asian LIS journals could further amplify their impact on both regional and international scales. Through these concerted efforts, Asian LIS journals can enhance their global presence and significantly advance the field of LIS.

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LIBRARIES AS CATALYST FOR SOCIAL CHANGE IN BUILDING INNOVATIVE REAL-TIME LIBRARIES

Dr. Suresh Jange[1] & Dr Savitri Krishna[2]

Introduction

Higher Education system in India has been striving hard through University Grants Commission (UGC) for the coordination, determination and maintenance of standards of teaching, examination and research in university education particularly colleges, universities and institutions of higher learning. Competition has become a characteristic growth at an international level due to the tremendous rise of knowledge and the emergence of useful tools in information and communication technology, and other scientific advances. Knowledge will therefore not only propel the Indian economy but also spread throughout all societal levels in the country in an effort to improve living standards.

For this Libraries, have to be Catalyst for Social Change towards building knowledge society. Alvin Toffler has said - The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn and that's why a library is a hospital for the mind."

Libraries as Catalyst for Social change has been used in the context of role of Libraries particularly Public Libraries where they play significant role to transform communities irrespective of their specialization as a public in General. Based on Secondary databases, reveal that specifically, Libraries as Catalyst for Social Change has been discussed by Mehra and Srinivasan (2007) wherein the library-community convergence framework (LCCF) to extend the role of all libraries to participate more fully in community action and enhance their function as proactive catalysts of social change. Bartels (2019) discussed on Academic Library Metamorphosis and Regeneration.

"The public library will be a concept more than a place. The library will be more about what it does for people rather than what it has for people. As society evolves and more content becomes digital, people will access information in different ways. Physical items will be less important than they have been up to now. Library buildings and spaces will be used in different ways, and services will be provided beyond the building and

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virtually. The library as a catalyst for civic engagement will facilitate learning and growth for people of all ages" Bill Ptacek (2013)

In the stiff world of Competition and challenges, therefore, India has to rise to the occasion urgently and reorient its higher education system to be vibrant, competitive, and meaningful. Besides, there is absolutely no substitute to quality of higher education, although the country has been faced for a long time with the serious problem of meeting the quantity needs of our society. It is, therefore, essential that a careful balancing of the two is given priority to meet the twin requirements of the society in the foreseeable future (UGC, 2003).

University Grants Commission and LIS Education

UGC has played an important role in Library and Information Science (LIS) education in India. The committee that it appointed in 1957 under the chairmanship of Ranganathan to look into the functioning of college and university libraries also focused its attention on education for librarians. In 1961 again under the chairmanship of Ranganathan UGC appointed a Review Committee on Library Science education in Indian universities. This committee made insightful recommendations which are still considered a landmark. UGC also supported two national level seminars in 1973 and 1977 on LIS education that was organized by Delhi University. Purnima Devi and Kh. Surchand Singh (2006) highlights the various aspects for development of library manpower in today's fast changing environ/pent and analysed reports of various committees set up by the UOC in respect to libraries: and their implication upon the manpower development of libraries.

Dr.S. R. Ranganathan Library Committee (1957)

A Library Committee under the Chairmanship of Dr. S. R. Ranganathan was appointed by UGC in 1957 to give proper direction to the development of university libraries and to advise the UGC on matters relating to the proper functioning and proper management on the various problems connected with provision of growth of the libraries, book purchase, development of reading habits and help students in the use of the libraries. This was the first attempt to look into the problems of university libraries and to systematically survey the standards of academic libraries on national basis.

Report of the UGC Library Committee entitled" University and college libraries' was published in 1959 .It is a most comprehensive and significant document. The recommendations of the committee deal with important areas like financial requirements/ grants, library, fund, collection development (book selection and book purchase), promotion of reading habits, weeding out/loss of books, services, staff, building, furniture and equipment.

Ranganathan Committee on Development of University and College Libraries (1959)

Ranganathan committee was constituted for the development of University and college libraries in 1959.

Ranganathan Committee on Library Science in Indian Universities (1965)

The existing curriculum of most universities is based on the recommendation of the Ranganathan Committee and the committee set up by the UGC in 1978. The recommendations made by these committees where mainly for bachelors level courses, which are outdated and irrelevant in the present day. In the 1980s, a marked change in LIS education programmes was required due to the introduction of information technology into the field. As a result, the next revision was initiated by the UGC in the early 1990s (Ranganathan 1965, Mahapatra 2006).

Kaula Committee on Curriculum Development in Library and Information Science(1993)

To bring a uniform national pattern to LIS education in India, the UGC appointed the Curriculum Development Committee (CDC) in 1990 to restructure the curriculum under the chairmanship of Prof. P.N. Kaula. The report of this committee was published in 1993 under the title "Report of the curriculum development committee on library & information science" (Kaula 1993). The publication of this curriculum helped university departments update their syllabi; however, the report was found unsatisfactory and was not adopted by most universities (Mahapatra 2006).

Karisiddappa Committee on Curriculum Development in Library and Information Science (2001)

Many changes have occurred in the ICT sector, which has had a direct impact on libraries. This caused the UGC to undertake a study on the previous CDC report. The committee discussed all aspects of the curriculum and proposed modular syllabi for Indian universities (Karisiddappa 2001). The CDC (2001) recommended that "in view of the emerging network environment, in view of the fundamental shift in the goals of the library, and in view of the changes in information storage and delivery mechanisms, the educational programmes should cater the needs of these changed settings by including in their course contents, the knowledge and skills required to function effectively in such an environment". This curriculum enumerated in detail the contents of each module, along with objectives and expected outcomes. The report contains a detailed syllabus for a 2-year integrated programme leading to an MLIS, along with the marking pattern, number of credits, and number of hours of teaching theory and practice. This syllabus has proved useful, and soon after its publication, a majority of Indian universities modified their course structure to adopt it. Now, almost all LIS departments in India have common syllabi for teaching the LIS subjects. There are still some gaps in curriculum, and further revisions and updates are still needed.

National Knowledge Commission and LIS Education and Libraries

(www.knowledgecommission.gov.in/downloads/documents/NKC_Library.pdf)

The National Knowledge Commission (NKC), Prime Minister of India Dr. Manmohan Singh told that the time has come to create a second wave of institution building, and of excellence in the fields of education, research and capacity building to make us better prepared for the 21st Century. National Knowledge Commission (NKC) under the chairmanship of Mr. Sam Pitroda envisaged Knowledge Society as the Goal for India. As NKC sees it- along with many other countries of the world India is to join in the march of Knowledge Society. Knowledge Society needs information professionals well equipped with the zeal of documenting, preserving, sharing, and in short, facilitating the use of information in whichever way possible for the growth and development of our country. Towards that end, LIS curricula must incorporate into it the concepts of ICT-D (Information & Communication Technology for Development), Web for Development, Information Literacy, etc. There should also be a tremendous thrust so as to preserve and disseminate the indigenous knowledge not only in the S & T sector but also in the field of literature, social science and also every little tit-bit that is important to portray our culture (Chakraborty and Sarkel, 2009).

The National Knowledge Commission (NKC) Working Group on Libraries gave ten recommendations for a journey towards Knowledge Society -

- Set up a National Mission on Libraries
- Prepare a National Census of all Libraries
- Revamp Library and Information Science education, training and research facilities
- Re-assess staffing of libraries
- Set up a Central Library Fund
- Modernize library management
- Encourage greater community participation in library management
- Promote Information Communication Technology (ICT) applications in all libraries
- Facilitate donation and maintenance of private collections
- Encourage public - private partnerships in development of library and information services

LIS curriculum change has been an inevitable continuous phenomenon in India. At the university level, the UGC mainly controls the general course structure of curricula. Since its inception, UGC has given due emphasis to curriculum design for LIS departments, along with developments in university and college libraries, as evidenced in the following committees (Singh and Shahid), 2010).

UGC-NAAC and academic libraries

It is needless to state that because of emergence of NAAC has improved the image and importance of college and university libraries in India by earmarking parameter of Library. National Assessment and Accreditation Council (NAAC) was established in

1994 as an autonomous institution of the University Grants Commission (UGC) in making quality assurance an integral part of the functioning of Higher Education Institutions.

Guidelines on quality indicators in Library and Information Services: Affiliated/ Constituent Colleges has been issued by National Assessment and Accreditation Council (NAAC) (Source: http://www.naac.gov.in). Assessment and Accreditation is broadly used for understanding the "Quality Status" of an institution. NAAC has identified the following seven criteria to serve as the basis of its assessment procedures:

- Curricular Aspects
- Teaching-Learning and Evaluation
- Research, Innovations and Extension
- Infrastructure and Learning Resources
- Student Support and Progression
- Governance, Leadership and Management
- Institutional Values and Best Practices

The guidelines presented below identify the principal factors influencing the development and maintenance of college library services and collections.

- Management of library and information services
- Collection and services provided to users
- Extent of the use of services
- Best practices for college libraries

There has always been debate about the role of librarians in the college or university environment, and there is no doubt that that we the libraries are indispensable in the learning, teaching, and research processes. The visibility cannot be demanded but we should innovate the library activities, services and involvement in NAAC and let us do not confine to just Key Indicator - 4.2 Libraries as a Learning Resource (20), but also to play significant role in other criteria's of NAAC

Public Libraries in Karnataka: Transforming Communities

Public libraries play a significant role in local communities, especially in underprivileged and rural areas. Information is a valuable resource that should be handled as such in order to spur development and help people make wise decisions. Information society is a society in which the quality of life as well as prospects for social change and economic development depends upon access to information to meet their needs and requirements (Jawahar, 2018).

The Public Libraries have set a model particularly in Karnataka State and its repercussions can be seen for community development and transformation during and Post COVID19. E-Sarvajanika Granthalaya App: A Solution during Covid-19 - Digital Platform developed by National Informatics Centre, Ministry of Electronics and Information Technology Government of India for Government Libraries (www.karnatakadigitalpubliclibrary.org). The digital library has five sections - E-books: 38,024

books; Videos: 5,829 videos; Journals: 59,990 and Kids zone: 2,557 activities



ವರ್ಲ್ಡ್ ಬುಕ್ ಆಫ್ ರೆಕಾರ್ಡ್‌ನಲ್ಲಿ ದಾಖಲು | ಅಮೆರಿಕದ ಸಾರ್ವಜನಿಕ ಗ್ರಂಥಾಲಯವನ್ನು ಹಿಂದಿಕ್ಕಿದ ಇ-ಗ್ರಂಥಾಲಯ

ಕರ್ನಾಟಕ ಡಿಜಿಟಲ್ ಲೈಬ್ರರಿ ವಿಶ್ವದ ನಂ.1 ಓದುಗ ಸ್ನೇಹಿ ಗ್ರಂಥಾಲಯವೆಂಬ ಹೆಗ್ಗಳಿಕೆ

ಬೆಂಗಳೂರು: ಓದುಗರಲ್ಲಿ ಆಕ್ಷರ ಸಂಸ್ಕೃತಿ ಬೆಳೆಸುವ ನಿಟ್ಟಿನಲ್ಲಿ ಸಾರ್ವಜನಿಕ ಗ್ರಂಥಾಲಯ ಇಲಾಖೆ, ಡಿಜಿಟಲ್ ಗ್ರಂಥಾಲಯ ಎಂಬ ವಿನೂತನ ಕಾರ್ಯಾರಂಭಗೊಳಿಸಿರುವ ಮಿಲ್ಲಿಯಾಮಲ್ ನಿರ್ಮಾಣವಾಗಿದೆ. ಇಡೀ ವಿಶ್ವದಲ್ಲಿಯೇ ಓದುಗರ ಸ್ನೇಹಿ ಗ್ರಂಥಾಲಯ ಎಂಬ ಹೆಗ್ಗಳಿಕೆ ಪಾತ್ರವಾಗಿದೆ. ಆಕ್ಷರ ಅಳ್ಳು, ಬರ್ಲ್ಡ್ ಬುಕ್‌ಆಫ್ ರೆಕಾರ್ಡ್ ಪಠ್ಯದಲ್ಲಿ ದಾಖಲಾಗಿದೆ.

ಓದುಗರ ಆಕ್ಷರಕ್ಕೆ ಆದ್ಯತೆಯಾಗಿ ಪುಸ್ತಕಗಳ ಲಭ್ಯತೆ ಹಾಗೂ ಶ್ರೇಷ್ಠ ಮಟ್ಟದ ಕಾರ್ಯ ವೈಕರಿಯೆ ಯನ್ನು ಸದಾ ರೂಢಿಸುವ ಸಾರ್ವಜನಿಕ ಗ್ರಂಥಾಲಯ ಇಲಾಖೆಯು ಕಳೆದ ಸುಮಾರು ಸಂವತ್ಸರಗಳಲ್ಲಿ ಓದುಗರ ಮನೆಬಾಗಿಲಿಗೆ ಪುಸ್ತಕ, ಆಧ್ಯಕ್ಷರಲ್ಲಿ ಅವರುಗಳು ಎಂಬ ಪರಿಕಲ್ಪನೆಯೊಂದಿಗೆ ಈವರೆಗೆ ಯಶಸ್ವಿಗೊಳಿಸಿದ ಹೆಗ್ಗಳಿಕೆಯನ್ನು ಪುಸ್ತಕ ರಾಜ್ಯಾದ್ಯಂತ ಸುಮಾರು 5೦೦ಕ್ಕೂ ಹೆಚ್ಚು ಡಿಜಿಟಲ್ ಗ್ರಂಥಾಲಯಗಳ ಕಾರ್ಯಾರಂಭಿಸಿವೆ.

2020 ಜೆ. 26 ರಂದು ದೇಗುಲಗಳಿಗೆಯಂದಿರುವ ಕಾರ್ಯಾಚರಣೆ ಸರಕಾರದ ಡಿಜಿಟಲ್ ಗ್ರಂಥಾಲಯದ ಕುರಿತು, ಆಯೋಜಕ ಸಾರ್ವಜನಿಕ ಗ್ರಂಥಾಲಯ ಹುಬ್ಬಳ್ಳಿಯಲ್ಲಿರುವ ಹೆಚ್ಚು ಮಂದಿ ಇಂಜಿನಿಯರಿಂಗ್‌ನಲ್ಲಿ ಸರ್ಕಾರ ಮಹತ್ವಾಕಾಂಕ್ಷೆಯ ಸಾರ್ವಜನಿಕ ಡಿಜಿಟಲ್ ಲೈಬ್ರರಿ ಮೊದಲು ಸ್ಥಾಪನೆಯಲ್ಲಿದ್ದ ಆಯೋಜಕ ಸಾರ್ವಜನಿಕ ಗ್ರಂಥಾಲಯ ವಿಶೇಷ ಸ್ಥಾನವನ್ನು ಪಡೆದಿದೆ. ಆಯೋಜಕ ಸಾರ್ವಜನಿಕ ಗ್ರಂಥಾಲಯ ಇಲಾಖೆ ಸಹಯೋಗದಲ್ಲಿ ಸಾರ್ವಜನಿಕ ಡಿಜಿಟಲ್ ಲೈಬ್ರರಿ ಎಂಬ ಪರಿಕಲ್ಪನೆಯೊಂದಿಗೆ ಕಾರ್ಯಾರಂಭಿಸಿತ್ತು.

ಸಾರ್ವಜನಿಕ ಗ್ರಂಥಾಲಯಗಳು ದಿನೇ ದಿನೇ ಬೆಳೆಯುತ್ತಿವೆ

ಜಿಲ್ಲಾ ಸಚಿವರು ಮತ್ತು ಬಿಬ್ಬಂದಿ ವರ್ಗದ ಸಹಾಯದಿಂದಿಗೆ ಕಾರ್ಯಚ್ಚರ್ಯ, ಸಂಚಾಲಕರಾಗಿ ಬೆಳೆಸಿದೆ

ಡಾ.ರಾಜ್‌ಕುಮಾರ್ ಹೆಸರಿನಲ್ಲಿ ಡಿಜಿಟಲ್ ಗ್ರಂಥಾಲಯ ಮೊದಲಾಗಿದೆ. ಪುಸ್ತಕ ಸಚಿವರು ಮತ್ತು ಬಿಬ್ಬಂದಿ ವರ್ಗದ ಸಹಾಯದಿಂದ ಕಾರ್ಯಚ್ಚರ್ಯ, ಸಂಚಾಲಕರಾಗಿ ಬೆಳೆಸಿದೆ

ಸಾರ್ವಜನಿಕ ಗ್ರಂಥಾಲಯಗಳು ದಿನೇ ದಿನೇ ಬೆಳೆಯುತ್ತಿವೆ

ಸಾರ್ವಜನಿಕ ಗ್ರಂಥಾಲಯ ಇಲಾಖೆ 26 ಸಾರ ಕೇಂದ್ರ ಗ್ರಂಥಾಲಯಗಳು, 30 ಜಿಲ್ಲಾ ಗ್ರಂಥಾಲಯ, 83 ತಾಲೂಕುಮಟ್ಟ ಗ್ರಂಥಾಲಯಗಳು, 5766 ಗ್ರಾಮ ಪಂಚಾಯತ್ ಗ್ರಂಥಾಲಯಗಳು, 100 ಕೊಳಚೆ ಪ್ರದೇಶ ಗ್ರಂಥಾಲಯ, 127 ಅಲೆ ಮಾರಿ ಗ್ರಂಥಾಲಯಗಳಾಗಿ 31 ಸಮುದಾಯ ಮಟ್ಟ ಗ್ರಂಥಾಲಯಗಳು ಕಾರ್ಯನಿರ್ವಹಿಸುತ್ತಿವೆ. ಇದಲ್ಲದೆ ಸರಕಾರ 26 ಜಿಲ್ಲಾ ಕೇಂದ್ರಗಳ 30 ಹಾಗೂ 216 ತಾಲೂಕು ಗ್ರಂಥಾಲಯಗಳು ಸೇರಿ 272 ಗ್ರಂಥಾಲಯಗಳನ್ನು ಡಿಜಿಟಲೀಕರಣಗೊಳಿಸಿದೆ.

ವಿಶೇಷ-ಡಿಜಿಟಲ್‌ನಲ್ಲಿ: ರಾಜ್ಯ ಸರಕಾರದ ಡಿಜಿಟಲ್ ಲೈಬ್ರರಿಯಲ್ಲಿ 4.30 ಲಕ್ಷ ವಿವಿಧ ವಿಷಯಗಳಿಗೆ ಸಂಬಂಧಿಸಿದ ಪುಸ್ತಕಗಳು, 59,990 ವಿವಿಧ ದಿನ ಪತ್ರಿಕೆಗಳು ಲಭ್ಯವಿದೆ. ಕ್ವೈಜ್‌ಗಳ ಮತ್ತು ಕಥೆಗಳ ಇಳ್ಳವು ರುವ ಎಳ್ಳ ವಿಭಾಗಗಳಿಗೆ ಸಂಬಂಧಿಸಿದ ಕನ್ನಡ, ಇಂಗ್ಲಿಷ್, ಹಿಂದಿ, ಉರ್ದು, ಮರಾಠಿ, ತುಮಿಳು, ತೆಲುಗು ಭಾಷೆಯಲ್ಲಿ ಮಾಹಿತಿಗಳು ಲಭ್ಯವಿದೆ. ಎಸಿಎಸ್‌ಸಿ ವಿಶೇಷಚೇತನರಿಗೆ ವಿಶೇಷ ಅನುಕೂಲಕ್ಕೆ ಡಿಜಿಟಲ್ ಗೂಡಾದ್ಯ ಅಭಿವೃದ್ಧಿಪಡಿಸಲಾಗಿದೆ. ಕರ್ನಾಟಕ ಮತ್ತು ಕರ್ನಾಟಕೇತರ ವಿಶೇಷ ಪತ್ರಿಕೆಗಳು ಹಾಗೂ ಪುಸ್ತಕ ಲಭ್ಯವಿದೆ. ಇದಲ್ಲದೆ ಸಾರ್ವಜನಿಕ ಸಾಮಾನ್ಯ ಒಳಗೊಂಡಂತೆ 5 ಸಾವಿರಕ್ಕೂ ಹೆಚ್ಚು ಆಕ್ಷರಗಳಲ್ಲಿ ಪುಸ್ತಕಗಳಿವೆ. ರಾಜ್ಯ ಸರಕಾರ ಹಾಗೂ ಸಾರ್ವಜನಿಕರಿಂದ ಸುಮಾರು ೫೦೦ಕ್ಕೂ ಹೆಚ್ಚು ಪತ್ರಿಕೆಗಳು ಲಭ್ಯವಿದೆ. ಈ ಯೋಜನೆಯು ಭಾರತಾದ್ಯಂತ ವಿವಿಧ ಪತ್ರಿಕೆ 10 ಲಕ್ಷ ಸರಕಾರ ಹಾಗೂ ಪುಸ್ತಕ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಗುಣಮಟ್ಟದ ಕಲಿಕಾ ಸಾಮಗ್ರಿ ಒದಗಿಸಲಾಗಿದೆ.

ಗ್ರಂಥಾಲಯ ಪರಿಕ್ಷೇಪಣ ಮಾಹಿತಿ: ಇ-ಲೈಬ್ರರಿಯಲ್ಲಿ ಐಐಟಿ, ಬೆಳಗಾ, ನಿಟ್ಟೆ, ಐಐಎಂ, ಐಐಎಸ್‌ಸಿ ಸೇರಿದಂತೆ ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗೆ ಅಗತ್ಯವಿರುವ ವಿವಿಧ ವಿಷಯಗಳನ್ನು ಅಳವಡಿಸಲಾಗಿದ್ದು, ಹೆಚ್ಚಿನ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಇದು ಅನುಕೂಲಕರವಾಗಿದೆ. ಇ ಪ್ರಿಪ್ಟ್ ಫಾರ್ಮರ್ ಬಳಕೆದಾರರಿಗೆ ಮೊದಲ ಅಧಿಕೃತ ಮತ್ತು ಇದ್ದ ಅಧಿಕೃತ ವಾಗಿದೆ. www.karnataka digitalpublic library.org ಮೊದಲಲ್ಲಿ ಲಭ್ಯವಿದೆ. ಇದರಿಂದಿಗೆ ಇ-ಪ್ರಕಟಣೆಗಳ ಅಧಿಕೃತವಾಗಿದ್ದು, ಮೊಗಲ್ಲಿದ್ದಾರೆ ಎಂಬಲ್ಲಿ ಮಾಹಿತಿಯೂ ಇಲ್ಲಿರುವುದು ಇದೆ. ಲೈ ಸಿಲ್ಲಾಲ್ಲಿದ್ದ E- Sarvajanika Granthalaya B ಕ್ಷ ಲೈಬ್ರರಿಯಲ್ಲಿ ಮಾಹಿತಿಯಾಗಿದೆ.

ಡಿಜಿಟಲ್ ಗ್ರಂಥಾಲಯದಲ್ಲಿರುವ ಕಂಠಿಗಳು: ಕನ್ನಡ ಮತ್ತು ಸಂಸ್ಕೃತ ಇಂಬಾಯಿ ಸುಮಾರು 800 ಇ-ಪುಸ್ತಕಗಳು, ಸ್ಪರ್ಧಾತ್ಮಕ ಎಕ್ಸಾಮ್ಸ್, ಲೈಬ್ರರಿ ಇ-ಪುಸ್ತಕಗಳು, ಶಾಸ್ತ್ರೀಯ ಪರ್ಯಾಕ ಕಂಠಿಯ ರಾಷ್ಟ್ರಗಳು, ಇಂಗ್ಲಿಷ್, ಉರ್ದು, ಮರಾಠಿ, ತಮಿಳು, ತೆಲುಗು ಭಾಷೆಯಲ್ಲಿ ಮಾಹಿತಿಗಳು ಲಭ್ಯವಿದೆ. ಎಸಿಎಸ್‌ಸಿ ವಿಶೇಷಚೇತನರಿಗೆ ವಿಶೇಷ ಅನುಕೂಲಕ್ಕೆ ಡಿಜಿಟಲ್ ಗೂಡಾದ್ಯ ಅಭಿವೃದ್ಧಿಪಡಿಸಲಾಗಿದೆ. ಕರ್ನಾಟಕ ಮತ್ತು ಕರ್ನಾಟಕೇತರ ವಿಶೇಷ ಪತ್ರಿಕೆಗಳು ಹಾಗೂ ಪುಸ್ತಕ ಲಭ್ಯವಿದೆ. ಇದಲ್ಲದೆ ಸಾರ್ವಜನಿಕ ಸಾಮಾನ್ಯ ಒಳಗೊಂಡಂತೆ 5 ಸಾವಿರಕ್ಕೂ ಹೆಚ್ಚು ಆಕ್ಷರಗಳಲ್ಲಿ ಪುಸ್ತಕಗಳಿವೆ. ರಾಜ್ಯ ಸರಕಾರ ಹಾಗೂ ಸಾರ್ವಜನಿಕರಿಂದ ಸುಮಾರು ೫೦೦ಕ್ಕೂ ಹೆಚ್ಚು ಪತ್ರಿಕೆಗಳು ಲಭ್ಯವಿದೆ. ಈ ಯೋಜನೆಯು ಭಾರತಾದ್ಯಂತ ವಿವಿಧ ಪತ್ರಿಕೆ 10 ಲಕ್ಷ ಸರಕಾರ ಹಾಗೂ ಪುಸ್ತಕ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಗುಣಮಟ್ಟದ ಕಲಿಕಾ ಸಾಮಗ್ರಿ ಒದಗಿಸಲಾಗಿದೆ.

Academic Libraries: A Catalyst for Social Change

Let us not worry about what others equate librarians, the reality is it is the Librarians who deal with entire gamut of knowledge and the librarians are real social workers deal with all the departments and serve the users of various subjects with its rich print, online and attitudinal services. Today libraries are not just issue or return of books but have plenty of information sources both in print and online sources to support learning, teaching, research and extension activities of the user community and the Librarians have significant role to play in IQAC and RUSA activities of university and colleges occupying positions as Director, IQAC/ RUSA Coordinators and also NSS and IT Coordinators.

Gulbarga University Library: Towards Transforming Community - Marketing as a means to promote the use of Library resources

The challenge of the Librarian today especially in the Degree College or University library is general context as to how to attract the users to the library and this is the question posed by the management including in the assessment of NAAC. The probable reasons are:

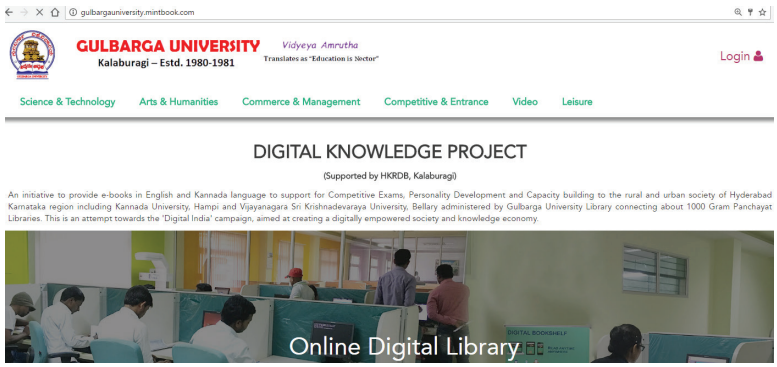
- The teaching learning process in the Faculty-Students environ
- The methodology of assessment
- Quantification and quality of higher education system
- Challenges of infrastructure and Library staff
- Attitude of Management and Library staff

For every challenge, there is a solution, but how a Librarian handles within the limitation of the system is more important and it should be noted that the libraries are second priority in practice but theoretically it may be first priority. The measures to be undertaken in this regard with respect to:

- Decentralization of Book Collection, Selection and even sometimes procurement

- Concept of moving library to departmental library
- Promotional measures through workshops, pamphlets and displays
- Library policy
- Under NEP, the role of librarian to grab the opportunity
- Strategy to include Marks assignment in the purview of Library in the process of Professional ethics and research.

'Digital Knowledge Gram Panchayat Project' is an initiative to provide e-books and educational videos mainly in Regional (Kannada) language to support students and youth from rural areas and villages in North Karnataka (Hyderabad Karnataka Region – considered to be a backward region in the State of Karnataka) for Competitive Exams, Personality Development and Capacity building. This project is supported by Kalyan Karnataka Development Board, Government of Karnataka in collaboration with Gulbarga University. Under this project, digital library and e-learning solution customized to each of the 1000 identified gram panchayats libraries (in six districts of Gulbarga, Raichur, Bidar, Koppal, Bellary and Yadgir) and provided accessibility to 1200+ e-books and video content comprising of 800 plus in Kannada language and 400+ in English language (https://gulbargauniversity.mintbook.com/). The digital content covers academic subjects (Political Science, Economics, Law, Ambedkar studies, Sociology, etc), English language books, Computer science literacy, Personality development, Folk literature, Kannada classics, Mathematics, Employment related exam preparation within Government like Railways, Banking, PDO, Teachers recruitment. UGC-NET, JRF, CSIR-NET, SET, Civil Services, etc and competitive exam preparations for higher studies like Engineering, Medical, Chartered Accountancy, Science research, Post-graduation admission, study abroad, etc.



URL: http://gulbargauniversity.mintbook.com/

An awareness and training Program for 1000 Gram Panchayat (GP) Librarians of Hyderabad Karnataka region was carried out at Gulbarga University, Kalaburagi under the Digital Knowledge Project supported by KKRDB, Kalaburagi to provide access to around 1200 e-books mainly in Kannada language to support for Competitive Exams, Personality Development, subject based books and Capacity building to the rural and urban society of Hyderabad Karnataka region.



Training Program for Gram Panchayat Librarians



"Smart Village" at the Smart Cities India Expo

MoU with affiliated Colleges of Gulbarga University

The Degree colleges affiliated to Gulbarga University demand for MoU and access to remote access facility to the electronic resources of Gulbarga University especially for their NAAC activities and uploading for SSR. In the digital environ, access to information irrespective of location is essential and the Gulbarga University Library has been providing access to e-resources using remote access facility to the faculty and students of Gulbarga University and there is a need to extend these e.resources to the affiliated degree colleges of Gulbarga University as it is demanded by the college librarians. In fact, Outreach Extension Activity for Affiliated Degree Colleges of Gulbarga University (Government and Private Aided Degree Colleges) as a Social Responsibility to reach user's with Information to support NAAC Criteria 3 for Research, Innovations and Extension. This is being practiced to have MoU to support each with other and extend Remote Access Facility to the Government Degree Colleges (16+9) and Private Aided Degree Colleges (18+14) covering 57 degree colleges.

Innovations in Libraries

There is always mis-conceptions about the term innovation means something new and its true, it is not necessary to indulge with investments in new things, rather within the availability of infrastructure, facilities and services, innovations can be done.

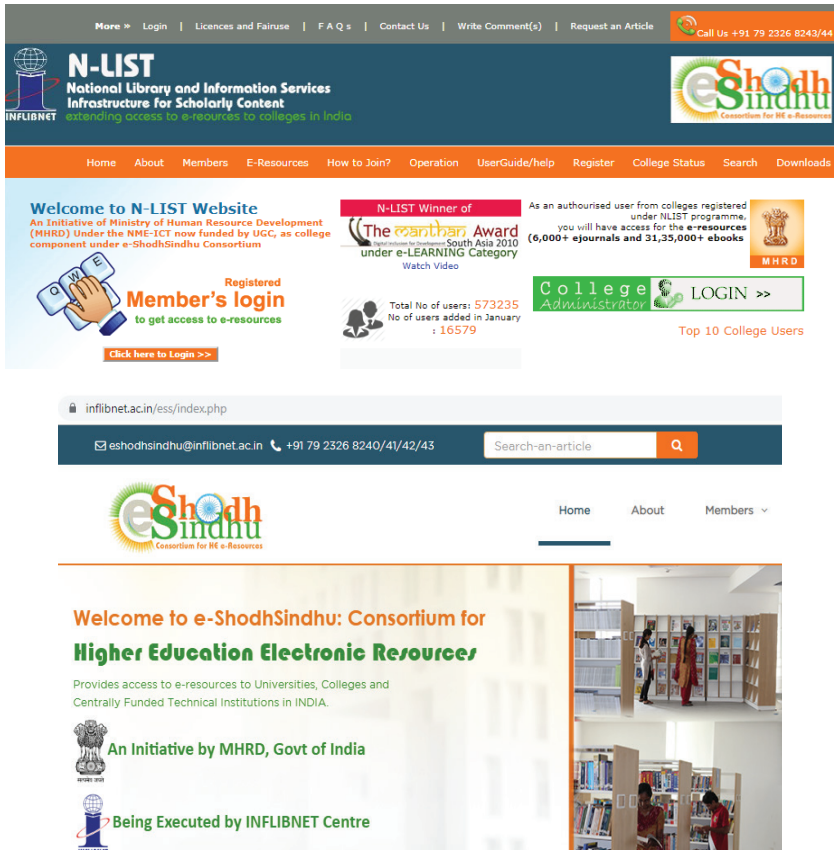
Research Support services are essential and should become part of library services especially for the teaching faculty. Supporting for faculty and research scholars publications and this can be found at (http://gukir.inflibnet.ac.in/handle/123456789/7405) and recent workshop organized at Gulbarga University Library is as under:

Information and Library Network (INFLIBNET) – an IUC of University Grants Commission has been a great boon to university and college libraries providing the best of e-information spending crores together of amount. Large number of E-journals and databases under National Consortia like eshodhSindhu - the world class publishers like Taylor and Francis, Springer, Oxford University Press, Cambridge University Press, JSTOR, American Chemical Society etc, are made available in network environment to the colleges and universities to strengthen the academic and research base. Besides, large number of e-resources is available in open access domain to support users. Thus

libraries are considered as treasure of knowledge and act as a Knowledge Hub and have been great stimulus in scientific research productivity of universities and this is reflected as under:

e-ShodhSindhu

Ministry of Human Resource Development has formed e-ShodhSindhu merging three consortia initiatives, namely UGC-INFONET Digital Library Consortium, NLIST and INDEST-AICTE Consortium.The e-ShodhSindhu will continue to provide current as well as archival access to more than 15,000 core and peer-reviewed journals and a number of bibliographic, citation and factual databases in different disciplines from a large number of publishers and aggregators to its member institutions including centrally-funded technical institutions, universities and colleges that are covered under 12(B) and 2(f) Sections of the UGC Act. This has helped the academic and research community to improve their quality of research and extension activities.



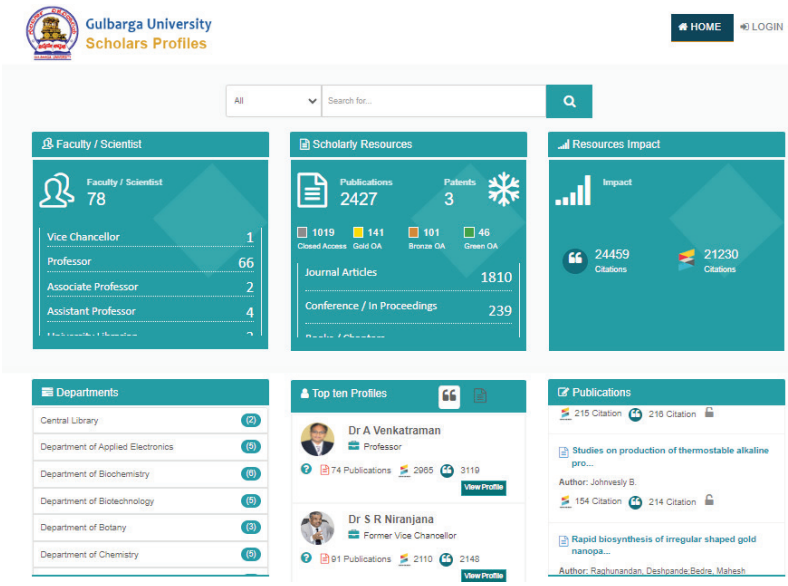
Besides, there is large number of free e-journals, ebooks portals and databases which are of great help to the students may be promoted by giving proper links in the website.

e-PG Pathshala

e-PG Pathashala is an MHRD program carried out by the UGC as part of its National Mission on Education via ICT (NME-ICT). High quality, curriculum-based, interactive e-content in 70 subjects spanning all disciplines of social sciences, arts, fine arts and humanities, natural & mathematical sciences, linguistics, and languages has been developed by subject matter experts working in Indian universities and other R&D institutes across the nation.

IRINS is web-based Research Information Management (RIM)

IRINS is web-based Research Information Management (RIM) service which facilitates the academic, R&D organisations to collect, curate and showcase the scholarly communication activities and provide an opportunity to create the scholarly network. Screen shot of IRINS at Gulbarga University @ http://gug.irins.org/ is shown below.



Swayam Prabha

Swayam Prabha has collection of 32 DTH channels uses the GSAT-15 satellite to broadcast top-notch educational programming around-the-clock. Every day, students will have access to fresh content for at least four hours, which will be repeated five more times during the day, letting them select the time that works best for them. The NPTEL, IITs, UGC, CEC, IGNOU, NCERT, and NIOS are the providers of the contents.

Support for plagariasm tools

Drillbit- an anti-plagiarism tool is provided to all the universities in India to validate the similarity index and to ensure plagiarized free text for quality in research

work. Vidya-mitra and open access portal to access information and technical support to the librarians are unique services rendered by Inflibnet Centre to the librarians. Marching towards excellence in Education, Teaching, Learning and Extension, the **Gulbarga University Library –** a Knowledge Hub for accessibility developed on modern lines as a prominent Learning Resource Center on Jnanaganga Campus housed with print and online information sources and excellent state-of-the-art ICT facilities and innovative services. Some of the unique features of the library are:

Virtual Learning Resource Center and Digital Library (VLRC & DL) established with support of INFOSYS Foundation, Bangalore, has now 150 computer systems and three main servers, a giant leap into information age is at the heart of the University Learning experience supporting e-LTR (e-Learning Teaching and Research), provides access to e-resources (8,500 e-journals+ & databases), Internet and e-learning, course materials and e-books using one GBPS leased line connectivity under NMEICT Project.



Virtual Learning Resource Center and Digital Library, Gulbarga University Library

Competitive Examinations & Career Information Resource Centre

For this purpose, fair collection of books, periodicals and other documents on Competitive Examinations, Career Planning, Personality Development, Communication skills etc have been stacked. Documents required for preparing to various recruitments, common entrance examinations and competitive examinations have been collected and updated regularly for reference by Students and staff. This will help our students to successfully pass through various competitive examinations.

Cloud Computing Technology for Library Automation

KOHA - a fully featured open source software and scalable library management system is used for automating the in-house activities. Cloud Computing Technology has been adopted to facilitate proper library database management using KOHA Library software.

Institutional Repository (http://14.139.156.108/jspui/)

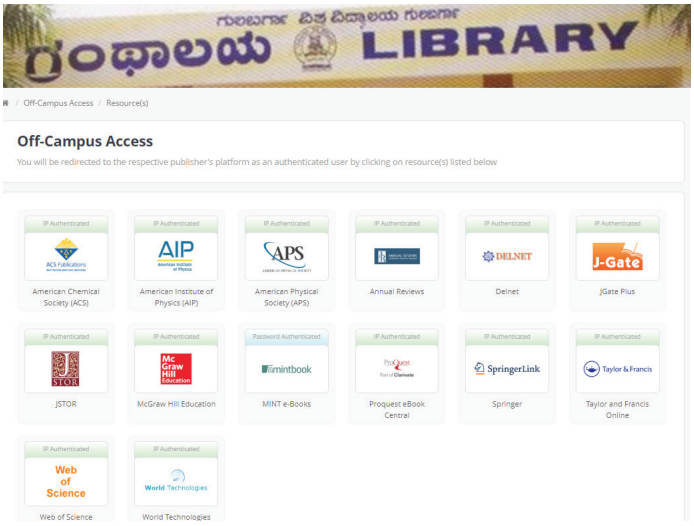
Faculty research publications, question banks (Semester I, II, III, and IV) in all fields of science, social sciences, humanities, commerce and management, law, and education comprise the university's institutional scientific productivity.



Shodhganga & Irins Database Management

Gulbarga University signed MoU with INFLIBNET Centre for Shodhganga, and actively contributing its doctoral thesis to Shodhganga. It has also setup IRINS database accessible at gugirins.org. Support for anti-plagiarism at university level and affiliated colleges is the need of the hour,

Remote Access Facility



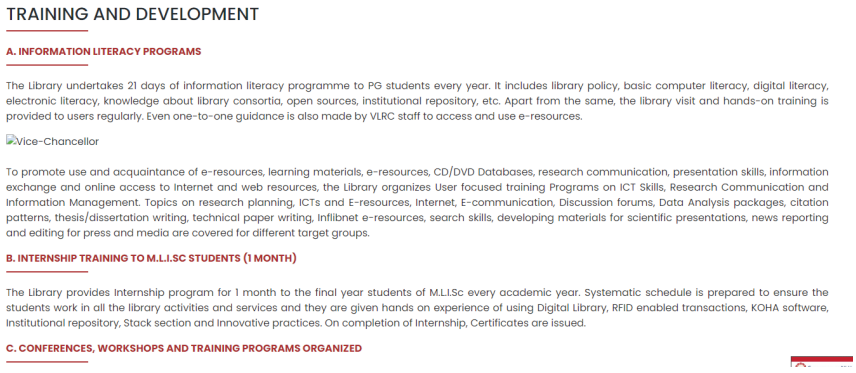
Wi-Fi Facility and CCTV Surveillance System

Wi-fi (Wireless Fidelity) access is available across the library and users can bring their laptop for accessing e-information. Further CCTV Surveillance System in the University Library has been established to mmonitor the theft or misuse of books in the library, Checking and observing proper behavior of users in the library.

Question Point service from OCLC, USA rendered as 'ASK a Librarian' to answer the information queries and reference questions of any users around the world.

Training and Videoconferencing facility

Regular Training and workshops are conducted and Videoconferencing facility provides platform for interactive lectures, demonstrations, educational films and other e-resources for the academics (https://gug.ac.in/library/training-development) .



TRAINING AND DEVELOPMENT

A. INFORMATION LITERACY PROGRAMS

The Library undertakes 21 days of information literacy programme to PG students every year. It includes library policy, basic computer literacy, digital literacy, electronic literacy, knowledge about library consortia, open sources, institutional repository, etc. Apart from the same, the library visit and hands-on training is provided to users regularly. Even one-to-one guidance is also made by VLRC staff to access and use e-resources.

Vice-Chancellor

To promote use and acquaintance of e-resources, learning materials, e-resources, CD/DVD Databases, research communication, presentation skills, information exchange and online access to Internet and web resources, the Library organizes User focused training Programs on ICT Skills, Research Communication and Information Management. Topics on research planning, ICTs and E-resources, Internet, E-communication, Discussion forums, Data Analysis packages, citation patterns, thesis/dissertation writing, technical paper writing, Infilibnet e-resources, search skills, developing materials for scientific presentations, news reporting and editing for press and media are covered for different target groups.

B. INTERNSHIP TRAINING TO M.L.I.SC STUDENTS (1 MONTH)

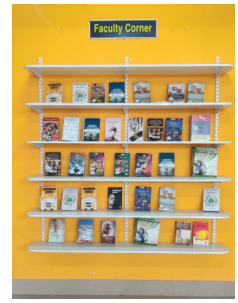
The Library provides Internship program for 1 month to the final year students of M.Li.Sc every academic year. Systematic schedule is prepared to ensure the students work in all the library activities and services and they are given hands on experience of using Digital Library, RFID enabled transactions, KOHA software, Institutional repository, Stack section and Innovative practices. On completion of Internship, Certificates are issued.

C. CONFERENCES, WORKSHOPS AND TRAINING PROGRAMS ORGANIZED

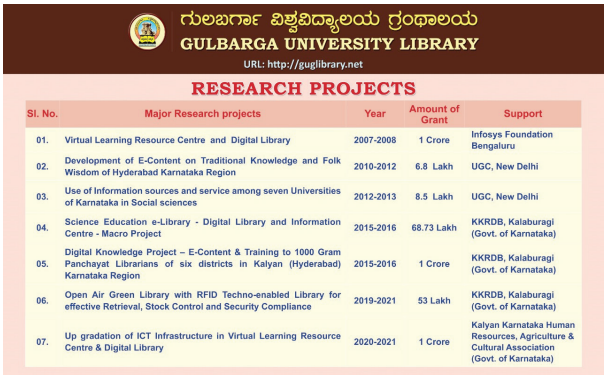
Value Added Services

Open Green Library, Helpdesk, Library Bulletin, Research Support Cell, developing learning coursewares and Content alert services can be value additions to the library and these could be found at gug.ac.in/library









ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ ಗ್ರಂಥಾಲಯ

GULBARGA UNIVERSITY LIBRARY

URL: http://guglibrary.net

RESEARCH PROJECTS

Sl. No.	Major Research projects	Year	Amount of Grant	Support
01.	Virtual Learning Resource Centre and Digital Library	2007-2008	1 Crore	Infosys Foundation Bengaluru
02.	Development of E-Content on Traditional Knowledge and Folk Wisdom of Hyderabad Karnataka Region	2010-2012	6.8 Lakh	UGC, New Delhi
03.	Use of Information sources and service among seven Universities of Karnataka in Social sciences	2012-2013	8.5 Lakh	UGC, New Delhi
04.	Science Education e-Library - Digital Library and Information Centre - Macro Project	2015-2016	68.73 Lakh	KKRDB, Kalaburagi (Govt. of Karnataka)
05.	Digital Knowledge Project – E-Content & Training to 1000 Gram Panchayat Librarians of six districts in Kalyan (Hyderabad) Karnataka Region	2015-2016	1 Crore	KKRDB, Kalaburagi (Govt. of Karnataka)
06.	Open Air Green Library with RFID Techno-enabled Library for effective Retrieval, Stock Control and Security Compliance	2019-2021	53 Lakh	KKRDB, Kalaburagi (Govt. of Karnataka)
07.	Up gradation of ICT Infrastructure in Virtual Learning Resource Centre & Digital Library	2020-2021	1 Crore	Kalyan Karnataka Human Resources, Agriculture & Cultural Association (Govt. of Karnataka)

Conclusion

Let's prove beyond doubt the inevitability of Librarians in academic setup with positive attitude and smile approach for not only gaining better accreditation but also for better visibility to ensure sustenance and innovate to attract users to the library. It is always stated that, we should change according to the situation and it should be noted that, the Librarians have to change by themselves to meet the changing needs and cannot blame the system. Within the limitations, the Librarian has to be pro-active and serve the users within their purview and Community around as a social responsibility to render the services in order to be in the race of competitive world and ensure Librarianship as a real catalyst of change and it cannot be replaced.

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RESEARCH CLINIC SUPPORT SERVICES IN FEDERAL UNIVERSITY DUTSIN-MA LIBRARY, KATSINA-NIGERIA: A COMPOSITION AND WAY FORWARD

Ukashatu Hamza Musa[1], Abubakar Ladan[2], Usman Hassan[3] Abubakar Sirajo Danzangi[4] & Mohammed Ibrahim[5]

Introduction

It is generally agreed and accepted that there can be no standard and progressive University without a standard and progressive University Library services. It's the heart and back born of the University. The major task of any university library is to support, promote and facilitate the achievement of the university's major functions of teaching, learning, research and development especially through the timely provision of needed and relevant information resources and services in print and digital formats (Zakari, 2020).

In addition, the resources and services library offer create a new opportunity for learning, literacy, research and education, which helps in shaping the new perspectives and ideas that are central to creative and innovative society in general.

The mission of a typical university library is to support, promote and provide high quality and relevant library information resources and services for effective learning, teaching, study, research and advancement (Zakari, 2020).

With the advent of paradigm shift in education especially in the university systems, one can say no university can develop and achieve its global standard and visibility without standard library system and services which the most of universities use their libraries as "learning Common" "Knowledge economy" Knowledge sharing center" Research clinic center" which aid their visibility and ranking globally. This has to do with the availability of information resources and services. Singh and Kaur (2009) emphasized that university libraries' primary responsibilities are knowledge and information access and preservation, in addition to assisting their parent institutions of teaching, learning and research missions.

1 University Librarian, Federal University Dutsinma, Katsina-Nigeria
2 University Librarian, Al-Qalam University Katsina, Katsina-Nigeria
3 College Librarian, Ahmadu Bello University, Zaria-Nigeria
4 University Library Complex, Federal University Dutsinma, Katsina-Nigeria
5 Department of Library and Information Science, Federal University Dutsinma, Katsina-Nigeria

University libraries are at the forefront of providing information services to their respective communities which comprises of students, academics or lecturers, researcher, consultant to support their academic activities needs.

With paradigm shift in Academic Library and use of AI tools in information services delivery, the role and position of libraries has dramatically changed and even with the global trend which characterized library has a fundamental shift from traditional information environment to an e-environment where emphasis is placed more on the acquisition of e-resources such as e-books, e-journals as well as online databases. However, traditional library and information services and functions are still relevant. Today, the contemporary practice in academic library services in the 21st century is being propelled with an information explosion, and the inclusion of Information and Communication Technologies (ICTs) in all aspects of library services. Kumar (2009) notes that academic libraries are changing dramatically by adopting new means of technology in all activities of print to e-environment where a variety of manual method, are replaced by computerized system which provides opportunity for online accessibility.

Fudma Library Complex

FUDMA library complex is one of the major components of Federal University Dutsinma, Katsina-Nigeria that serves the entire university community with relevant information resources in print and electronic formats. The FUDMA library complex serves two complementary purposes: to support the school's curriculum, and to support the researches of the university academics and students. FUDMA Library complex is one of the major units that serve the entire university community with relevant Information Resources both in print and digital formats. The FUDMA library is accessible anywhere in the world provided there is internet connection to the computer and the library website is www.elibrary.fudutsinma.edu.ng. The website has a both open access and closed access online database that provides relevant information resources, anti-plagiarism software, paraphrasing software, NERDC E-curriculum link, grand link and links to some other education links. A very important part of the institute (University Library) is not limited to only support the University but also assist in fulfilling the academic mission of the university. FUDMA Library Complex is an Academic Library mainly to support the university curriculum and others activities including teaching, learning, research and development and the society at large playing an essential role in enabling the delivery of library services to the public encouraging creativity and learning (White, 2012).

Research Clinic Support Services In Fudma Library, Federal University Dutsinma, Katsinma-Nigeria

The quality of any academic university library services will be largely influenced by the availability of human, material and financial resources. The vision of FUDMA library is to promote and maintain quality service that will support the academic activities (teaching, Learning and learning). FUDMA library provides a wide range of services to support the researches and educational needs of students and faculty as well as the host community.

Research Clinic

A research clinic typically refers to a facility or organization where a scientific research activity is conducted. It's a forum or place where researchers, scholars, or professionals engage in systematic investigation and experimentation to answer specific questions or solve problems.

In the context of a library research support service, a research clinic could focus on guiding researchers right from topic generation, providing or supporting with needed information resources and services to individuals or teams engaged in research. This might include access to a comprehensive library database, research tools (SPSS, Mendeley, Zotero, Turnitin and Eaglescan etc) and expert librarians who can guide researchers in navigating and utilizing these resources effectively.

The goal is to create an environment where researchers can access the information they need, stay current with relevant literature, and receive support in refining their research questions or methodologies and best in data collection and analysis. Research clinic support services could also involve workshops on use of online database search strategy, training use and customization of online research management tool (Mendeley and Zotero), training on use of anti-plagiarism software, or one-on-one consultations to enhance researchers' skills in literature review, information retrieval, and academic writing (Raju et al., 2015).

Top of Form

The research clinic is a new innovation service in academic libraries that serves to assist researchers (staff, postgraduate and undergraduate students) in issues that relates to research ranging from articulating a problem, research topic, sourcing relevant information resources using databases and search engines (Ukashatu, 2021). The services obtained in the unit will be conform to world's best practices in Academic Libraries. This implied that, the librarian will be focus, driven, and make research output devoid of illegalities, especially those against research originally, and support collaborative sharing of ideas and accountable ethically. This thrust of the research support unit is to ensure the survival of Higher Education and appeal to the Library Patrons to take cognizance of the best scholarship practices. Efforts of the division to sustain research compelled the process, facilitate, subscribe appropriate information resources, arrangement, training and disseminating information that are current, reliable, relevant, authenticable and traceable to source of origin, accordingly. Therefore, providing research guide at these ubiquitous moments of the history of the library to emphasize the changing roles of the Librarian. All research activities and unsolicited consultant.

Research if the library context happens any time information are collected for the purpose of resolving research problem in such areas that help establish literally gaps, suppositions of earlier studies that are related and relevant to the current research. The librarians' roles is supply of information resources after thorough collation of logically and chronological facts so they can influence patron's decisions about such a

research. However, this article will focus on the composition of research clinic support services in Federal University Dutsinma, Katsina Nigeria on the following themes: when librarians are expected to facilitate research right from topic research, facilitate in searching literature and paraphrasing, How the librarian help in chosen the best research methodology, the connection of generated research topic with other parts of research, the inclusion of conceptual, methodological, theoretical and empirical literature in research, the position of methodology in the research data collection, subscribed databases/ electronic information resources by the library: its position in the synthesis and analysis of research, and finally the fight against plagiarism. The following are the composition of research clinic in FUDMA

Composition of Research Clinic Services

The role of the librarians as guide starts long before generation as enshrined by the information. When established it will provide virtual and physical services to the university community at large and it will be a composition of Librarians capable of executing the task: one-on-one research guide, starting from topic generation, literature search, literature review, arrangement of the entire research chapters and choosing the best research methodology among others. The composition of research clinic support services in FUDMA library have the following units with some responsibilities such as:



Research Consultation Service

As stated earlier that the Research Clinic or consultation is a new Innovation Service established in FUDMA Library with aims to assist researchers, scholars and academics (staff, postgraduates and undergraduates) in issues that relate to research paradigm using some AI apps. The Division is focused driven and make researches devoid of illegalities and support collaborative sharing of ideas and also the team of academic librarians would be responsible for guiding and instructing researchers on the following:

- Topic generation and Statement of research problem
- Literature search in the online environment or databases (open and Subscribed Databases)
- Connection of generated research with other parts of the research and the inclusion of conceptual and theoretical literature in research
- The position of methodology in the review of literature
- Data Collection, Data analysis and interpretations
- Use and customization of online reference management tools (Mendeley, Zetero)
- Use of ant-plagiarism software's (Turnitin) to fight against plagiarism
- Help in type setting and extracting article for publication

Topic generation

Research topic is the summary of expected content of research that guides research conversation. It is the custodian of the research idea and variables nested together. That is why research topics is one of the most important sections of the entire research cycle. Therefore, without a research topic there is simply no research. The team of Librarians in the units must be concern about research topics brought to them by the researcher and focus to firstly establish dependent and independent variables. Secondly, that the team of librarians in the division has to confirm whether such research can contribute to knowledge and thirdly that the researcher possess the capacity to readily communicate their thoughts. Conveying these messages through dialogue by librarians helps to arouse the independence and confidence built of a patron about the choice of a topic and encourage patrons to possess sense of responsibility towards the research that librarians support with information resources. Without any prejudice, the role of librarians is to equip patrons at this stage with the needed intellectual skills that open up the other stages of research during topic generation stage, and to ensure that the topic generated has never been done exactly the way a patron has proposed in terms of scope.

Research Topic Analysis and Statement of the Research Problem

Research topic analysis at the research clinic will assume the suitability and relevance of generated topics show understanding of the potential outcomes of the study and the connections of research problem, research question, research objectives and research hypothesis. The essence of topic analysis is to show the importance of such research with theoretical base and research methodologies. Librarians' role here is to take note and encourage particularly students (undergraduate and postgraduate) and staff members to ensure that they are led by their respective project supervisors who are key to the topic restructuring and modifications.

Every research that leads to the award of certificate must have a problem statement. Statement of research problem are carefully articulated words that clearly, concisely and manageably present the communicable focus of a research and the need for such research in context, scope and framework. Statement of research problem should indicate evidence-based inquiry that are stated as phrased questions and mindful of the adopted research method. The role of librarians is to help patron's narrow statements of

research to specific questions and indicate the function of the variables proposed with the nexus of the research frame. Sources of research problems is not limited to patrons Expression of personal experience and insights, practical situation, current social, Economic, health, educational and political issues, causal observation, related literature and deduction from theory

Research Process using ICT facilities

As we all know, the process of carrying out research is indeed a tedious and time-consuming process and it is for this reason that the introduction of ICT facilities becomes absolutely necessary especially in order to meet up with the 21st century challenges facing most researchers.

Now, the ICT facilities referred here does not delve around computers alone but rather it covers the practical application of some research software's, databases and some unique search engines specifically designed and coded to meet the need of modern day researchers. The clinic will therefor take upon itself as one of its main objective to enlighten researchers on the use and practical application of software's like Mendeley, Zotero. Academia, Research gate, Grammarly, Quillbot and other research related software's. Researchers will also be thought how to access and academic databases so as to give them unlimited access to books articles, Journals and other publications that are relevant to their research.

With the process of research being digitized by the day the need to educate researchers in Federal University Dutsin-Ma on the availability of ICT facilities in the field of research and how to properly and effectively use those ICT facilities cannot be over emphasized.

The Connection of Generated Research with other Parts of the Research and the Inclusion of Conceptual and Theoretical Literature in Research

Research cycles have tried to illustrate the connection of generated research topic to other parts of research. A typical research cycle identify that research topic kick starts research and terminates when such topic is presented and results published.

The role of librarians is to ensure that each component of the generated topic has dependent and independent variables, and that they are connected.

Librarian role is to guide that conceptual literature reviewed provides diverse definition of the variables of the study. The methodological literature should be able to show categorically subjects, instrument and procedures utilized by other studies. Methodological reviews help to reveal implications of subjects, instrument, procedures and conclusion reached in other works. When librarians are guiding researches and the focus is on theoretical review, it is required that they connect the research problem with constructs of the research variables, and ensure that it conforms to operational definition of the current research. Research carefully guided by theoretical review help with constructs during the formulation of researches that have been Empirical literature review

provides established results of other researches that have been published. Librarians must ensure that empirical review link current research to numerous theories as well as provide coherent and explicit chain of reasoning, thereby encouraging scrutiny and critique of earlier studies in the context of the present research.

The Position of Methodology in the Review of Literature

Methodology requires researchers to showcase the design employed to help them address the research problem accurately and suitably. The position of methodology in the review of literature can be emphasized by librarians by helping patrons to clearly distinguish research method from methodology. Research method help researchers get a solution to a problem, while methodology explains the constituents that lead to the solution. Research methodology is simply the explanations of why, how and what about research. The role of librarians in a research is to guide a researcher to use the research methodology to explain why the research is undertaken in the first place, how the research problem where formulated, the type of data collected, and the method used. In the maze, the research technique employed to lead to data analysis should be stated. Please note that the role of librarian at this stage is facilitation. and the decision is the prerogative of the supervisor's as far as method and methodology is concern. However, the role of the librarian is to help patron apply research methods to liquidate research problems and show the methodology that is most suitable by providing information resources that can lead to tools and techniques relevant for justifying the routes and can lead to understanding problems and solutions.

Data Analysis and Interpretations

Data analysis brings to fruition the overall plan of action elicited answers to research problem. Data interpretation is achieved with measurable techniques, interviews, observation or using set of documents. Data are collected to answer research questions and or test postulated hypotheses, provide the originally and basis on which contributions are made to the body of knowledge. The role of librarians is to suggest instrument that do not strive on vague propositions. Leveraging on theoretical reviews and their constructs can help librarians with the guide to connect with the research variables, research questions or hypothesis.

As a component expressed in methodology, data analysis and interpretation facilitate the analytic procedure for patrons to investigate research problem. The role of the librarian is to link patrons to previously carefully constructed instrument so that patrons are not led to wrong decisions. Librarians must connect patrons with other professionals who are knowledgeable and can provide concise information on the matter. Online Referencing and the Use of Subscribed Databases/Electronic Information Resources in the Synthesis and Analysis of Research

The subscribed databases/electronic information resources are distinguished collection of the library. Librarians understanding of the features can effectively and efficiently help them during information literacy programs anchored on researches.

The subscribed databases/electronic information resources gain prominence from the initial levels of research activities when patrons are taught to roam, and later when they are expected to independently use the platform themselves. Librarians are encouraged not to take the literacy level of a patron for granted. It therefore implies that librarians are required to spend quality time so as to understand the characteristics of these subscribed databases/electronic resources with emphasis on the composition, navigation, areas of interest and categorized knowledge do as to help patrons during analysis and interpretations. In addition it will help justify the position of the present actions of a patron. Understanding these databases/electronic information resources also ease the use of tools to retrieving current, authentic, accessible, retrievable and storable information resources.

The librarian's disposition of the databases/electronic information resources can help the library address challenges such as underutilization of subscribed databases/ electronic information resources it is important to note that subscribed databases/ electronic information resources help patron's with rationale to underscore gaps, limitations, weaknesses, methodology, and when making claim for originality. Librarians should be able to generate key words, use narrow/broader terms, and search according to format, year, locations, and language, this helps during research categorization, critique, evaluation, selective quotation, summarization and syntheses of the entire research work.

Helping in the fight against plagiarism

Research must be undertaken following legal and ethical standards that do not undermine the efforts of others. Librarians should be found promoting fight against any kind of scholarship illegally or intellectual theft. One of such crimes to fight against is plagiarism, which is simply taking credit belonging to other scholars by deliberate acts such as failing to acknowledge by citation, proving incomplete citations and falsifications of any type.

To be able to fight against plagiarism, librarians role is to teach patrons to be consistent with the citation styles approved by the university for reports, dissertations and theses writing, and that the originality of research from Federal University Dutsin-Ma, Katsina fall within permissible severity index.



Discussions on Research Paradigm Shift

Training and Teaching Suppport Services

This unit is always responsible for collecting profiles of academics, research areas of specialization and research areas of interest of these academics from various departments of the University with the sole aim of supplying them with content (e-resources and Video lectures) through their various e-mails addresses.

This unit is also embedded with the responsible of marketing the products and services of FUDMA library. Staff of this unit will visit various departments within the University and advertise current and relevant e-resources acquired by the library. The databases that the library subscribed to, the electronic and physical information resources available in the library are all promoted through this unit.



Presentation on New Trends of Methodology of Teaching taking place in Fudma Library

Databases and Digital Content Support Service

FUDMA Library as a System is streamlining its online resource and services to ensure improved access to digital information resources to lecturers and students. Currently, the library has over 50 million digital information resources.

The objectives of these Services in Support of Research is to train 25 users daily i.e. 635 users weekly and 1460 users monthly on how to access the following databases subscribed by the Library.

- Elsevier's
- EBSCOhost
- Trip Medical Databases
- MIT OPEN Courseware
- Hinari
- Jstor
- ProQuest Databases
- Research4Life

- Web science
- AJOL
- ACM database
- DOAB, DOAJ, HINARI, AGORA



A picture showing how Databases are accessed in Fudma Library

Citation Style and Plagiarism Support Services:

Citing a source means that you show, within the body of your text, that you took words, ideas, figures or images from another place. Citations are a short way to uniquely identify a published work (e.g. book, article, chapter, web site)

- We cite our work to protect other people's intellectual property.
- Plagiarism occurs when you borrow another's words (or ideas) and do not acknowledge that you have done so. In this culture, we consider our words and ideas intellectual property

Citation is therefore the best way to avoid plagiarism. There are many types of citation styles but FUDMA Library conducts weekly workshops on the three most common citation styles; **APA, MLA & Chicago Styl**e. Our team of experts also conduct weekly workshops on citation style software such as: Refworks, Mendely, Zeteros, Endnote, among others to help students, lecturers and researchers in organizing the citations and making them accessible by managing the information while researching.

FUDMA Library provides plagiarism software services. The service has the following objectives;

- To conduct similarity index on FUDMA scholarly work
- Conduct weekly workshop on ethics of academic writing.

You can visit or contact the librarian who is a TURNITIN and EAGLESCAN administrator to learn more about this service and how you can benefit from it.



The above picture shows a researcher undergoing a plagiarism test by the librarian in charge.

Assignment Consultation Support Services

Assignment consultation services has to do with direct contact with student, resources and librarian who is assigned to guide the client on how to conduct their assignment. In assignment consultation services, student will be guided on why the assignment is given, how to search literature, how get the best point from the literature, how to paraphrase or contribute, how to arrange their work according to the lecturer instruction and how to acknowledged the reference consulted. To achieve this service, the FUDMA library has dedicated academic librarians that help students on a variety of information resources. In particular, we provide assignments consultation support services. Reference librarians of FUDMA library are always ready to answer queries raised by their clientele to make sure that they are connected. FUDMA reference Library staff are well positioned to provide expertise advisory service to students on: identifying the most suitable information resources to support students write an aassignment.



A picture portraying a student seeking for assistance from the librarian of the above service

Presentation Rehearsal Support Services

One of the missions of presentation rehearsal support services in FUDMA Library to provide a conducive learning environment with all needed facilities and expert in all

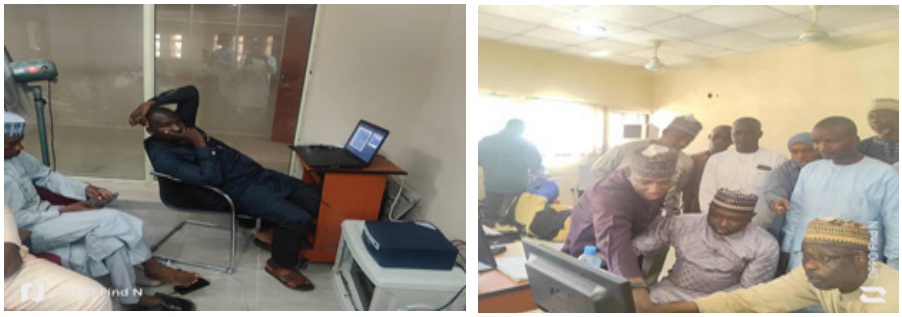
feel of endeavor to allow researchers to present their research for correction, observation and recommendation before pre-viva or final viva. FUDMA library has a designated room specifically for presentation rehearsals. The presentation rehearsal room is well equipped with projector, PowerPoint software, Prezi, animation software, and public speaking consultant. The space is available and is allocated on first-come first serve. Students and lecturers can use the space for two hours at a time



Pictures showing how presentations are done in Fudma Library

E-Learning Support Services

One of the cardinal goals of FUDMA library is to supports e-learning among its users. In FUDMA library, provision of digital information resources in form of videos, journal articles, and digital textbooks to lecturers, students, and research scholars is possible. Our eLearning support services librarian connects lecturers and students with the information they need for improved teaching, learning, and research. This service is a round-the-clock service which is rendered 24/7 by FUDMA E-learning support team. FUDMA e-learning librarians are well positioned to help FUDMA lecturers, students, and research scholars have access to information resources 24/7 regardless of time and space.



Pictures portraying how E-learning takes place by the Unit

Laptop and Tablets on Loan Services

FUDMA Library as a System has over 50 million digital information resources and is spending millions of Naira annually on digital information services. Unfortunately, the service is not utilized to the optimum by the university community. To improve

the adoption and use of digital information resources among students, faculty and staff, the FUDMA library systems and services has introduced laptops and tablets on loan services. This services is with the sole responsibility to provide users with laptops and tablets as loan to enable the access the digital contents of the library. These facilities are provided through collateral and the beneficiaries are expected to pay back before graduation. FUDMA Library has Information resources in the following formats

- Hard copy Resources
- Online Resources
- Offline Resources
- Databases
- Educational Videos
- Audio Resources
- Educational Link

Grant and Scholarship Support Serices

FUDMA library provides latest information on scholarships and grants. This information is very vital as far as academia is concerned. It is believed that most people do not know that large amount of grants that are widely available to sponsor their education. Both international & local, partially funded & fully funded scholarships are available

- The guide includes information about:
- When and where to apply for scholarships
- What documents to include
- How to phrase your Letter of Application so that it makes a positive impression
- How to present yourself at your best in your application
- How to find rare scholarships

FUDMA library scholarship information service is dedicated to help students get a better education without having them to spend a fortune for it.



A picture showing how Scholarships and Grants are won

Collaborative Study Space Services

FUDMA Library makes available learning Common room with a complete collaborative space. Students, Lecturers and researchers have the liberty to interact freely with their peers. They can also use equipment such as whiteboards, projectors, computers, printers etc for their researches and presentations.



Collaborative Learning taking place in Fudma Library

Bindery Support Services

- The FUDMA library is always available and accessible by its users. Bindery service is one of the services rendered by the library. It does the following activities:
- Resources that are worn out are repaired and bound.
- The section also provides support for materials that are not easily shelved without damage.
- Binding of journal issues or newspapers to make them easier for library users and library personnel to locate them.
- Library binding uses specific materials and methods to make sure the books last as long as possible and are easily used by library users.
- All types of binding are provided.



Bindery Service taking place in Fudma Library

Way forward

One of the core mandates of research clinic support service in FUDMA library is to facilitate access with resources to teaching, learning and research paradigm, with

all the challenges of shortage academic librarians, lack of digital information skill by other categories of library staff, financial challenge, lack of 5G internet services at permanent site, This paper recommended that the University management and other library stakeholders should take leading support to the FUDMA library complex to meet global challenges by increasing the budgetary provision of FUDMA library,

Conclusion

FUDMA research clinic is all about enabling library users to have full access to the services of the library without restriction. The Librarians in FUDMA library support library users to access information resources at ease. Activities such as searching for articles and other supporting materials for your research using library databases, understanding how and why information is organized into formats, such as scholarly journal articles, understanding why you want to cite your sources, as well as how to use a few tools to help out when building your references list or works cited page, workshops are offered at various times and locations throughout the semester are all provided to the library users for effective library service delivery.

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THE CURRENT STATUS AND FUTURE DIRECTIONS OF DIGITAL INCLUSION SERVICES FOR THE ELDERLY IN PUBLIC LIBRARY

Ji-Won Baek[1] & Hyo-Jung Oh[2]

Introduction

While digital transformation is making society more convenient and efficient, it is also creating digital divides and exacerbating new inequalities (Ank, J., et al., 2022). Digital inequality overlaps with existing age, race, and geographical disparities, taking on a complex form, and it poses a crisis in life rather than mere inconvenience. In particular, the elderly, considered an information-vulnerable group, are at risk of being marginalized or excluded in the digital society (Marta PérezEscolar & Fernando Canet, 2022). Due to aging, the elderly are more vulnerable to acquiring information technology skills than other generations, and they are likely to face difficulties in social interaction and relationship formation (Kim, 2017).

The public library is a main source of information in society, regardless of the medium, providing easy and equal access to information and reliable information for everyone (IFLA, 2014). The role of public libraries as a source of information is becoming more emphasized as digital divides increase. The public library is making efforts to provide digital inclusion activities, and it is the most representative organization that can promote digital inclusion (Noh, 2016). Furthermore, public libraries must provide specific services and materials for users who have difficulty using general services and materials due to a lack of digital or computer skills (IFLA, 2022), especially for the elderly who have difficulty acquiring digital skills. In other words, public libraries have a duty to provide digital inclusion services for the elderly, who are at risk of being excluded from the digital society.

However, traditional studies or resources related to digital inclusion services that public libraries have focused on for the elderly are insufficient. Accordingly, the aim of this study is to derive the services that public libraries should provide for the digital inclusion of the elderly, identify the current status of existing services, and propose future service directions.

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Literature Review

Digital inclusion is defined as equitable and safe access to use, lead, and design of digital technologies, services, and associated opportunities for everyone, everywhere. According to the ITU (2021), the United Nations agency for ICT, digital inclusion is a fundamental element for promoting equality and equity, and it is important to promote digital opportunities for those who are disadvantaged, marginalized, or at risk of exclusion. Pertinent previous studies related to solutions for digital inclusion are discussed here. First, the ALA (2015) suggested four services that public libraries should provide for digital inclusion: Free access to technology (hardware, software, high-speed Internet connectivity), diverse digital content, digital literacy services, and programs and services for civic engagement. Second, UNU-EGOV (2019) proposed a framework to measure the degree of digital inclusion. Based on nine international indicators, the framework suggests four elements: Access, Skills, Use, and Supportive environment. Third, Marta Pérez-Escolar and Fernando Canet (2022) integrated the solutions proposed for digital inclusion into eight categories based on 331 documents related to digital inclusion. These categories include Accessing technology, Internet spaces network, Bridging the digital divide, Information Technology in Education, Health information technology, Active aging, Libraries, Digital Literacy. There is currently no research or literature on the services that public libraries should provide to promote the digital inclusion of the elderly. Based on the above literature, this study derived the digital inclusion services of public libraries for the elderly.

Analyze The Current State of Digital Inclusion Services For The Elderly In Public Libraries

This research identified the services that public libraries should provide for the digital inclusion of the elderly from the aspects of ACCESS, SKILLS, and COMMUNITY, based on the literature review in Chapter 2. ACCESS services are that ensure access to digital devices and internet connectivity for the elderly, providing online information resources. SKILLS services aim to enhance the digital literacy skills of the elderly, and COMMUNITY services are to relieve the sense of isolation and disconnection that the elderly may feel in a digital society.

This study selected the State Library Victoria of Australia, which is an advanced digital inclusion country, the National Library of South Korea, which has a rapidly aging population, and the National Library Board of Singapore, which provides most of its government services digitally, and analyzed them from the three perspectives descrived above (see Table 1).

Table 1. Current Status of Digital Inclusion Services for the Elderly in Public Libraries

	 The State Library Victoria	 The National Library	 The National Library Board
ACCESS	PCs and Wi-Fi within the library e-book, audiobook digital collections	PCs and Wi-Fi within the library e-book, audiobook digital collections	PCs and Wi-Fi within the library e-book, audiobook digital collections
SKILLS	how to use databases and digital collections	Digital Content Creation program	how to use digital devices information literacy education
COMMUNITY	library-health partnership strategic framework	integrated search support through linkage	learning communities education through government cooperation
FEATURES	workstations equipped with assistive devices access-inclusive librarians	experience new technologies an elderly-friendly library website youth volunteer group operation	'Time of Your Life' magazine for the elderly

Access

All three libraries provide PCs and Wi-Fi connectivity within their library, and offer electronic resources such as e-books and audiobooks, as well as online digital collections. This ensures that the elderly have access to digital technology and internet connectivity. The State Library Victoria of Australia has workstations equipped with assistive devices such as alternative keyboards, joystick mouse (see Fig.1). The National Library of South Korea has created an exhibition hall using digital technologies including. Additionally, the website of the National Library is designed to be elderly friendly. The National Library Board of Singapore publishes a magazine for the elderly, which is available online, and organizes the content into topics that are helpful to the elderly. However, all three libraries do not provide services such as lending digital devices, Wi-Fi pocket devices for use outside the library. The digital collection of the National Library Board of Singapore does not include zoom functionality in the document viewer, which may cause inconvenience for the elderly.



Fig. 1 Assistive Technology at the State Library Victoria of Australia
(source: https://www.slv.vic.gov.au/visit/access-inclusion)

Skills

There were digital literacy education programs to enhance the digital skills of the elderly in all three libraries, but there were differences in the content. The State Library Victoria of Australia provides webinars to enable people of all ages to actively use electronic resources. The National Library of South Korea provides education for users aged 55 and over on essay writing methods using AI and video editing techniques. In particular, the National Library manages a youth digital volunteer corps, and they assist in the classes (see Fig. 2). The National Library Board of Singapore provides education on how to use the library's mobile app and Wi-Fi connection methods, enabling the elderly to effectively utilize library resources, and it supports creative activities using digital technology.



Fig. 2. Digital Youth Volunteer Corps Recruitment Poster at the National Library of South Korea
(source: https://www.nl.go.kr/NL/contents/N50601000000.do?schM=view&id=47638&schBcid=normal0202)

Community

The three libraries offer different COMMUNITY services to help the elderly feel less isolated and disconnected from the digital world. The State Library Victoria of Australia recommends information and organizations that can help the elderly through access inclusion librarians and provides a strategic framework for public libraries to collaborate with hospitals and welfare centers. The National Library of South Korea supports integrated searching of electronic library through national institutions linkages. The National Library Board of Singapore provides learning communities to support the autonomous formation of communities (see Fig. 3) and offers information literacy program through cooperation with the government. However, there are no employment support linkage services, and there is a need for more active elderly community formation and linkages with the government and related organizations.

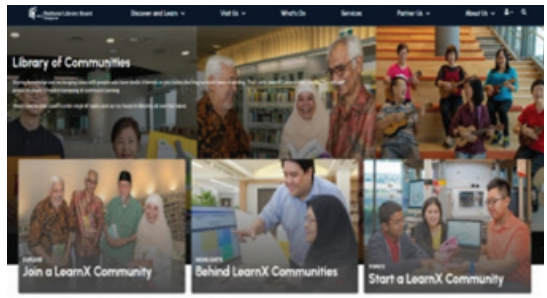


Fig. 3. Learning Community Website at the National Library Board of Singapore
(source: https://www.nlb.gov.sg/main/site/learnx/explore-communities)

Suggest Directions For The Development of Digital Inclusion Services For The Elderly In Public Libraries

In this section, this paper presents the direction of digital inclusion services for the elderly as shown in Fig. 4, based on the implications derived from the analysis of the current status of the elderly services.



Fig. 4. Developing Public Libraries Digital Inclusion Services for the Elderly

Access

First, public libraries should ensure that the elderly can access the internet anytime, anywhere. Public libraries should provide portable devices such as laptops, tablet PCs, e-book readers, etc., so that the elderly can use digital devices without restrictions of time and place. Additionally, the public library should also consider lending Wi-Fi pockets to the elderly so they can access the internet at home or at work.

Second, public libraries need to design digital information structures considering the elderly. As public libraries provide important information through their websites, it is essential to design these websites in a way that minimizes any inconvenience for the elderly. Moreover, dedicated viewers for electronic resources and digital collections should include features, such as text size and contrast adjustment, etc., that can assist the elderly.

Skills

First, public libraries should develop and provide digital literacy education programs that consider the information needs of the elderly. The information needs of the elderly are health and medical, financial, government policies, transportation information (Edewor, N., Ijiekhuamhen, O. P., & Emeka-ukwu, U. P., 2016; Silva, T., Caravau, H., & Campelo, D., 2017).

Second, public libraries should design and operate digital literacy education programs considering the learning environment and learning abilities of the elderly. The time and duration of digital literacy education should be set according to the learning ability of the elderly to ensure that the content of digital literacy education is sufficiently acquired.

Community

First, public libraries should make efforts to alleviate the sense of exclusion and isolation that the elderly may experience in the digital society. Public libraries need to create community spaces to enhance the social vitality of the elderly.

Second, public libraries should collaborate with the government and local community to provide digital inclusion services. Public libraries should provide integrated information on digital inclusion services provided to help the elderly benefit from a variety of services. Additionally, the public library should be able to provide connections to employment support services to ensure the participation of the elderly in the digital society and enhance their self-efficacy.

Conclusion

In the digital environment, the role of public libraries is crucial for the digital inclusion of the elderly. This study, through a review of the literature, identified the services that public libraries should provide for digital inclusion of the elderly, focusing on aspects of ACCESS, SKILLS, and COMMUNITY. Next, the current state of public

library services was analyzed in Australia, South Korea, and Singapore, which are countries with a background in digital inclusion of the elderly. The State Library Victoria of Australia is characterized by its ACCESS service, which provides PCs with assistive devices, and its SKILLS service, which offers digital literacy classes for all users, but not specifically for the elderly. The National Library of South Korea provides digital literacy classes for the elderly with the digital youth volunteer corps as SKILLS services, but its COMMUNITY services were less active. The National Library Board in Singapore, as part of its ACCESS services, makes magazines for the elderly available online, but the digital content viewer needs to be improved. For its COMMUNITY services, it offers digital literacy classes in partnership with the government.

Based on the surveyed results, this study suggested directions for the development of digital inclusion services for the elderly in public libraries. To improve ACCESS services, digital devices, Wi-Fi pocket lending services need to be provided, and the design of the library homepage and content viewer should consider the elderly. For SKILLS services advancement, digital literacy programs that are suitable for the information needs, learning environment, and learning ability of the elderly should be continuously provided. COMMUNITY services need to be more active, and public libraries should actively cooperate with various related organizations to ensure the social participation of the elderly. The elderly digital inclusion services of public libraries should be expanded and continuously provided more than they are now, and above all, the information needs, cognition, perception, and motor functions of the elderly should be considered.

The result of this study is meaningful in that it proposed services that libraries should provide in response to the digital exclusion of the elderly and identified the current status of elderly digital inclusion services in public libraries through case surveys, suggesting directions for future development. However, this study was limited in the number of libraries surveyed, so it is necessary to expand the research targets in the future to ensure the representativeness of the sample.

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A SURVEY ON USER USAGE AND SATISFACTION LEVELS WITH REGARD TO DIGITAL RESOURCES AND SERVICES IN VETERINARY SCIENCE COLLEGE LIBRARIES OF ANDHRA PRADESH

Srinija Bathinapatla[1] & Dr. M.Doraswamy[2]

Introduction

Recently, learners have had a lot of options thanks to the digital world of information, including fast access, flexibility, different apps, etc. There has been a constant rise in the amount, velocity, and diversity of information that different kinds of students and information searchers are looking for. Libraries have undergone a remarkable digital transition that has improved user access and experiences. Despite fewer in-person visits, it has made library experiences simpler, easier, and more gratifying for patrons. A learner's typical reason for visiting a library has shifted from looking for print versions to more widely available digital materials that can be accessed online instantly through networks or authentication techniques without ever leaving the comforts of their home or place of business. Due to the large and varied user population in India, library professionals face significant challenges in terms of usage familiarity and optimisation while utilising digital resources. Another difficulty is making better use of these resources in a time-bound, quicker manner. Digital resources provide instantaneous and efficient retrieval, demonstrating its tremendous value and significance to a huge number of users throughout university libraries nationwide in terms of research proliferation and information diffusion. Academic libraries may profit greatly from digital resources like e-books, e-journals, CD-ROM databases, online databases, Online Public Access Catalogue, Internet resources, etc. Multiple in terms of time and space neutral access, rich material, reusability, and access speed.

Since digital resources are the primary means of global idea transmission, they are an essential part of library collections. Recent years have seen a massive increase in electronic publication due to major ICT developments. As a result, massive information stacks and data heaps are being generated quickly with digital resources. Because of their many practical uses and cost-effective methods, libraries are transitioning to digital resources as a result of technology improvements. In the digital age, print media is

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being replaced by the Internet, CD-ROMs, online databases, library OPACs, and other publicly accessible digital resources. There are a lot of plausible reasons why academic communication has been using digital tools more and more in recent years. The creation and sharing of recently emerging data and information through scholarly education and research is one of the main purposes of academic libraries. Open communication has made it possible for artificial intelligence and machine learning technologies to provide a wealth of chances for data and information to be transmitted in real time, even to the last mile user, and to build an inclusive global learning order.

Review of Literature

Adenariwo (2022) carried out an investigation into the awareness and usage levels of electronic resources among undergraduates of Fountain University, Osun State, Nigeria. The study revealed that undergraduates of Fountain University are quite aware and made high use of electronic information resources. The study also reported that undergraduates in Fountain University are skilled in the use of electronic information resources. Cabflan (2022) examine the veterinary medicine student's use of library resources and access to scientific papers. The study aims to determine the satisfaction level of DVM students of Benguet State University with the resources of the Veterinary Medicine Library and their usage of these resources. The study confirms that the resources of the Veterinary Medicine library fulfill the academic needs of DVM students of Benguet State University. Kulveen & Kiran (2022) did a measurement of students-faculty satisfaction of Punjab Agricultural University library facilities. A survey of 202 Punjab Agricultural University Library users was investigated to determine users' satisfaction with the library webpage, library resources, infrastructure facilities, and library services. The study found differences in the satisfaction level and awareness of library services and facilities among the undergraduate, graduate, research scholars and faculty users.

A compulsory credit-based course exists for postgraduate students only, leaving the other users uninformed about the services and facilities offered by the library. It was discovered that a robust ICT infrastructure is required since most of the users assessed the ICT infrastructure as 'average'. Karthikeyan & Vijayakumar (2019) did a study on information access pattern of faculty members of Veterinary College and Research Institute in Chennai and Orathanad of Tamil Nadu. This study analyses the accessibility of library collections, information and communication technology infrastructure facilities, the user satisfaction on electronic resources and database management, and the services provided to the user through the Internet. The study found that around 50% of them user satisfaction of the library services is excellent. Kopperundevi & Malmarugan (2018) evaluated a study on user satisfaction with resources and service of library at Veterinary College and Research Institute, Turnelveli. The study revealed that 60% of the users were highly satisfied with collection of newspapers and 80% were satisfied with the collection of periodicals. Majority of the users were satisfied with library facilities. Regarding the services provided by the library 62.80% were satisfied with the library

working procedure. 70% were satisfied with the internet facility and periodical facility and 40% were highly satisfied with the circulation desk and 21% were dissatisfied with the availability of computers.

Scope and limitation

The scope of the study is limited to exploring the usage and satisfaction levels of digital resources and services available to fulfill the academic needs of users. It specifically focuses on the digital resources and services available in the veterinary science college libraries.

Objectives

The objectives of the present study are:

1. To find out the frequency use of digital library;
2. To evaluate the usage and satisfaction levels of Veterinary Science faculty members with regard to digital resources and services;
3. To determine the ranking of digital resources and services as per veterinary science faculty members usage and satisfaction levels; and
4. To find out the gap between the veterinary science faculty members usage and satisfaction levels of digital resources and services.

Methodology

Keeping in view the above objectives, a questionnaire is prepared to collect data from faculty members of the following veterinary science colleges affiliated to Sri Venkateswara Veterinary University, Tirupati, Andhra Pradesh, India:

- College of Veterinary Sciences, Tirupati
- NTR College of Veterinary Sciences, Gannavaram
- College of Veterinary Sciences, Proddatur
- College of Veterinary Sciences, Garividi

The researchers have undertaken a survey in the month of July 2023, spreading over 20 days, engaging 150 faculty members working in these colleges as respondents. A questionnaire was distributed among all faculty members to elicit their measured views/opinions. However, 110 faculty members only responded by returning completed questionnaires. Then, the data was analyzed and interpreted for the outcome and presented in the following paragraphs.

Data Analysis and Interpretation

Frequency of using the digital library

The distribution of faculty members, according to the frequency of using the digital library is shown in Table 1.

Table 1: Distribution of faculty members according to the frequency of using the digital library

Frequency	No of responses	Percentage
Daily	39	35.45
2 or 3 times a week	33	30.00
Once a week	21	19.09
Once in a month	11	10.00
Rarely	06	5.46
Total	110	100.00

Table 1 shows that 35.45 percent faculty members are using the digital library daily; 30 percent two or three times a weekly; 19.09 percent once in a week; 10 percent once in a month; and the remaining 5.46 percent of the faculty members are rarely using the digital library.

Usage Levels of Digital Resources and Services

The distribution of faculty members according to the level of using the digital resources and services is shown in Table 2.

Table 2: Distribution of faculty members according to the level of using the digital resources and services

Digital Resources and Services	Level of Usage (%)					Total
	Highly	Frequently	Occasionally	Rarely	Never	
SVVU E-Resources	23 (20.91)	36 (32.73)	28 (25.45)	13 (11.82)	10 (9.09)	110 (100)
CeRA	29 (26.36)	38 (34.54)	25 (22.73)	12 (10.91)	6 (5.46)	110 (100)
Wiley online	16 (14.55)	31 (28.18)	21 (19.09)	27 (24.55)	15 (13.63)	110 (100)
Science Direct	23 (20.91)	29 (26.36)	34 (30.91)	14 (12.73)	10 (9.09)	110 (100)
CAB-E-books	21 (19.09)	34 (30.91)	39 (35.45)	10 (9.09)	6 (5.46)	110 (100)
KrishiKosh Portal	29 (26.36)	39 (35.46)	23 (20.91)	9 (8.18)	10 (9.09)	110 (100)
ICAR E-Journals	27 (24.55)	37 (33.64)	27 (24.55)	12 (10.90)	7 (6.36)	110 (100)
OPAC	33 (30.00)	36 (32.73)	31 (28.18)	10 (9.09)	--	110 (100)
College Website	19 (17.27)	29 (26.36)	23 (20.91)	25 (22.73)	14 (12.73)	110 (100)

It is evident from Table 2 that 32.73 percent of the faculty members are using the Sri Venkateswara Veterinary University (SVVU) E-resources frequently; 25.45 percent of them are using occasionally; 20.91 percent of them are using highly; 11.82 percent of them are using rarely; whereas, 9.09 percent of them are never used. With regard to the 'CeRA consortium', a majority of the faculty members (34.54%) frequently used; while 26.36 percent of them highly used; 22.73 percent of them occasionally used; 10.91 percent of them rarely used; and 5.46 percent of them never used. With regard to 'Wily Online Library Collection', 28.18 percent faculty members are using frequently; 24.55 percent of them rarely used; 19.09 percent of them occasionally used; 14.55 percent of them highly used; and 13.63 percent of them never used.

It is also evident from table 2 that a majority of the faculty members (30.91%) are using 'Science Direct' occasionally used; 26.35 percent of them frequently used; 20.91 percent of them highly used;12.73 percent of them rarely used; and 9.09 percent of them never used. With regard to the 'CAB E-books', a majority of the faculty members (35.45%) are using occasionally; 30.91 percent of them frequently used; 19.09 percent of them highly used; 9.09 percent of them rarely used; and 5.46 percent of them never used. With regard to the 'KrishKosh Portal', 35.46 percent of the faculty members are using frequently; 26.26 percent of them highly used; 20.91 percent of them occasionally used; 9.09 percent of them never used; and 8.18 percent of them rarely used.

With regard to the 'ICAR consortium', a majority of the faculty members (33.64%) are using frequently; 24.55 percent of them occasionally used; 24.55 percent of them highly used; 10.90 percent of them rarely used; and 6.36 percent of them never used. With regard to 'Online Public Access Catalogue (OPAC)', 32.73 percent of the faculty members are using frequently; 30 percent of them highly used; 28.18 percent of them occasionally used; and 9.09 percent of them rarely used. About 26.36 percent of the faculty members are using the college website information frequently; 22.73 percent of them rarely used; 20.91 percent of them occasionally used; 17.27 percent of them highly used; and 12.73 percent of them never use.

Relative usage levels of digital resources and services

In order to know the relative usage of different digital resources and services by the faculty members of veterinary science colleges affiliated to Sri Venkateswara Veterinary University, the weightages of 5,4,3,2, and 1 are assigned to responses of highly used, frequently used, occasionally used, rarely used, and never used, respectively. Then, the Total weightage is calculated for each digital resource. The Mean Weightage is calculated by dividing the total weightage by the number of faculty members included in the sample. Based on the Mean weightage, the digital resources and services have been ranked.

The distribution of users according to their relative usage of different digital resources, total weightage, mean weightage and ranks are shown in Table 3.

Table 3: Relative Usage of the Digital Resources and Services

Digital Resources	Total weightages	Mean weightages	Rank
OPAC	422	3.84	1
CeRA	402	3.65	2
KrishiKosh Portal	398	3.62	3
ICAR-E Journals	395	3.59	4
CAB-E-books	384	3.49	5
SVVU E-Resources	379	3.45	6
Science Direct	371	3.37	7
College Website	344	3.13	8
Wiley Online Library	336	3.05	9

Table 3 shows that the faculty members of Veterinary Science Colleges are shown mainly using the online public access catalogue (OPAC) when compared to other digital resources, which is assigned the first rank. It is followed by 'Consortium for e-Resources in Agriculture' (CeRA), 'Krishikosh portal', 'ICAR E-Journals', 'CAB E-Books', 'SVVU electronic resources', 'ScienceDirect.com', 'College website information' and 'Wiley online library', ranked second, third, fourth, fifth, sixth, seventh, eighth, and ninth, respectively for their usage levels.

Satisfaction Levels with the Digital resources and Services

The distribution of faculty members in terms of satisfaction levels with the various digital resources and services is shown in Table 4.

Table 4: Distribution of faculty members according to the level of satisfaction with the digital resources and services

Digital Resources and Services	Level of Satisfaction (%)					Total
	Highly Satisfied	Satisfied	Neither Satisfied nor Dissatisfied	Dissatisfied	Highly Dissatisfied	
SVVU E-Resources	18 (16.36)	31 (28.18)	24 (21.82)	24 (21.82)	13 (11.82)	111 (100)
CeRA	21 (19.09)	33 (30.00)	22 (20.00)	18 (16.36)	16 (14.55)	110 (100)
Wiley online	15 (13.64)	28 (25.45)	28 (25.45)	25 (22.73)	14 (12.73)	110 (100)
Science Direct	21 (19.09)	25 (22.73)	38 (34.54)	16 (14.55)	10 (9.09)	110 (100)
CAB-E-books	23 (20.91)	37 (33.64)	33 (30.00)	10 (9.09)	7 (6.36)	110 (100)
KrishiKosh Portal	21 (19.09)	41 (37.27)	28 (25.45)	15 (13.64)	5 (4.55)	110 (100)
ICAR E-Journals	23 (20.91)	31 (28.18)	28 (25.46)	18 (16.36)	10 (9.09)	110 (100)

OPAC	29 (26.36)	31 (28.18)	23 (20.91)	19 (17.27)	8 (7.28)	110 (100)
College Website	16 (14.55)	21 (19.09)	19 (17.27)	31 (28.18)	23 (20.91)	110 (100)

Table 4 shows that a majority of the faculty members (28.18%) are satisfied with the SVVU E-Resources, 21.82 percent of them are neither satisfied nor dissatisfied, 21.82 percent are dissatisfied, 16.36 percent are highly satisfied, where as the remaining 11.82 percent are highly dissatisfied. With regard to the 'CeRA consortium', a majority of the faculty members (30%) are satisfied; while 20 percent of them are neither satisfied nor dissatisfied, 19.09 percent of them are fully satisfied, 16.36 percent are dissatisfied and 14.55 percent are highly dissatisfied. With regard to the 'Wiley online', a majority of the faculty members (25.45%) are satisfied; while 25.34 percent of them are neither satisfied nor dissatisfied, 22.73 percent of them are dissatisfied, 13.64 percent are fully satisfied and 12.73 percent are highly dissatisfied.

It is also evident from table 4 that a majority of the faculty members (34.54%) are neither satisfied nor dissatisfied with the science direct resources, 22.73 percent of them are satisfied, 19.09 percent are fully satisfied, 14.55 percent are dissatisfied, where as the remaining 9.09 percent are highly dissatisfied. With regard to the 'CAB- electronic books', a majority of the faculty members (33.64%) are satisfied; while 30 percent of them are neither satisfied nor dissatisfied, 20.91 percent of them are fully satisfied, 9.09 percent are dissatisfied and 6.36 percent are highly dissatisfied. With regard to the 'KrishiKosh Portal', a majority of the faculty members (37.27%) are satisfied; while 25.45 percent of them are neither satisfied nor dissatisfied, 19.09 percent of them are fully satisfied, 13.64 percent are dissatisfied and 4.55 percent are highly dissatisfied.

With regard to the 'ICAR electronic journals', a majority of the faculty members (28.18%) are satisfied; while 25.46 percent of them are neither satisfied nor dissatisfied, 20.91 percent of them are fully satisfied, 16.36 percent are dissatisfied and 9.09 percent are highly dissatisfied. With regard to the 'OPAC', a majority of the faculty members (28.18%) are satisfied; while 26.36 percent of them are fully satisfied, 20.91 percent of them are neither satisfied nor dissatisfied, 17.27 percent are dissatisfied and 7.28 percent are highly dissatisfied. With regard to the 'College Website', a majority of the faculty members (28.18%) are dissatisfied; while 20.91 percent of them are highly dissatisfied, 19.09 percent of them are satisfied, 17.27 percent are neither satisfied nor dissatisfied and 14.55 percent are highly satisfied

Relative satisfaction levels of digital resources and services

In order to know the relative satisfaction levels of different digital resources and services by the faculty members of veterinary science colleges affiliated to Sri Venkateswara Veterinary University, the weightages of 5,4,3,2, and 1 are assigned to responses of highly satisfied, satisfied, neither satisfied nor dissatisfied, dissatisfied, and highly dissatisfied, respectively. Then, the Total weightage is calculated for each digital resource. The Mean Weightage is calculated by dividing the total weightage by

the number of faculty members included in the sample. Based on the Mean weightage, the digital resources and services have been ranked.

The distribution of users according to their relative satisfaction levels of different digital resources, total weightage, mean weightage and ranks are shown in Table 5.

Table 5: Relative Satisfaction levels of the Digital Resources and Services

Digital Resources	Total weightages	Mean weightages	Rank
CAB-E-books	389	3.54	1
KrishiKosh Portal	388	3.53	2
OPAC	384	3.49	3
ICAR-E Journals	369	3.35	4
Science Direct	361	3.28	5
CeRA	355	3.23	6
SVVU E-Resources	347	3.15	7
Wiley Online Library	335	3.05	8
College Website	306	2.78	9

It is evident from Table 5 that veterinary science faculty members are more satisfied with CAB Electronic books as compared to other digital resources and services. It is followed by KrishiKosh Portal, Online Public Access Catalogue (OPAC), ICAR-E Journals, Science Direct, which have got second, third, fourth and fifth ranks respectively for their satisfaction levels. College Website are the least ranked among digital resources and services for reaching lowest satisfaction levels. CeRA, SVVU E-Resources, Wiley Online Library have got the sixth, seventh and eighth ranks respectively for their satisfaction levels as ranked by users.

6.6 Gap analysis of the usage level and satisfaction level of Digital Resources

The gap analysis identifies the performance of the libraries as perceived by faculty members. Gap analysis identifies the gaps between the usage levels and the satisfactory levels of the digital resources and services. The mean values are derived by subtracting the 'usage mean score' from the 'satisfaction mean core'. This comparison reveals the gap analysis.

Table 6 shows the performance gap between the usage levels and satisfaction levels in digital resources and services as indicated by the veterinary science faculty members is displayed in Table 6.

Table 6: Performance Gap between the usage and satisfaction levels of digital resources and services

S.No	Digital Resources and services	Usage Mean Score (Rank)	Satisfaction Mean Score (Rank)	Performance Gap
1	OPAC	3.84 (1)	3.49 (3)	-0.35
2	CeRA	3.65 (2)	3.23 (6)	-0.42
3	KrishiKosh Portal	3.62 (3)	5.53 (2)	1.91
4	ICAR-E Journals	3.59 (4)	3.35 (4)	-0.24
5	CAB-E-books	3.49 (5)	3.54 (1)	0.05
6	SVVU E-Resources	3.45 (6)	3.15 (7)	-0.30
7	Science Direct	3.37 (7)	3.28 (5)	-0.09
8	College Website	3.13 (8)	2.78 (9)	-0.35
9	Wiley Online Library	3.05 (9)	3.05 (8)	0

Table 6 indicates the overall comparisons made at the outset, between the usage and satisfaction levels with regard to various digital resources and services. It shows an absolute negative performance gap as indicated in various digital resources such as OPAC (-0.35), CeRA (-0.42), ICAR E-journals (-0.24), SVVU E-resources (-0.30), science direct (-0.09), college website (-0.35). However, a positive performance gap of 1.91 and 0.05 is noticeable in case of the KrishKosh Portal as well as CAB E-books. Finally, it is interesting to note that there is no performance gap with regard to wiley online library.

Conclusions

1. Most of the faculty members (35.45%) are using the digital library daily; 30 percent two or three times a weekly; 19.09 percent once in a week; 10 percent once in a month; and the remaining 5.46 percent of the faculty members are rarely using the digital library.
2. Most of the faculty members (31.21%) are using the digital resources and services frequently, 25.35 percent of them are using occasionally, 22.22 percent of them are using highly, 13.33 percent of them are suing rarely, and the remaining 7.88 percent are never used various digital resources and services.
3. A majority of the faculty members (28.08%) are satisfied with the digital resources and services, 24.54 percent of them are neither satisfied nor dissatisfied, 18.89 percent are highly satisfied, 17.78 percent are dissatisfied, and the remaining 10.71 percent are highly dissatisfied.
4. A majority of the faculty members of Veterinary Science Colleges are shown mainly using the online public access catalogue (OPAC), Consortium for e-Resources in Agriculture' (CeRA), and 'Krishikosh portal' when compared to other digital resources, which is assigned the first, second and third ranks respectively.
5. Most of the veterinary science faculty members are more satisfied with CAB Electronic books, KrishiKosh Portal, Online Public Access Catalogue (OPAC), as compared to other digital resources and services.

6. An Overall comparison made at the outset, between the usage and satisfaction levels with regard to Online Public Access Catalogue, CeRA, ICAR Electronic journals, SVVU Electronic resources, Science Direct, College website is an negative performance gap.
7. A positive performance gap is noticeable in case of the KrishKosh Portal as well as CAB E-books. Finally, it is interesting to note that there is no performance gap with regard to wiley online library.

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LIBRARIES AS CATALYSTS FOR SUSTAINABLE DEVELOPMENT: ADVANCING THE SDGS THROUGH ACCESS, EDUCATION, AND COMMUNITY ENGAGEMENT

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Introduction

In 2015, The General Assembly of United Nations has set seventeen global goals to address the various social, economic and environmental challenges and sustainable development by 2030. These goals are considered as Sustainable Development Goals (SDG), these goals serve as a roadmap for nations and organization to work towards a sustainable and equitable future. The seventeen SDGs are: No Poverty; Zero Hunger; Good Health and Well-being; Quality Education; Gender Equality; Clean Water and Sanitation; Affordable and Clean Energy; Decent Work and Economic Growth; Industry, Innovation, and Infrastructure; Reduced Inequalities; Sustainable Cities and Communities; Responsible Consumption and Production; Climate Action; Life Below Water; Life on Land; Peace, Justice, and Strong Institutions; Partnerships for the Goals. The core mission of libraries is to act as an access point to information, promote literacy and lifelong learning, support education, foster community engagement and preserving the cultural heritage. Libraries serve as inclusive spaces where individuals from all walks of life can access resources, explore diverse perspectives, and participate in intellectual and cultural enrichment. They play a vital role in promoting equity, social cohesion, and democratic values by providing free and open access to knowledge and information for everyone. The core mission of the libraries aligns with the some of the goals of SDGs and since the libraries have unique position as community hubs for providing access to information, promote education and foster social inclusion, the libraries can act as a catalyst for achieving the SDGs.

SDGs in Libraries: Review of Literature

Khalid Lahyani a, Ghizlane Diab b, Ghizlane Moukhliss(2024) analysed the activities, sources and services offered at Mohamed Sekkat University library aligned with the SDGs and the opined as the library innovative services are assisting students, teachers, administrative staff and the general public and through other activities, the Mohamed Sekkat University Library contributing in achieving the SDGs. Aurora Cuevas-Cerveró, María-Jesús Colmenero-Ruiz, Daniel Martínez-Ávila (2023) discussed the

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concept of informational activism as one of the main lines action for library and information science and presented the critical dimension of information literacy and emphasized on the role of informational activism in promoting changes in the society aligned with SDGs especially the human rights and social justice. The study reviewed the works on Critical Information Literacy especially in Brazil and its Freirean influence with the aim of structuring the concept and its characteristics in the global landscape dominated by misinformation and absence of informational and digital competences. Sarah K. Tribelhorn (2023) assessed the sustainability awareness and sustainability efforts and its measuring methods in the US academic libraries. The results indicated that few libraries embraced sustainability holistically with limited assessment, little direction from leadership, thus study emphasized on necessity of library leadership in recommitting their values, promoting the culture of sustainability through continual assessment to benefit their communities in the future. Saowapha Limwichitr (2024) examined the Garvin's three 'M's framework 'meaning, management and measurement' to identify the principles of Library 4.0, policies and practices including measurement alterations. The study observed that the libraries had taken on more responsibilities to address wider societal effects while keeping support for teaching and research as their top priorities. The need of proficiently employing measurement techniques, specifically data analytics, was emphasized to elucidate the worth and influence of libraries in the digital age. The study's comprehensive framework adds to our understanding of Thai academic libraries' adaptability in a complete way. This paradigm ensures academic libraries stay relevant in the run-up to Library 5.0 by offering guidance for future research, given the critical role that environmental dynamics play.

Islam, M.A., Sultana, R. and Widén, G. (2024) conducted a survey among the librarians working in public libraries of Bangladesh to investigate their perception on SDGs and find out the challenges faced by them achieving the SDGs. It's found that, the librarians are aware of UN SDGs and out of 17 SDGs, the public libraries are working well on 7 goals. Lack in SDG related activities, awareness, funds, implementation plan and preparedness among policy makers found as challenges as a result of the study. Fedorowicz-Kruszewska, M. (2023) attempted to identify the reason for still-low interest in the development of green libraries both its theoretical and practical dimensions. The study found that, the ambiguous definition of green libraries, lack of guidelines for green libraries and evaluation criteria and lack of tools for monitoring the progress towards SDGs in an environmental aspect found as barriers to the development of green libraries.

It's observed that, the concept of SDGs in libraries still in preliminary stage. No comprehensive studies were conducted in this regard. It's ascertained the existing literature that, guidelines on SDG activities and for its institutionalization and evaluation criteria are much more needed for libraries to thick towards taking initiatives in achieving the SDGs. In this connection, the study has made an attempt to provide a library strategies for advancing the SDGs, its conceptualization and model for implement the SDGs in the library setting.

The SDGs aligns with Core Mission of Libraries

Libraries are considered as pillars of knowledge, serving communities with its mission, rooted in education, accessibility and cultural preservation. As its core mission, the libraries are supporting learning, providing equitable access to information, fostering literacy and nurturing communities by acquiring wide range of information sources in different forms, it processing, storing, preserving and its dissemination and acting as bridge to address the gap between tradition and innovation. The core mission of libraries transcends the mere dissemination of information; it embodies a commitment to lifelong learning, community empowerment and cultural enrichment. The core mission aligns with SDGs are as follows:

- **SDG 4**: Quality Education: Libraries are providing access to wide range of information resources available in different forms and formats. Library are promoting literacy and lifelong learning opportunities for all through adult literacy programs, cultural enrich programs such as author talks, special lectures, exhibitions etc.
- **SDG 9**: Industry, Innovation and Infrastructure: many libraries are providing access to computers and internet facility and also conducting digital literacy programs to address the digital divide.
- **SDG 5 and 10**: Gender Equality and Reduced Inequalities: Libraries encourages inclusivity by proving access to information and resources for all members of the society irrespective of their gender, designation, level of education, socioeconomic condition and so on.
- **SDG 11 and 16**: Sustainable Cities and Communities and Promotion of Peaceful and inclusive Societies: Libraries are beacons for preserving the cultural heritage through its collections, archives and transferring it to the future to promote the cultural diversity and by safeguarding the cultural resources and encouraging the intercultural dialogue.
- **SDG 13**: Climate Action: Many libraries adopted eco-friendly practices such as green library initiatives, energy-efficient buildings, recycling programs and creating awareness among its users through awareness programs, signboards and hoardings.

Strategies for Libraries in Advancing SDGs

The IFLA- UNESCO Public Library Manifesto 2022 emphasized on the importance of public libraries in advancing literacy, lifelong learning and social inclusion and it serves as a guiding source for policymakers, Library and Information Science professionals, and other stakeholders in developing and strengthening the library services to contribute in advancing the SDGs.

Since the libraries are service oriented organizations, user/user community centric approach is inevitable; especially the public libraries have a unique position as community hubs, the following strategies or initiatives will help libraries to support advancing the SDGS within its scope. These strategies are outlined based on the possibilities in the libraries.

Table 1: Library Strategies for Advancing the SDGS

SDGs	Library Strategies
SDG 1: No Poverty	• Providing information about social services, job opportunities, government benefits and other assistance programs • Conducting financial literacy programs • Organizing training programs for individuals to learn skills needed for earning (tailoring, cookery class, embroidery, other earning opportunities etc.)
SDG 2: Zero Hunger	• Conducting workshops on nutrition, food preserving techniques • Conducting training/workshop on sustainable agriculture and food preserving techniques and community gardening practices. • LIS professionals need to join their hands with agricultural extension officers to understand the farmers' issues in accessing and using agricultural information and develop information products and services in the regional language to assist villagers.
SDG 3: Good Health and Well-being	• Conducting health literacy programs. • Providing awareness with reliable health information • Conducting health support and wellness programs • Conducting Health awareness campaigns and free health screening in collaboration with health organizations.
SDG 4: Quality Education	• Organizing Special Lecture programs • Interaction with Experts • Discussion Forums
SDG 5: Gender Equality	• Observing International Women's day • Sensitizing about gender equality, women empowerment through sign boards, special lectures and discussion • Conducting leadership training, literacy classes, career development workshops
SDG 6 Clean Water and Sanitation	• Awareness program on importance of clean water and sanitation practices • Exhibitions on water conservation, rain water harvesting techniques and regaining the life of dried bore wells, etc.
SDG 7 Affordable and Clean Energy	• Providing information sources on renewal energy • Displaying the experts' demonstrations videos on energy conservation techniques and practices • Hosting a workshop on clean energy solutions like solar power, wind power, energy storage, etc.
SDG 8 Decent Work and Economic Growth	• Job training programs, resume workshops and career counselling services • Providing sources and programs to support entrepreneurship and small business developments
SDG 9 Industry, Innovation and Infrastructure	• Providing access to computers and internet and digital technology • Establishment of Maker spaces to encourage creativity through technology like 3D printers and coding tools.
SDG 10 Reduced Inequalities	• Offering programs and resources to address social inequalities and promote social inclusion

SDG 11 Sustainable Cities and Communities	• Act as community hubs and provide space for community engagement • Preserving local history and cultural heritage, fostering a sense of identity and continuity
SDG 12 Responsible Consumption and Production	• Hosting recycling programs and promoting reuse of materials like book swap • Educating public through displaying videos on sustainable consumption practices and production methods.
SDG 13 Climate Action	• Green library initiatives • Programs on educating and raising awareness about climate change and to promote actions to soften its effects.
SDG 14 Life Below Water	• Providing educational materials and dedicated programs on marine conservation and aquatic ecosystems
SDG 15 Life on Land	• Initiating/joining hands with community project like tree planting and other environmental programs
SDG 16 Peace, Justice and Strong Institutions	• Creating awareness on legal rights and services • Hosting issue based discussion with experts for solution • Celebrating special events, and local festivals to promote understanding in the community and spread the cultural diversity
SDG 17 Partnership for the Goals	• Resources sharing is not a new idea in library practices, an innovative approach is needed in making collective efforts in achieving SDGs • Libraries collaboration with local, national and international organisations in supporting and promoting the SDGs is needed.

Model Approach to institutionalization of Library Strategies

The study presents the model or an approach for the institutionalization of the above library strategies. Since managing library with its routine work is core job for libraries, the library may not have much more time to focus on the advancing the SDGs, therefore, the libraries can focus on advancing in the SDGs only through its extension and outreach activities. Libraries need to adopt pedagogical approach in designing its extension and outreach programs.

The study has made an attempt to conceptualise the library extension and outreach programs in the form of **Access, Education and Community Engagement (AECE).**

Access: creating and raising awareness on SDGs and educating the public to make them as informed citizen to enhance their critical thinking and decision making and for their effective participation in democracy access to information is essential. Therefore, the libraries need to provide equitable access to the wide array of information sources for the social change and advocacy.

Education: The educational program, workshops, literacy programs offered by the libraries promotes lifelong learning. Libraries complement formal education system by

providing sources, study spaces, learning environment for its users to support them to excel in their academic learning. The skill development programs, training for IAS/KAS and other competitive exams aspirants enhances the job skills and career development. Some libraries are providing access to computers and internet, it address the digital divide, promotes digital literacy with access to technology.

Community Engagement: organizing awareness campaigns, workshops, seminars, special lectures to educate the community, collaborating with community to enhance resources, expertise and other capabilities, host cultural festivals, art exhibitions, film screenings and other events to promote awareness on SDGs and emphasize on cultural diversity. Libraries can utilise the social media and other digital platforms to reach the unreached through virtual programming. Therefore, the libraries are having chance of advancing the SDGs through Access, Education and Community Engagement (AECE). To provide practical approach in implementing the library strategies through AECE, the study proposes three pillars model.



Figure 1: Trinity Model for Implementing Library Strategies

The pillars of the model are **Awareness, Training and Evaluation**. With these three pillars, the libraries can provide a practical approach through AECE programs for advancing the SDGS. The trinity model acts as an action plan in implementing the library strategies.

Awareness: the special lectures, expert's talks, workshops, exhibitions/fairs and displays, film/documentary screening, literary discussions, interactive programs, online campaigns, observing special days (Women's Day, Kannada Rajyotsava) hording, signboard installation etc. mentioned in the library strategies can be initiated under the Awareness programs

Training: the hands-on programs, demonstrations, participation in projects, hosting of recycling programs, providing access to computers and internet, Maker spaces, job training programs, resume workshops, career counselling, leadership trainings, literacy classes, health screening programs, sustainable agricultural practices, training programs, developing information products and services, skill oriented programs of library strategies can initiated under the Training programs. It involves the library collaboration with other organizations in local, national and international level.

Evaluation: conducting surveys for feedbacks at the end of the programs, conducting tests and quiz at end of the training programs and certification, recognition of good

learners with prizes. The libraries collaborate with local schools, colleges and other organizations for conducting competitions, quizzes.

Conclusion

Libraries play a key role in advancing the SDGs through their multifaceted contribution to education, access to information and community engagement with sustainable efforts. The present study has made an attempt to provide library strategies to achieve the SDGs with the possibility in libraries without compromising the routine housekeeping activities. The libraries can seek for financial support from government grants, grants, fellowships and funding from the international organizations such as United Nations, UNESCO, the World Bank, IFLA and the libraries can join hands with partnership and collaboration with corporate institutions, NGOs, community groups, academic institutions, government agencies for support and sponsorship. As said by IFLA, sustainability is every library's business, so all libraries need to advocate for sustainability. The libraries commitment in bridging digital divides, promoting lifelong learning, and addressing societal challenges exemplifies their integral role in local and global efforts towards achieving the SDGs. As libraries continue to innovate and collaborate with diverse stakeholders, they reinforce their position as catalysts for positive social change and sustainable development in communities worldwide.

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BIG DATA AND INFORMATION SERVICES IN ACADEMIC LIBRARIES: AN INSIGHT

Dr. Shiva Kanaujia Sukula[1]

Introduction

The advent of concept of big data nad data science has encompassed the libraries as well. The kind of data present in libraries has always posed challenges for providing services as well as maintaining the records. The study by Burton and Lyon (2017) has discussed in detail about the pervasive proliferation of data and data science applications into libraries. The present article has endeavored to find out the experiences shared across the literature regarding data science in libraries and many other aspects which are leading toward the information services and information retrieval.

Method

Data has been collected from Web of Science database and Google scholar database during April 2023 to November 2023 with the following search phrases:

1. Big data; Big data in libraries
2. University library and Big data
3. Academic libraries and big data
4. Academic libraries and big data issues and challenges
5. Big data and library services
6. Big data applications in academic library
7. Big data and information services in academic libraries
8. Big data and information retrieval in academic libraries

Big Data and Digital Libraries

There are information technology applications into libraries but the impact created by big data is nascent and yet to discern the intricacies. Since more than five years there have been instances of big data applications, the areas in which big data applications (Knapp, 2013; Prindle & Loos, 2017; Blummer, & Kenton, 2018; Kamupunga & Chunting, 2019; Garate-Escamilla, El Hassani, & Andres, 2019) have been observed as well as the scalability. The questions of data privacy in the age of big data have also invited attention. The digital libraries have provided the vast amount of data; mechanisms for access to data as well as data based information services especially

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in research support system. Public libraries have not been behind, in this context few examples are found such as the studies (Cooke, 2018; Zhan & Widén, 2018; Li, Jiao, Zhang & Xu, 2019) conducted in late years of last decade.

Academic Libraries and Big Data Experiences

Academic libraries have explored digital libraries and big data applications in detail yet the experiences are being shared from past two or three years at large (Al-Barashdi & Al-Karousi, 2019; Anna & Mannan, 2020; Tella & Kadri, 2021). There are questions about its hype as well as real time applications in order to provide information services. The academic libraries have introspected the library scenario and it was observed that there are big opportunities as well as challenges (Ahmad, JianMing & Rafi, 2019; Garoufallou & Gaitanou, 2021) in libraries. There are required skills for dealing with big data as well as conquering the challenges.

Role of Library Professionals

Librarians have come forward to understand as well as input big data applications into libraries. Libraries began building community data infrastructures and defining roles of big data since the mid of last decade (Bertot, Butler & Travis, 2014; Liu, 2018). There are few examples such as big data and cloud computing applications, social big data as well as various challenges in the context of digital disruption. Technologies such as internet of things, synthetic biology, artificial intelligence, blockchain as well as other aspects (Goldberg, Olivares & Klein, 2014; Bello-Orgaz, Jung & Camacho, 2016; Oussous, Benjelloun, Lahcen & Belfkih, 2018; Kim, 2020) are bringing big data into large picture. Better services can be designed around big data. Libraries are structuring better information services where the unstructured data is being taken care. Visual analytics can play a greater role (Olendorf & Wang, 2017; Laskowski, 2021) in this kind of scenario.

Manpower is significant in implementing any components of technologies and various applications. The change of perception among library professionals is required while transition of technologies is going through the libraries. Various opportunities are underlying while challenges are overcome by the librarians. The understanding and application of big data in libraries estimate the local solutions which can be brought by big data in public libraries as well as academic libraries (Tella, 2021; Kim, Gang & Oh, 2020; Chow & Tian, 2021; Ahmad, JianMing & Rafi, 2020).

University Libraries and Big Data Challenges

University libraries plan in accordance with the university academic and research goals. The compulsion of technology, dwindling budgets and lack of grants may force university libraries to innovate from within. The big data era and changing strategies are providing ways to libraries. Specially in social sciences and humanity development, big data is becoming a crucial point in the context of information service (Wang, 2015; Travis & Ramirez, 2020).. The informed decision making is also possible due to big data

considerations in the academic libraries (Azam, & Ahmad, 2023; Oladokun, Aboyade & Aboyade, 2023).

Data Analysis

With the following tables and graphs data has been presented and analysed.

University Library and Big data

While searching for the publications and literature, with the search phrase "university library and big data", a good number of publications were resulted. The total number of publications were 1272 which were having 15 306 citing articles along with 15162 without self citations. These articles have been 15984 times cited with the average citation of 12.57 along with 52 h-index.

Publications	Citing Articles	Times Cited		
1,272	15,306 Analyze	15,984	12.57	52
Total	Total	Total	Average per item	H-index
From 1989 to 2023	15,162 Analyze	15,778		
	Without self-citations	Without self-citations		

Table-1: ***University Library and Big data***

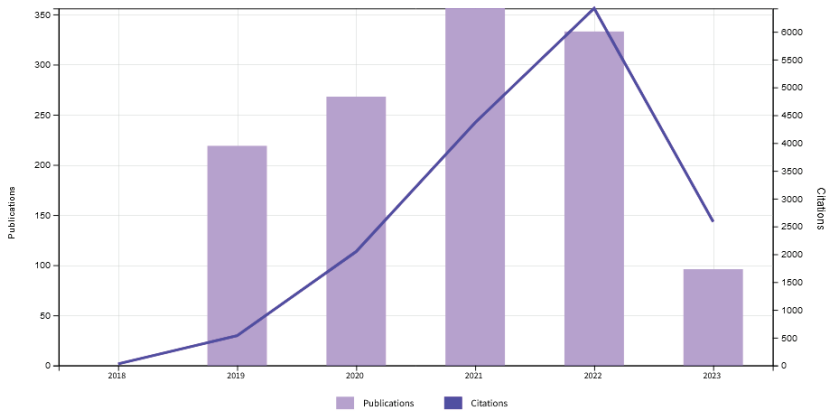


Fig.1- ***University Library and Big data***

Academic Libraries and Big Data

With the serch phrase "academic libraries and big gdata", the total number of publications related with the broader subject are 156 in number while the number of citing articles is 3178, follwed by 3159 without self citaions. These 156 articles have been 3219 times cited with the h index of 20.

Publications	Citing Articles	Times Cited		H-Index
156 Total	3,178 Analyze Total	3,219 Total	20.63 Average per item	20
From 1989 to 2023	3,159 Analyze Without self-citations	3,189 Without self-citations		

Table-2 ***Academic Libraries and Big Data***

Times cited and publications over time

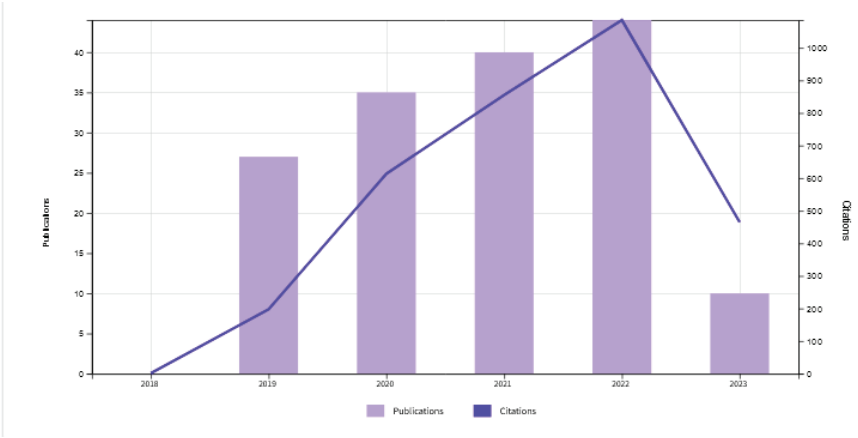


Fig.2- ***Academic Libraries and Big Data***

Academic Libraries and Big Data Issues and Challenges

While searching with the string "academic libraries and big data issues and challenges", very few results were observed i.e., 06 which have 18 citing articles and totally cited counts are 18 with the h index of 2. Being a specific area of research, it may be assumed that few researches have been carried out while this may take some time to explore the research in this context.

Publications	Citing Articles	Times Cited		H-Index
6 Total	18 Analyze Total	18 Total	3 Average per item	2
From 1989 to 2023	18 Analyze Without self-citations	18 Without self-citations		

Table-3 ***Academic Libraries and Big Data Issues and Challenges***

Big Data and Library Services

Publications	Citing Articles	Times Cited		H-Index
335 Total	5,607 Analyze Total	5,925 Total	17.69 Average per item	37
From 1989 to 2023	5,556 Analyze Without self-citations	5,852 Without self-citations		

Table-4 ***Big Data and Library Services***

While trying to search literature on "big data and library services", there are good numbers of publications. Total number of such publications are 335 which are relating to 5607 citing articles. These articles have been 5925 times cited with 17.69 times average citations. The h index s 37 which seems quite high.

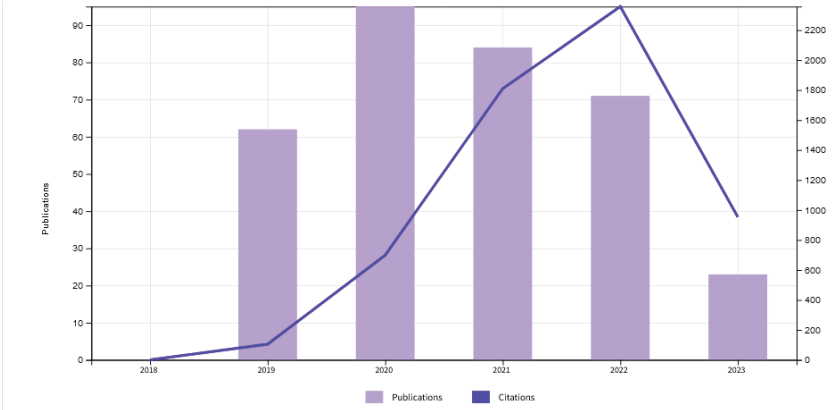


Fig.3- ***Big Data and Library Services***

Big Data Applications in Academic Library

Finding literature regarding the area "big data applications in academic library", there have been moderate to low search results. Only 51 articles in related specific field were found. These 51 articles have been 1077 times cited with 21.12 average number of citations. The h index is 13 for these results.

Publications	Citing Articles	Times Cited		
51	1,070 Analyze	1,077	21.12	13
Total	Total	Total	Average per item	H-Index
From 1989 to 2023	1,066 Analyze	1,073		
	Without self-citations	Without self-citations		

Table-5 ***Big Data Applications in Academic Library***

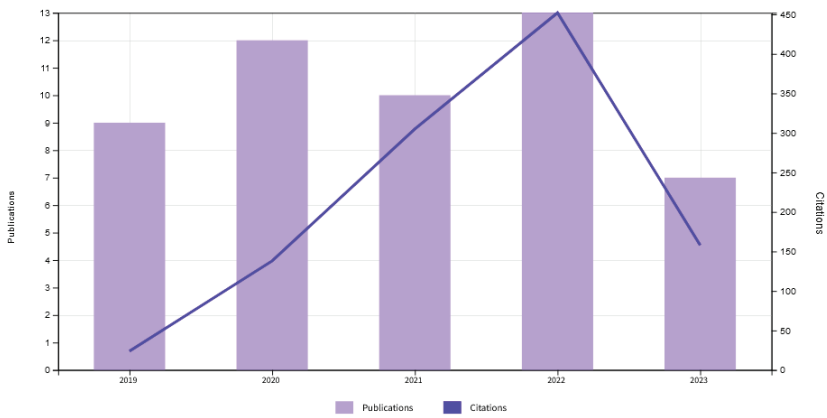


Fig.4 ***Big Data Applications in Academic Library***

Big Data and Information Services in Academic Libraries

There are few number of publications related to "big data and information services in academic libraries" as the results shown after search. Only 23 publications were found which have been cited a good number of times such as 760 times cited with 33.04 average citations.

Publications	Citing Articles	Times Cited		H-Index
23 Total	759 Analyze Total	760 Total	33.04 Average per item	6
From 1989 to 2023	758 Analyze Without self-citations	759 Without self-citations		

Table-6 ***Big Data and Information Services in Academic Libraries***

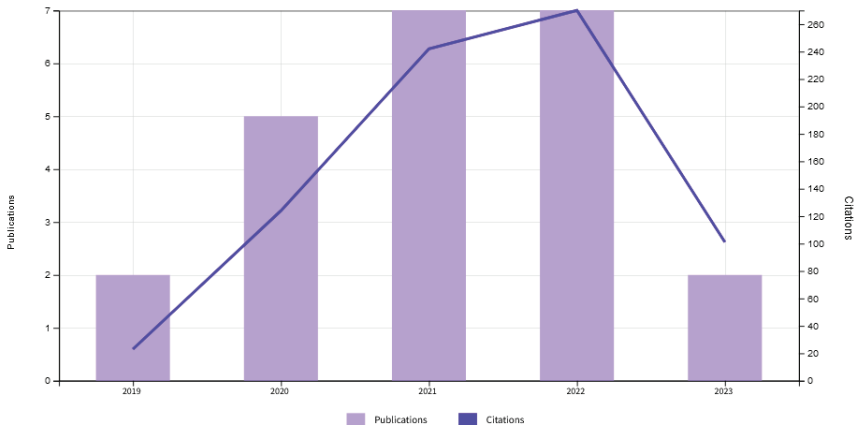


Fig.5 ***Big Data and Information Services in Academic Libraries***

Big Data and Information Retrieval in Academic Libraries

The search results related with "big data and information retrieval in academic libraries" has been very indicative of less explored area of research. Only 3 articles were resulted with 6 times cited and 2 citations as average number of citations.

Publications	Citing Articles	Times Cited		H-Index
3 Total	6 Analyze Total	6 Total	2 Average per item	1
From 1989 to 2023	6 Analyze Without self-citations	6 Without self-citations		

Table-7 ***Big Data and Information Retrieval in Academic Libraries***

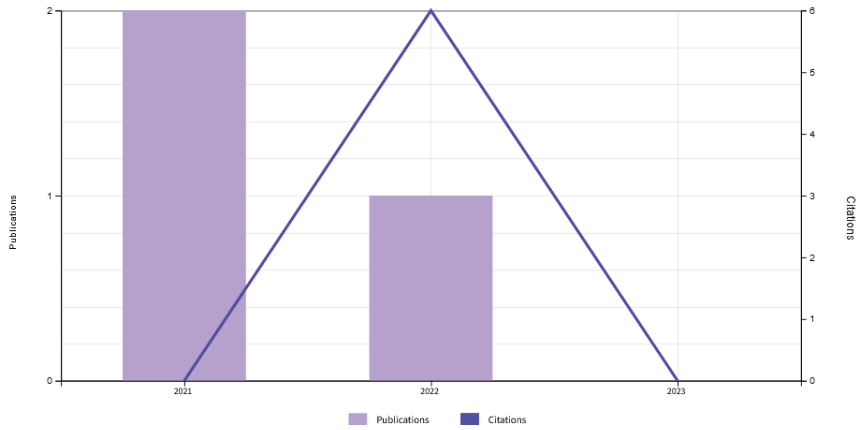


Fig.6 ***Big Data and Information Retrieval in Academic Libraries***

Findings and Discussion

While searching publications and literature, the search term "university library and big data" yielded a large number of publications. The total number of publications was 1272, with 15,306 citing articles and 15162 without self-citations. These articles have been cited 15984 times with an average citation of 12.57 and an h-index of 52. The total number of publications related to the broad topic with the search term "academic library and big data" is 156, while the number of cited articles is 3178, followed by 3159 without self-citations. These 156 articles have been cited 3219 times with an h-index of 20. Very few results were seen when searching with the search term "academic library and big data issues and challenges", i.e., 18 cited articles with 06 cited articles and the total number of cited articles is 18 with an h-index of 2. Being a specific research area, it can be assumed that few studies have been conducted, while it may take some time to locate research in this context. When we search the literature on "big data and library services", there are a large number of publications. The total number of such publications is 335 and includes 5607 cited articles. These articles have been cited 5925 times with 17.69 times more than the average number of citations. The h-index is 37, which seems quite high. When searching the literature in the area of "big data applications in academic library", medium to low search results were found. Only 51 articles were found in the related specific area. These 51 articles have been cited 1077 times with an average number of citations 21.12. The h-index for these results is 13. There are few publications related to "big data and information services in academic libraries", as shown by the results displayed after the search. Only 23 publications were found that were cited a significant number of times, such as being cited 760 times with an average of 33.04 citations. Search results related to "big data and information retrieval in academic libraries" are highly indicative of an under-explored area of research. Only 3 articles were produced with 6 citations and 2 citations as the average number of citations.

Conclusion

The area of research in big data applications and libraries seems promising with the more involvement of big data understanding and use in decision making as well. The libraries can explore this area for better information services. The research support services and few other data specific services from digital libraries can be identified as major concerns. Few specific agenda of libraries can be strolled around the information retrieval and big data which may be intensive areas of research and library services.

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AN ANALYTICAL STUDY OF COLLECTION DEVELOPMENT AND MANAGEMENT: SPECIAL REFERENCE OF MEDICAL COLLEGE OF INDORE DIVISION

Hasina Begum[1] & Dr. M Suresh Babu[2]

Introduction

Collection development is the process of acquiring and maintaining materials, both physical and electronic, that meet the needs and interests of library users. It is an ongoing process that involves selecting, acquiring, organizing, preserving, and weeding materials based on the library's mission, community needs, and budget. The following are the key steps involved in collection development:

Assessing user needs: The library should identify the needs and interests of its users through surveys, focus groups, and other methods to determine what materials should be included in the collection.

Developing selection policies: The library should establish selection policies that outline the criteria for acquiring materials, such as relevance, accuracy, timeliness, and authority.

Acquiring materials: The library should purchase or lease materials that meet the selection criteria and are within the library's budget.

Organizing and cataloging materials: The library should organize and catalog materials in a way that makes them easily accessible to users.

Preserving materials: The library should take steps to preserve materials so that they can be used by future generations.

Weeding materials: The library should regularly evaluate the collection and remove materials that are outdated, inaccurate, or no longer relevant to the needs of the community.

Promoting the collection: The library should actively promote the collection through displays, programming, and other means to increase awareness and use of the materials.

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Effective collection development requires collaboration between librarians, library staff, and community members to ensure that the collection meets the needs and interests of the community.

Collection development in academic libraries is a vital process that involves the selection, acquisition, organization, and maintenance of library resources to support the teaching, learning, and research needs of the academic community. Here are some key considerations for collection development in academic libraries:

1. Collaboration: Collaboration between librarians, faculty members, and students is essential in developing a relevant and up-to-date collection that meets the needs of the academic community. Faculty members and students can provide input on the materials that are most useful for their research and coursework.
2. Budget: The library's budget is a critical factor in collection development. Libraries must allocate funds effectively to acquire and maintain high-quality resources in the face of ever-increasing costs.
3. Diversity and inclusivity: It is essential to ensure that the library's collection reflects the diversity of the academic community and includes resources that represent a wide range of perspectives and experiences.
4. Access: The library must provide access to its collection in various formats, including print, electronic, and audiovisual resources. The library must also ensure that its collection is accessible to users with disabilities.
5. Assessment: Regular assessment of the collection is necessary to evaluate its relevance and effectiveness in meeting the needs of the academic community. Usage data, feedback from users, and other metrics can inform collection development decisions.
6. Preservation: The library must take steps to preserve its collection, including ensuring proper storage, handling, and conservation of materials, and digitizing fragile or rare items to ensure their long-term accessibility.
7. Intellectual freedom: Academic libraries must uphold the principles of intellectual freedom and provide access to materials that represent a wide range of viewpoints and ideas, even if they may be controversial or unpopular.

Literature Review

Collection development policy (CDP) is a critical tool for medical college libraries in selecting and acquiring materials that align with the library's mission, goals, and users' needs. The following literature review provides an overview of current research on CDPs for medical college libraries and highlights the key elements necessary for developing effective CDPs.

Smith and Kusunose (2018) found that medical college libraries must consider several factors when developing their CDPs, including the medical college's curriculum,

faculty research interests, and the library's budget. They recommended that CDPs should be reviewed and updated regularly to ensure that they align with the evolving needs of the medical college community.

Johnson and Hathcock (2017) emphasized the importance of collaboration between librarians and medical college faculty members in developing CDPs. They recommended that librarians should work with faculty members to identify gaps in the library's collection and acquire materials that support the curriculum and research needs.

Tennant and Cataldo (2016) discussed the importance of incorporating digital resources into CDPs for medical college libraries. They recommended that libraries should consider the cost and accessibility of digital resources when developing CDPs and should work with vendors to negotiate favorable licensing agreements.

Moreover, DeGroote and Grundy (2018) stressed the importance of diversity and inclusivity in CDPs for medical college libraries. They recommended that libraries should ensure that their collections represent a diverse range of perspectives, including those of underrepresented groups.

Yi and Dong (2020) emphasized the importance of regularly assessing CDPs in medical college libraries. They recommended that libraries should use a variety of metrics, including usage data and user feedback, to evaluate the effectiveness of their CDPs and make necessary adjustments.

Vasileiou and Sachini (2019) provide a step-by-step guide for developing a CDP for academic libraries. They recommend involving all stakeholders in the process, including librarians, faculty, and students, and suggest including sections on the library's mission, goals, selection criteria, budget, and evaluation.

In "Collection Development Policies in Academic Libraries: A Survey of Practices," Chowdhury and Biswas (2017) surveyed academic libraries in India to assess their CDP practices. They found that the majority of libraries had CDPs in place, but they varied in terms of scope, depth, and specificity. They recommended that academic libraries should develop more comprehensive and specific CDPs that align with their institutional goals and objectives.

In "The Evolving Landscape of Collection Development: A Case Study of an Academic Library's Collections Policy Review," Han and Huang (2019) describe a case study of an academic library's review of its CDP. They found that the review process helped the library identify gaps in its collection and revise its selection criteria to better align with its users' needs.

Krishnan and Ramesha (2018) analyzed CDPs from 24 academic libraries in India to identify common themes and best practices. They found that most CDPs included sections on selection criteria, acquisitions, and evaluation, but few addressed digital resources or preservation. They recommended that academic libraries should update their CDPs to include these important areas.

Harp and Hallmark (2019) provide an overview of collection development and assessment practices in academic libraries. They emphasize the importance of collaboration between librarians, faculty, and students in developing and assessing collections and recommend using a variety of metrics to evaluate collection effectiveness, such as usage statistics, citation analysis, and user feedback.

In conclusion, developing a strong CDP is essential for medical college libraries to provide relevant and up-to-date resources that support the needs of the academic community. Effective CDPs should consider the medical college's curriculum, faculty research interests, budget, digital resources, diversity, inclusivity, and regular assessment.

Objectives

The objective of the study "Collection Development and Management in Medical Colleges of Indore Division: Analytical Study" to examine the collection development and management practices in medical college libraries within the Indore Division of India. The specific objectives are follows:

1. To identify the current status of collection development and management practices in medical college libraries within the Indore Division.
2. To assess the adequacy and appropriateness of the existing collection of medical college libraries in the Indore Division.
3. To identify the factors influencing collection development and management practices in medical college libraries in the Indore Division.
4. To evaluate the effectiveness of collection development policies and procedures in medical college libraries within the Indore Division.
5. To recommend strategies for improving collection development and management practices in medical college libraries within the Indore Division.

By addressing these objectives, the study contributed to the development of effective collection development and management practices in medical college libraries in the Indore Division and potentially other similar contexts.

Hypotheses

The hypothesis for "Collection Development and Management in Medical Colleges of Indore Division: Analytical Study" are as follows:

1. H0: The current collection development and management practices in medical college libraries within the Indore Division are adequate and appropriate.
   H1: The current collection development and management practices in medical college libraries within the Indore Division are not adequate and appropriate.
2. H0: The factors influencing collection development and management practices in medical college libraries in the Indore Division are significant.
   H1: The factors influencing collection development and management practices in

medical college libraries in the Indore Division are not significant.

3. H0: The collection development policies and procedures in medical college libraries within the Indore Division are effective.
   H1: The collection development policies and procedures in medical college libraries within the Indore Division are not effective.

These hypotheses are tested using statistical analysis of the data collected through the research methodology described above. The results used to support or reject these hypotheses and provide insights into the current state of collection development and management practices in medical college libraries within the Indore Division.

Research Methodology

The research methodology for the "Collection Development and Management in Medical Colleges of Indore Division: Analytical Study" involved the following steps:

1. Study Design: The study adopted a descriptive analytical research design, which involves the collection and analysis of data to describe and explain a phenomenon or situation.
2. Sampling Technique: The study employed a purposive sampling technique to select medical college libraries within the Indore Division for inclusion in the study. The sample selected based on criteria such as the size of the library, the availability of collection development policies, and the willingness of librarians to participate
3. Data Collection: The primary data collected using structured questionnaires, interviews, and focus group discussions. The questionnaires administered to the librarians, faculty, and students in medical colleges within the Indore Division to gather information on the collection development and management practices, adequacy and appropriateness of the existing collection, and factors influencing collection development and management practices. The interviews conducted with the heads of the medical college libraries to gain an in-depth understanding of the collection development policies and procedures. Focus group discussions conducted with the library users to obtain their opinions on the collection and collection development practices.
4. Data Analysis: The collected data analyzed using both quantitative and qualitative techniques. The quantitative data obtained from the questionnaires analyzed using descriptive statistics such as frequencies and percentages. The qualitative data obtained from the interviews and focus group discussions analyzed using content analysis to identify common themes and patterns.
5. Ethical Considerations: Ethical considerations such as informed consent, confidentiality, and privacy of the participants adhered to throughout the study.
6. Limitations: The limitations of the study such as sample size, sample representativeness, and generalizability of the findings acknowledged.

Overall, the research methodology designed to gather comprehensive data on collection development and management practices in medical college libraries within the Indore Division and generate insights that used to improve these practices.

Table no. 1 presents detail of questionnaire sent and received in medical college libraries in the Indore Division. Total 372 questionnaire were distributed, out of which 340 (91 percent) respondent's questionnaires were considered in this study.

Table no. 1: Respondent Details

Sl. No.	Particular	Distributed Questionnaire	Faculty member	Percent	Distributed Questionnaire	Students	Percent	Distributed Questionnaire	Library Staff	Percent
1	LIB A	25	18	72%	60	58	97%	8	5	63%
2	LIB B	25	21	84%	60	52	87%	8	5	63%
3	LIB C	25	23	92%	60	51	85%	8	5	63%
4	LIB D	25	18	72%	60	59	98%	8	5	63%
	Total	100	80	80%	240	220	92%	32	20	63%

Note: *The study used the name LIB A, LIB B, LIB C, LIB D instead of the name of the medical college library. The details are as follows for the Code of the respective libraries.*

1. **1**. **LIB A** means Library of Mahatma Gandhi Medical College, Indore.
2. **LIB B** means Library of Chirayu, Medical College, Indore.
3. **LIB C** means Library of Aurbindo, Medical College, Indore.
4. **LIB D** means Library of Mahatma NSC Govt. Medical College, Khandwa.

Data Analysis

The data collected for "Collection Development and Management in Medical Colleges of Indore Division: Analytical Study" analyzed using a combination of quantitative and qualitative methods. The following are some possible steps for data analysis:

1. **Quantitative Data Analysis**: The quantitative data collected through the structured questionnaire analyzed using descriptive statistics such as mean, standard deviation, and percentages. The data organized and presented using tables, graphs, and charts. The analysis could include the following:

- Descriptive statistics for each variable, such as the library's budget allocation, collection size, and acquisition methods.
- Comparison of the data collected from different medical college libraries in the Indore Division.

- Correlation analysis to identify the relationship between different variables, such as the library's budget allocation and collection size.

2. **Qualitative Data Analysis**: The qualitative data collected through in-depth interviews analyzed using thematic analysis. The following are some possible steps:
- Transcription of the interviews.
- Coding of the data to identify themes and patterns.
- Categorization of the themes into broader categories.
- Interpretation of the data to draw conclusions and identify recommendations.

3. **Integration of Quantitative and Qualitative Data:** The findings from the quantitative and qualitative data analyses integrated to provide a comprehensive analysis of the collection development and management practices in medical college libraries within the Indore Division. The integration could include the following:
- Comparison of the quantitative and qualitative data to identify common themes and patterns.
- Synthesis of the findings to draw conclusions and identify recommendations.

Overall, the data analysis provided insights into the current state of collection development and management practices in medical college libraries within the Indore Division and identify areas for improvement.

Table no. 2 shows some factors which affect collection development and applying such policies in practical use are defined below in which almost every library staff has agreed with these constraints on such policies.

Table no. 2 – Factors affecting Collection Development and Policies

Sl. No.	Particular	LIBA	LIBB	LIBC	LIBD	Total	Percent
1	Shrink Library Budget	4	5	5	3	17	85%
2	Long Procedure in procurement	3	4	4	5	16	80%
3	Lack of Human Resource	5	4	4	5	18	90%
4	Lack of Technical Resource	4	5	5	5	19	95%

Table no. 3 presents some evaluation effectiveness techniques which are consistently using by library staff to assess the collection in proposed libraries.

Table no. 3 – Evaluation effectiveness

Sl. No.	Particular	LIBA	LIBB	LIBC	LIBD	Total	Percent
1	Review the policy	4	3	4	5	16	80%
2	Analyse usage statistics	4	3	4	5	16	80%
3	Conduct surveys and focus groups	2	1	3	2	8	40%
4	Conduct a collection inventory	5	4	4	5	18	90%
5	Evaluate resource sharing agreements	2	3	3	2	10	50%
6	Assess the budget	5	4	5	5	19	95%

Hypothesis Testing

1. H0: The current collection development and management practices in medical college libraries within the Indore Division are adequate and appropriate.
   H1: The current collection development and management practices in medical college libraries within the Indore Division are not adequate and appropriate.

Table no. 4: Hypothesis no.1

Sl. No.	Particular	LIBA	LIBB	LIBC	LIBD	Total
1	Extremely dissatisfied	0.10316	0.375175	0.065405	1.360014	1.903753
2	Dissatisfied	0.71158	0.230411	0.197027	0.004156	1.143173
3	Neither dissatisfied or satisfied	0.83368	0.000112	0.159656	0.255124	1.248576
4	Satisfied	0.06055	0.028513	0.334278	0.418397	0.841733
5	Extremely satisfied	0.08735	0.12765	0.458548	0.371592	1.045137
Total						6.182372193

Significance level	0.05
Level of Freedom	12
Test Statistics	6.182
p-value	0.906631
Critical value	21.02607

After applying Chi-square test on observed data(Table no. 4) to investigate and examine hypothesis of current collection development and management practices are adequate and appropriate or not in prescribed study area, more than 0.05 p– value on significance level of 95% shows that null hypothesis will be accepted i.e. *The current collection development and management practices in medical college libraries within the Indore Division are adequate and appropriate* and alternative will be rejected. Critical value for such hypothesis is 21.02607

1. H0: The factors influencing collection development and management practices in medical college libraries in the Indore Division are significant.
   H1: The factors influencing collection development and management practices in medical college libraries in the Indore Division are not significant.

Table no. 5: Hypothesis no.2

Sl. No.	Particular	LIBA	LIBB	LIBC	LIBD	Total
1	Strongly Agree	0.022727273	0.20455	0.02273	0.02273	0.272727
2	Agree	0.166666667	0.16667	0.16667	0.16667	0.666667
3	Undecided	0.5	0.5	0.5	0.5	2
4	Disagree	0.25	2.25	0.25	0.25	3
5	Strongly disagree	0	0	0	0	0
	Total					5.939394

Significance Level	0.05
Level of Freedom	12
Test Statistics	5.939394
p-value	0.91910626
Critical Value	21.02606982

After applying Chi-square test on observed data (Table no. 5) to inspect hypothesis to verify the factors which are influencing collection development and management practices are significant or not in prescribed study area, more than 0.05 p – value on significance level of 95% shows that factors affect such policies and management practices and null hypothesis will be accepted i.e.*The factors influencing collection development and management practices in medical college libraries in the Indore Division are significant* and alternative will be rejected. Critical value for such hypothesis is 21.02606.

1. H0: The collection development policies and procedures in medical college libraries within the Indore Division are effective.
   H1: The collection development policies and procedures in medical college libraries within the Indore Division are not effective.

Table no. 6: Hypothesis no. 3

Sl. No.	Particular	LIBA	LIBB	LIBC	LIBD	Total
1	Extremely dissatisfied	0.01487	0.44576	0.001758	0.65988183	1.12227
2	Dissatisfied	0.0001	0.02928	0.770373	1.07538033	1.87514
3	Neither dissatisfied or satisfied	0.06533	0.00804	0.316478	0.04421881	0.43406
4	Satisfied	0.00026	0.15144	0.27258	0.7653719	1.18964
5	Extremely satisfied	0.01341	0.05457	1.172376	1.97107997	3.21143
	Total					7.832545

Significance level	0.05
Level of Freedom	12
Test Statistics	7.8325
p-value	0.798079
Critical Value	21.02607

To check effectiveness of collection development policies and procedures in specified area, Chi-square test applied on observed data (Table no. 4) and discovered p-value which is more than 0.05 on significance level of 95% indicated towards to acceptance of null hypothesis i.e. *The collection development policies and procedures in medical college libraries within the Indore Division are not effective* and rejection of alternate hypothesis. Critical value for such hypothesis is 21.02607.

1. H0: The end users of medical college libraries within the Indore Division are satisfied with the collection development of resources available in library.
   H1: The end users of medical college libraries within the Indore Division are not satisfied with the collection development of resources available in library.

Table no. 7 presents the ranking directed by library users for collection development which is divided into 5 ranking parameters i.e. form Rank 1 to Rank 5 where Rank 1 shows most satisfaction and Rank 5 shows most Dissatisfaction.

Table no. 7– Ranking of Collection Development

Sl. No.	Particular	Ranking					
		RANK1	RANK2	RANK3	RANK4	RANK5	TOTAL
1	LIBA	39	26	5	4	2	76
2	LIBB	35	29	2	2	5	73
3	LIBC	29	30	4	5	6	74
4	LIBD	32	23	5	8	9	77

Table no. 8 presents average and variance of above table ranking based on observed data.

Table no. 8– Analyzed data (Ranking of Collection Development)

SUMMARY				
Groups	Count	Sum	Average	Variance
LIBA	5	76	15.2	271.7
LIBB	5	73	14.6	258.3
LIBC	5	74	14.8	180.7
LIBD	5	77	15.4	134.3

Table no. 9 presents ANOVA Test and observed P-value was nearly 1 which shows that null hypothesis i.e. "*The end users of medical college libraries within the Indore Division are satisfied with the collection development of resources available in library"* will be accepted. Critical value for such observed data was 3.2887152.

Table no. 9– ANOVA TEST (Ranking of Collection Development)

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	2	3	0.666667	0.003155819	0.999744582	3.23887152
Within Groups	3380	16	211.25			
Total	3382	19				

Table of Descriptive Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
Library Budget	2247500	144460	2100000	2480000
Collection Size	25529	1806	21475	28475
Acquisition Method				
- Purchase	96%			
- Gift	3%			
- Exchange	1%			

Table No. 10 – Correlation efficient Between Library Budget and Collection Size

Variable	Library Budget	Collection Size
LIBA	2250000	25,112
LIBB	2100000	23,558
LIBC	2480000	28,475
LIBD	2160000	24,969
Total	8990000	102,114
Correlation efficient		0.980701

Table no. 10 presents while applying Correlation efficient in two variables i.e. library budget and collection, there is an almost perfect positive correlation among these two as value is near to 1 (0.980701) which perfectly shows the dependency one on another as one rises or falls with the increasing or decreasing value of other.

Table of Comparison between Different Medical College Libraries:

Variable	LIBA	LIBB	LIBC	LIBD	Total
Library Budget	2250000	2100000	2480000	2160000	8990000
Collection Size	25,112	23,558	28,475	24,969	102,114
Acquisition Method					
- Purchase	94%	96%	95%	97%	-
- Gift	5%	2%	4%	2%	-
- Exchange	1%	2%	1%	1%	-

Table of Themes and Categories from Qualitative Data Analysis

Theme	Category
Budget Allocation	Insufficient
Collection Development Plan	Nonexistent
User Needs Assessment	Inadequate
Acquisition Methods	Limited
Collection Evaluation	Inconsistent

Correlation coefficient between Library budget and Collection Size is -0.50586, which shows that there is no identical similarity between the Library budget and Collection Size in libraries.

This table used to show the correlation between library budget and collection size in the medical college libraries of Indore Division. The values in the table indicate the correlation coefficient, with a value of 1.000 indicating a perfect positive correlation and a value of -1.000 indicating a perfect negative correlation.

Table of Recommendations

Area for Improvement	Recommendation
Budget Allocation	Increase the library budget to ensure adequate funding for collection development and management.
Collection Development Plan	Develop a comprehensive collection development plan to guide acquisition, weeding, and preservation activities.
User Needs Assessment	Conduct regular user needs assessments to ensure that the collection meets the needs of students, faculty, and researchers.
Acquisition Methods	Explore and implement new acquisition methods, such as consortia purchasing, interlibrary loan, and digital repositories.
Collection Evaluation	Develop and implement a systematic process for evaluating the collection on a regular basis, using both quantitative and qualitative methods.

This table used to present recommendations for improving collection development and management practices in medical college libraries within the Indore Division. The recommendations based on the findings of the study, and presented in a concise and organized manner to facilitate action and implementation.

However, the study suggested some possible results that could have been found in the "Collection Development and Management in Medical Colleges of Indore Division: Analytical Study":

1. Library budget: The study found that the library budget varies widely across the medical college libraries in the Indore Division, with some libraries having insufficient funds to adequately support collection development and management.
2. Collection size: The study explained that the size of the collection also varies across the medical college libraries in the Indore Division, with some libraries having larger and more comprehensive collections than others.
3. Collection composition: The study analyzed the composition of the collection in terms of format, language, and subject matter, and found that certain formats (such as electronic resources).

Conclusion

The Collection Development and Management in Medical Colleges of Indore Division based on the objectives and scope of the study, the following conclusions drawn:

1. Criteria for selecting resources: Medical college libraries in Indore Division use various criteria to select resources for their collections. These criteria included relevance to the curriculum, quality, cost, availability, and demand.
2. Challenges facing collection development and management: Medical college libraries in Indore Division face several challenges in collection development and management. These challenges included inadequate funding, lack of space, preservation issues, and lack of trained personnel.
3. Use of electronic resources: Medical college libraries in Indore Division have started to embrace electronic resources to support teaching, learning, and research activities. However, they face challenges in providing access to these resources due to high subscription costs, inadequate infrastructure, and inadequate staff training.
4. User satisfaction: User satisfaction is a critical aspect of library service delivery. The study revealed that the level of user satisfaction with the collections and services provided by medical college libraries in Indore Division.
5. Strategies for improving collection development and management: The study provided valuable insights into strategies that medical college libraries in Indore Division could adopt to improve their collection development and management practices. These strategies included collaboration with other libraries, use of automation and information technology, and staff development programs.
6. User satisfaction with the collections and services provided by medical college libraries in Indore Division is generally high. However, there are still areas for improvement, such as the need for more current and relevant resources, better access to electronic resources, and more effective library services.
7. Overall, the study highlights the importance of collection development and management in medical college libraries and the need for continuous improvement in these areas. The findings used by library administrators and staff to identify areas for improvement and develop strategies to better serve their users.

In conclusion, the study provided valuable insights into the collection development and management practices of medical college libraries in Indore Division, highlighting areas of strengths and weaknesses and suggesting strategies for improvement.

Recommendations

Based on the conclusions drawn from the Collection Development and Management in Medical Colleges of Indore Division: Analytical Study, the following recommendations made:

1. Develop and implement clear criteria for selecting resources: Medical College libraries in Indore Division should develop and implement clear criteria for selecting resources to ensure that the collections remain relevant, high-quality, and meet the needs of library users.
2. Address challenges related to collection development and management: Medical college libraries in Indore Division should identify and address challenges related to collection development and management, such as funding constraints, preservation issues, and staff training needs.
3. Enhance access to electronic resources: Medical college libraries in Indore Division should enhance access to electronic resources by exploring new licensing models, negotiating better prices, and developing strategies to integrate electronic and print resources into the library's collection.
4. Improve user satisfaction: Medical college libraries in Indore Division should take steps to improve user satisfaction with the collections and services provided by the library. This could involve conducting user surveys, soliciting feedback, and developing targeted interventions to address specific areas of concern.
5. Foster collaboration among library stakeholders: Medical college libraries in Indore Division should promote collaboration among library stakeholders, such as faculty members, students, and administrators, to enhance the overall quality of library services and ensure that the collections and services meet the needs of all stakeholders.
6. Invest in technology and infrastructure: Medical college libraries in Indore Division should invest in technology and infrastructure to support collection development and management, such as digital preservation systems, online catalogs, and library management software.
7. Develop staff training and development programs: Medical college libraries in Indore Division should develop staff training and development programs to ensure that library staff are equipped with the skills and knowledge required to manage and develop the library's collections effectively.

Overall, the recommendations outlined above helped medical college libraries in Indore Division to improve their collection development and management practices, enhance the quality of library services, and ensure that the collections and services meet the needs of all stakeholders.

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COLLECTION DEVELOPMENT IN AUTONOMOUS COLLEGE LIBRARIES : A SPECIAL REFERENCE TO GOVERNMENT DEGREE COLLEGES IN ANDHRA PRADESH, INDIA

Dr.Md. Gouse Riajuddin[1]

Introduction

In Andhra Pradesh, autonomous colleges continue to have to comply with state government norms.. In this states, affiliating universities as well as state governments played a supportive role. With 18 colleges finally declared autonomous, other colleges are beginning to appreciate that autonomy brings more, not less, resources. For, autonomous colleges become eligible for a substantial grant from Government of India under its Rashtriya Uchchtar Shiksha Abhiyan. Autonomous colleges are also breaking the traditional rigid degree requirements by permitting students to take courses outside their normally prescribed curriculum. Maharashtra is forming an Autonomous Institutions' Consortium, which would allow students from one autonomous college to take courses in another autonomous college with full credit given.

Autonomous College libraries are now increasingly called upon for their contribution to the institutional mission and goals, Library is an essential component of the higher educational structure. Highlighting the importance of autonomous colleges, library as the heart of the college the UGC document on the XII Plan profile of higher education in India clearly states that: "The only safe and better way to improve the quality of undergraduate education is to the link most of the colleges from the affiliating structure. Colleges with academic and operative freedom are doing better and have more credibility. The financial support to such colleges boosts the concept of autonomy." It is proposed to increase the number of autonomous colleges to spread the culture of autonomy, and the target is to make 10 per cent of eligible colleges autonomous by the end of the XII Plan period.

Some positive outcomes are expected after the report is accepted. Meanwhile, it is imperative that the university and autonomous colleges work together for providing learner-centred quality education to the students. On its part, the government needs to assume a greater role in granting autonomy to more eligible colleges based on UGC guidelines.

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Need for Autonomy: The affiliating system of colleges was originally designed when their number in a university was small. The university could then effectively oversee the working of the colleges, act as an examining body and award degrees on their behalf. The system has now become unwieldy and it is becoming increasingly difficult for a university to attend to the varied needs of individual colleges. The colleges do not have the freedom to modernize their curricula or make them locally relevant. The regulations of the university and its common system, governing all colleges alike, irrespective of their characteristic strengths, weaknesses and locations, have affected the academic development of individual colleges. Colleges that have the potential for offering programmes of a higher standard do not have the freedom to offer them. The 1964- 66 Education Commission pointed out that the exercise of academic freedom by teachers is a crucial requirement for development of the intellectual climate of our country. Unless such a climate prevails, it is difficult to achieve excellence in our higher education system. With students, teachers and management being co-partners in raising the quality of higher education, it is imperative that they share a major responsibility. Hence, the Education Commission (1964-66) recommended college autonomy, which, in essence, is the instrument for promoting academic excellence.

Objectives

The National Policy on Education (1986-92) formulated the following objectives for autonomous colleges. An autonomous college will have the freedom to:

- Determine and prescribe its own courses of study and syllabi, and restructure and redesign the courses to suit local needs; and o prescribe rules for admission in consonance with the reservation policy of the state government;
- Evolve methods of assessment of students performance, the conduct of examinations and notification of results;
- Use modern tools of educational technology to achieve higher standards and greater creativity; and
- Promote healthy practices such as community service, extension activities, projects for the benefit of the society at large, neighbourhood programmes, etc.

Institutional Preparation: Since an autonomous college is called upon to perform many of the functions that the university has hitherto performed, it must study the academic, administrative/management and financial implications of such a changeover and prepare itself to discharge its new functions efficiently.

Procedure of applying for Fresh Autonomous Status: The eligible colleges can apply for Fresh Autonomous Status in the prescribed format throughout the year. .

(a) Procedure of applying for Extension of Autonomous Status: Colleges whose term of Autonomous Status is expiring should apply to UGC for Extension of their status in the prescribed format.

Procedure for approval by the UGC: An Expert Committee may be constituted for all fresh cases with representation of university and State Government nominees. The existing

procedure of Screening Committee may be scraped and the Chairman shall constitute Expert Committee for on the spot inspection for consideration of each proposal". The Chairman, UGC may constitute a Standing Committee of 3-4 members to look into the Expert Committee reports for conferment of fresh autonomous status and extension of autonomy to colleges before the recommendations are placed before the Commission. Any inconsistencies in the reports may also be informed to the Commission. Once the autonomy is granted by UGC with the concurrence of representatives of University and the State Govt. concerned, the University will issue a notification to the effect within a period of not more than three (3) months. Autonomy will be conferred initially for a period of six years.

The main features of autonomy are

a) Freedom for syllabus framing;
b) Striving for innovation in teaching and learning;
c) Scope for introduction of new courses;
d) Devising innovative techniques of evaluating students;
e) Freedom to adopt admission procedures; and,
f) Being relevant to the needs and the times.

The University Grants Commission (UGC) in its XI Plan Objectives provides for an autonomous college the freedom to determine and prescribe its own course of study and syllabus and redesign the course to suit local needs.

Besides, autonomy facilitates a credit based system including choice-based credit system. The term credit is used to describe the quantum of syllabus for various programmes in terms of hours of study. It indicates differential weightage given according to the contents and course duration the curriculum design.

Autonomous system, though in vogue since the late 1970s and 1980s, increased in number and importance only in this century-2004 onwards.

Best Practices

1. Library Open Access User Awareness Program: For Better Utilization of the Library Print and Electronic Information Resources, or by encouraging the students and teaching staff to become Academic and Research Strengthen.
2. Goal: To effective use of Library Information Resources and Services for the Users of college, i.e. Teaching Staff and Students, engaged faculty in academic and research programs, and students of study projects
3. 3. The Context: The college Library has a rich collection of Books etc. Degree first-year students who join the college are not having an idea about the usage of the library. The library conducts an orientation program for the students. Then they can utilize the available books, journals, and Electronic information resources. Text Books, Reference Books, Bibliographic data entered in Library Automation Software

for University Libraries (SOUL) developed by INFLIBNET-Information Library Network, accessing the Resources with Bar-coded accessioned books. Periodicals such as Journals, Magazines, and Newspapers are also included.

4. The Practice: Every year coaching classes are conducted for the students in the mathematics and chemistry subjects. They are taught every topic in the subject of the respective university they applied for and even advance topics in the subject which are part of top universities exams. Many students are sent to attend and participate in seminars, projects, and special programs conducted by various universities across India. They are evaluated continuously with various methods like exams, discussions, students as teachers in delivering some units to boost their confidence in understanding the subject and assignments, etc. They are provided with practice materials to engage them in continuous learning. They are given career guidance for PG, as well as Competitive Examinations, UGC NET, JRF, SET, and Orientation to Ph.D. Encouraging them to use library services, open learning resources like OCW by MIT etc.

Evidence of Success

Problems Encountered and Resources Required Problems encountered: 1. financial support for the students to provide them practice materials and books etc.

ACET- A Leading Autonomous College in India

Defining the Autonomous College

In India, we are offered admission into two types of colleges; one is, "Affiliated" while the other is, "Autonomous". Now, there is uncertainty among the students seeking admission into any of the courses. But here, all the perplexity regarding "Autonomous" will be made clear.

So let us know the difference between the two. The first type is affiliated to some other university. For, they have to follow the syllabus prescribed by the university and also the all the terms & conditions, etc. The university itself possesses the authority to initiate the whole admission process. The exams are conducted by the university meaning that the colleges that are affiliated to this university will be having the same question papers and the same marking criteria would be followed while making the results. And, talking about the Autonomous colleges, they are granted freedom and in some or all the matters as the syllabus, evaluation pattern, etc. will be decided independently by that particular college. Well, getting autonomy is not an easy process and an easy task though, currently, only a college having accreditation by National Assessment and Accreditation Council of India (NAAC) with a higher grade are given with the status of autonomous college. This assessment is five-yearly. Granting college autonomy is under the whole discretion of UGC (University Grants Commission) i.e. UGC may or may not grant accord the status of being autonomous to a college.

Understanding the benefit of studying in an autonomous college

- To conduct its house examination at any time of the year without the affiliating university's consent.
- To conduct admission events, without any intimation or permission from the affiliating university.
- To modify the intake capacity of the programs.
- To include/exclude any specific program at the Autonomous campus.

Moreover, Autonomous colleges have their own syllabus which means the whole curriculum is different from the other universities. The benefit of this is an updated course curriculum or we can say the syllabus is revised annually. The technology is changing rapidly but do you know the syllabus at some of the universities is still outdated i.e. by almost 5years? But this is a fact that it is hard for the universities to regularly revise the course and employ new faculty to teach new subjects. But, thanks to autonomy that enables ACET- an autonomous college to easily adapt new course or change syllabus every semester or year according to the trend. Do you know what that means? This simply means that you are updated to the course you are studying than others who study the same course as yours.

Profile of the Department of Collegiate Education

The Directorate of Public Instruction (DPI) all educational Institutions, both at Secondary and Collegiate level was bifurcated as Directorate of School Education and Directorate of Higher Education in the 1975. The Directorate of Higher Education was entrusted with the responsibility of the Management of Degree and Junior (+2) Colleges in the State. Over the years, due to enormous increase in the number of junior and Degree colleges, and its admiration of these two sectors of Higher Education become difficult for a single Head of the Department. In order to give special attention to these two areas of education, the Directorate of Higher Education was further divided into Directorate of Collegiate Education and Directorate of Intermediate (+2) during 31.10.1989. The Directorate of collegiate Education came into existence on 01.11.1989. The Head of Collegiate Education deals with the matters Undergraduate and postgraduate both the Government and Private Aided Colleges in the State of Andhra Pradesh.

The importance of autonomous colleges

The quality of faculty and amenities (labs, classrooms etc.) plays an important role in the quality of education. Autonomous colleges in India have flexibility in terms of curriculum and evaluation/assessment. Now, it depends upon an institution that how they make use of autonomy for uplifting the students' overall development.



Autonomous Colleges in Andhra Pradesh

S. No.	Name of the Autonomous Govt. Degree College	Year of Establishment	Total No. of Library Book collection
1	S.G.A.GDC, Yelamanchili	1987	10,683
2	G C (M), Anantapuramu	1916	1,18,001
3	G C (W), Anantapuramu	1984	15,380
4	PVKN GDC,Chittoor	1961	71,250
5	GDC, Nagari	1978	19,764
6	GC, Rajahmundry	1853	1,23,233
7	GC(W),Guntur	1942	54,718
8	GDC,Tuni	1980	17,512
9	ASD GDC (W), Kakinada	1962	35,000
10	PR GDC, Kakinada	1884	88,029
11	SRR & CVR GDC, Vijayawada	1937	58,961
12	DK GDC (W), Nellore	1965	39,793
13	GDC (W), Srikakulam	1968	30,369
14	Dr.VSK GDC, Visakhapatnam	1968	34,239
15	ASNM GDC, Palakol	1968	31,062
16	SCIM GDC, Tanuku	1968	31529
17	G D C (M), Kadapa	1948	59,525
18	G D C (W), Kadapa	1973	28,142

Role of libraries in Autonomous College Libraries

The role of the library is vital and crucial. The three major and most important components that together make up a library are users, staff and collection. The success of every library ultimately depends on its collection. Every other operation in the library is based and dependent on the holdings of the library. Classification, Cataloguing, Reference Service and an ideal building and equipment becomes meaningless if the library is empty of worthwhile books and other reading materials in adequate numbers. Future generations will probably blame us or praise us not for our fine catalogues, classification schemes, circulation system and reference techniques but what we manage to save and pass on to them.

A good library collection itself does not make an excellent library but not does the absence of it. The institutions like government, private, national, international, local, regional, all these are voluntary or profit making that have commitment and interest in quality education recognize that library services are important inputs for bringing excellence in teaching and learning process and as such a vital component of educational activity. In addition, the library is considered as a treasure house of knowledge, an important centre of learning, heart, pivot of an academic institution and an organ around which all academic activities revolve. Depending upon the autonomous college. The library attached, it has different aims and objectives. A Public library is called "peoples University". An Academic library is called the "Heart of Institution" and Special library is called the "Life blood of an Organization".

Collection Development Process

Collection development is defined "as a process that identifies the strength and weaknesses of the collection of materials made for the fulfilment of user needs of the college library. A collection development is a process that allows the library to develop a collection of information sources in response to users" demands and services. Accordingly, librarian has to assemble the materials for the satisfaction of user demand. Thus, it is a universally acknowledged process of assimilation of six aspects like library policies, selection of materials, acquisition of books and e-resources, user studies, weeding out and evaluation. It brings to gather the dynamic and constantly changing elements to formulate a systematized process of collection development Collection development is one of the most challenging and imaginative process of library profession, where by the college library staff acquires a wide variety of documents to meet the demand of the users. The steps involved in collection development include user's analysis, selection policies, acquisition policies, resource sharing, weeding and collection evaluation and management. A vital interactive between library staff and academic community is inevitable at each of the above stages for an effective operation of collection development process. Collection development thus, becomes a dynamic on-going cycle repeating the various functions in a systematic manner every year However, the challenging process of collection development has to be dynamic and the policies need to be adaptive to the ever changing needs of the institution and give information to its users. It is required to

setup an efficient and the relevant policy framework to collect and administer the process and methods that help in the task of collection development that includes the professional managers and the librarians to facilitate them in arriving at proper decision.

Advantages	Disadvantages
Interaction with a lot of student outside your college and this expands your horizon.	Frequent paper work
Opportunity to compete with the majority, giving more confidence.	Syllabus up dation becomes a tedious task.
More serious teaching would take place.	Exam papers may consist of out of syllabus questions. Lengthy procedure to report that.
Your teachers have the power to control/hold the internal and external examination.	You may have to travel a farther distance if your parent institute is a distance apart.

Studying in a College

Advantages	Disadvantages
Only the relevant topics need to be read as you must be knowing the fact that your teacher him/ herself will frame the question papers.	Frequent paper work Teachers become complacent for knowing the fact that they will frame the question papers.
Updating the curriculum is an easy task.	The students while being complacent will not take advantage of the time they saved.
You only have to compete with the students of your own class	-
Less travelling for clerical work	-
You have extra time to explore more of your subjects	-

Initiation by UGC

Under the February 2018 reform in higher education initiated by UGC, the colleges automatically become eligible for autonomy those have received scores of 3.51 or higher ranging from 0 to 4 from the National Assessment and Accreditation Council (NAAC), or accredited by the National Accreditation Board (NAB. This does not mean that the colleges performing lesser could not apply for the autonomy but the procedure for it is more intricate rather than automatic.

Hence, to be the best engineering college in India and getting a status of the being an autonomous college, Amritsar College of Engineering & Technology (ACET), the best college in Andhra Pradesh gives you so many additional benefits in terms of preference in job interviews in either government or private sector and a lot more. So, we welcome you to be a part of this leading institute to help you shape your career.

The Difference Between Autonomous & Non-Autonomous Colleges is As per a recent news, the colleges in India receiving scores of 3.51 or more on a scale of 0 to 4, from National Assessment and Accreditation Council (NAAC), or colleges that are accredited in three or more programmes with scores of 750 or more in every programme, by National Accreditation Board (NAB) would automatically become eligible for an

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That news got me thinking, do our students know about autonomous colleges and those that are not autonomous colleges. Do you know what is so different about being an autonomous college? There are many who are still not very sure of how differently these two academic bodies operate. Hence to help you understand better, here are few key differences between autonomous and non-autonomous colleges.

Privileges of Autonomous College

The College once granted autonomous status will have the privilege of:

I. Constitute their own Governing Body, Academic Council and Board of Studies to formulate new courses within the nomenclature specified by UGC as per the Specification of Degrees 2014 and amended from time to time.

II. Constitute their own Finance Committee.

III. The above bodies will also have the powers to review all existing courses making curricula more community relevant, skill oriented and keeping in view the employability requirements of the graduates.

IV. It can fix fees of the courses at their own level.

V. It will have complete administrative autonomy and have the privilege of appointing their own administrative staff and teaching faculty including Principal. However, the staff will be appointed as per the UGC (Minimum Qualification for Appointment of Teachers and other Academic Staff in Universities and Colleges and Measures for the Maintenance of Standards in Higher Education) Regulations 2010 as amended from time to time.

VI. The College will continue to receive funds as being done before the grant of autonomous status, if any.

VII. However, the degree will be awarded by the parent university

Role of Autonomous College Libraries in Higher Education

The Role of Autonomous college libraries as a higher educational institution plays a significant role. It collects, organizes and disseminates information, the recorded knowledge to the faculty and supports generation of new knowledge. The aims of the Autonomous college education and college libraries are interrelated. The college library

provides an opportunity for self-education to the students besides supplementing the class lectures. Realizing the importance of Autonomous college libraries the UGC has been granting special sums of money towards the development of college libraries. The higher education may be the nature of general, vocational, professional or technical education. The role of library plays a significant role in each and every field.. The role of library to improve equality and quality education is essential to improve skilled man power or human resources. India has third largest higher education system in the world. Higher education is recognized today as a capital investment and is of paramount importance for economic, social development of the country. Institution of higher education, college have the primary responsibility for equipping individual with advanced knowledge and skills required for positions of responsibility in government. Quality higher education is a source of great potential for the socio economic and cultural development of the country.

The Key Difference Flexibility.

In terms of flexibility, students of non-autonomous colleges are more relaxed, as the rules are set by the university and hence conducive.

Examination Pattern

The papers in an autonomous college are set by the faculty, and hence are quite predictable. Often this becomes the reason to study in the pattern or course elucidated in the classrooms.

However, such is not the case in non-autonomous colleges, as the question papers are set by the university committee. This is the reason why students are cautious and most of the times choose to study as per the syllabus provided at the beginning of the year, instead of only basing their studies on classroom teachings.

Admission Process

The other major difference between these two systems is their admission process. For an autonomous college, the decision of a student's admission lies with the head of the college. Therefore, it is easy to get admission in an autonomous college.

The admissions of non-autonomous colleges are mostly based on entrance exams or on the merit system. Therefore, it is not that easy to get admission in these colleges.

Conclusion

Autonomous engineering college libraries are the most important place for getting the required literature and information by the scientists, research scholars, students etc. The Library system needs to acquire digital technology, to compete with all requirements of the user. Unlike the modern library, today the library is being automated to maintain the time being wasted in the borrowing of books. The place with which the world is being run requires the work to be done as fast as possible. The library management software requires to be efficiently compliant and initiative. The right way

to handle and maintain a large number of books requires an automated system that could easily keep track of books and also of the borrower who had issued that particular book. An Automated Integrated Library would provide better library services to its users and will be able to maintain the library more accurately which a manual library can't do. This Automated Integrated-Library will completely automate all the activities of the library.

This will possible with proper library professional staff strength in the libraries. Higher education authorities fixed students and staffs ration to the colleges, like this must fix colleges and minimum library professionals staff ratio. Membership in professional associations illustrate in career development. Library professionals continuously update their skills through self-assessment. Uniform library services and facility should be maintained in the colleges. The libraries should try to provide more and more library services to their users. Professionally qualified library professionals are having more knowledge, skills and competencies in the changing information world. Vacant posts of libraries need to be filled up and new posts should be created as per requirement. There are both pros and cons in autonomous and non-autonomous colleges. Though autonomous colleges have greater responsibility, and therefore these institutions remain sensitive and alert to the needs of the students.

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BUILDING LIBRARY COLLECTION FOR FUTURE

Ashtamy. L[1] & Dr. B. Mini Devi[2]

Introduction

In the rapidly evolving 21st-century landscape, libraries are undergoing a fundamental metamorphosis due to the relentless drive towards digital expansion. Digital libraries are not just a new technique of storing and accessing knowledge; they represent a fundamental shift in the direction of the core of academic study. The transition from traditional physical archives to digital information spaces necessitates a complete revaluation of how we comprehend, handle, and engage with knowledge. It also serves as a reaction to contemporary trends. Information science and technical innovation work together to create electronic resources and virtual collection repositories, or digital libraries. This development is driven by the necessity of facilitating simple access, collaboration, and preservation in an era where connection is ubiquitous and data formats are changing swiftly. In the context of the digital library ecosystem, it is crucial to clarify the expected needs and expectations of users. Following an extensive investigation of the current advancements in technology, user needs, and trends the study explains the importance of building library collection.

The collection of libraries provides a solid basis for effective services. Every library builds and maintains its holdings in order to ensure that they are current and preserved for use in the future. Librarians will collaborate with both people and departments to build collections consistently and methodically. Apart from suggesting books, the librarians must keep in connection with the community members for maintaining good collection. Librarians always make sure that the necessary information is provided in the forms that are most relevant to the users. The advent of data analytics has given libraries access to a multitude of data that may help them make better informed decisions using data-driven methods. Libraries may find gaps in their holdings, make better judgements about what to add or delete, and have a deeper knowledge of the needs and preferences of their patrons by using data analytics (Missingham, 2016).

The library's ability to assist current and future generations of academics depends heavily on the collections it builds. Due to the intricate structure of collections and resources, budgetary adjustments are necessary to support the expansion of services

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like data management; nonetheless, collections are still essential for providing support for every aspect of knowledge dissemination. These expanded responsibilities for the library place it in a position to foster the growth of research capacities and expertise that will benefit future generations of scholars, policymakers, and community members. Future challenges will mostly centre on building a world with increased knowledge and academic communication capacities.

Understanding the Needs of Future

Libraries should aware of the information need of users in order to provide better services. Libraries can find out which publications are most popular and which subjects or interests are underrepresented in their holdings by examining data on borrowing trends, search terms, and other metrics. Libraries can determine the gaps in their holdings or the absence of resources on particular themes or topics. Libraries may address these gaps and provide better service to their patrons by using these insights to influence their selections about what resources to add to their collections. Libraries are able to learn which objects are most often used, which are underutilised, and which ones could be most suited for being eliminated from their collection and also which items are most widely in-demand as well as which ones might not be worth the money. By using this data, libraries may make better informed judgments about how best to spend their collection development funds and make sure that the resources they purchase are ones that their patrons would appreciate and utilise. Data analytics may help libraries to sort out this (Rajkumar, 2023).

Data analytics in collection creation can aid libraries in better understanding the requirements and preferences of their patrons. Data analytics can serve as a beneficial tool for libraries seeking to maximise the expansion of their collection. By employing data to uncover gaps in the collection, evaluate the effectiveness of the collection, and optimise budgets, libraries may enhance user outcomes and make more effective use of their resources. This enables libraries to choose which resources to add to or remove from their collections with more knowledge. Data analytics includes examining raw data sets to identify trends, project future occurrences, and make rational decisions based on the results. Modern data analytics methods and procedures are automated by machines and algorithms for human consumption. The various techniques employed for data analytics include diagnostic analysis, predictive analysis, recommendation analysis, and descriptive analysis, which describes what happened and why, and prescriptive analysis, which makes predictions about what will happen next (Sievers-Hill, 2009). Data analytics uses a range of software tools, including workbooks, data concoction, reporting appliances, data harvesting programmes, and open-source languages, to manipulate data at the most complex level. Librarians can use social media to gather users in order to share the latest news, notifications, events and also keep connection with them.

Diversity in Collection

Researchers, scholars, and students have grown increasingly in need of access to data and perspectives from a variety of sources. Libraries are responding by reeval-

uating their collections and ensuring that voices that have not gotten enough attention are not just included but also easily accessible and discoverable. User friendly resources can enhance the services of libraries towards the patrons. Diversity in a library's collection refers to the extent to which it reflects the subjects, perspectives, writers, characters, and stories of disadvantaged or underrepresented groups through various resources like books, journals, newspapers, databases, reference sources, blogs, websites, and so on. These collections can enable the discussion and insights necessary to inform and promote social change (Walters, 2023). Being knowledgeable and accessible to diverse collections can make people informed, approachable and can have deeper understanding of their surroundings.

Libraries are adapted to assist users with disability and are crucial in ensuring access to Internet and other information resources to users as more information is provided through computer and network technology. People with disabilities can satisfy their requirements more quickly and effectively with the use of assistive technologies. Notably, there are more helpful assistive technologies available, like screen readers, hearing aids, sophisticated communication devices, adaptive keyboards, etc. Additionally, accessible media and formats, like HTML (Hypertext Markup Language) books, videos with captions or subtitles, accessible DAISY (Digital Accessible Information System), etc., are beneficial (Chaurasia & Singh, 2022) Libraries should keep stem and steam resources which emphasizes Science, Engineering, Technology, Mathematics, Arts, this will help in building research, teachers, students' community. Including the emerging subjects like aritificial intelligence, machine learning will enhance this.

Technological Advancements

Libraries make significant investments in digital collections to enable flexible and remote access. They also create and manage institutional repositories to store and make available digital copies of academic and research outputs, as well as streaming audio and video content, including instructional videos, films, and music for all type of users. Libraries form consortia to exchange collections and pool resources, increasing access to a wider variety of items without requiring duplicate work. Collaborating with other libraries to exchange and preserve print collections, cutting down on duplication and making sure that less-used resources are preserved (Anderson, 2011). In this digital era wide variety of apps are available for enhancing collection in library.

Libib: The application allows catalogue books using the barcode scanner, ISBN entry, or manual addition of information, Title, author, category, and other criteria can be used to arrange collection. Libib provides features to manage loans, track reading progress, and mark favourites, so can stay organised with books. Also, if collections are spread out across several sites, can create numerous libraries with it. Whether the use the mobile app or the browser version, it provides cross-device synchronization, guaranteeing that the data in the library is current.

Book Crawler: Book Crawler is a personal, portable book database designed for voracious readers. It provides a reliable, easy-to-use solution for organising and sharing favourite book collections within app. Regular functions include importing data from web sources, manually inputting book details, scanning ISBN barcodes, and establishing book groupings based on several criteria including author, genre, title, and more. This location-aware software facilitates book sharing and discussion among readers.

Hoopla: Hoopla delivers digital material (audiobooks, CDs, DVDs, and shelf-ready solutions) to public libraries for over 25 years. As public libraries change over time, it collaborates with them to provide users with the finest information in the most effective manner, hoping to foster a growing love for them in the process.

Gerty: Gerty is a straightforward and carefully developed book reading application. Separate library for paper and eInk books, magazines, and other publications. It will scan barcodes to look up info and covers of paper books. Auto scroll with speed adjustment and reading time estimation and also maintain a private blog, take notes, make marginalia, or compose a photo essay.

Collaborative spaces

Libraries offer communities places to work, create, study, play, and socialise. The requirements for collaborative spaces in play-like creating a claymation-are very different from those in education-like gathering with research partners. The ability to cooperate, communicate, work in groups, solve issues creatively, and exercise critical thought is necessary for success in the network economy. Not only do libraries offer space, but they also offer resources and research support to a diverse range of users, such as co-working spaces, nonprofits, and for-profit and nonprofit enterprises. The number of people using the library as an office, workshop or experimentation ground has increased exponentially. Be prepared to navigate longer stays and multiple competing demands on your collaborative spaces. Libraries will be better able to meet the diverse needs and educational possibilities of their patrons if they go beyond a one-size-fits-all strategy for collaboration spaces (Lesneski, 2017).

Libraries are moving towards a paradigm that highlights collaboration as the foundation of education. This change is a reaction to how education is changing and how important it is for students to work in teams, communicate, and solve problems together. To support collaborative academic endeavours, libraries increasingly provide group study spaces, interactive learning zones, and adjustable seating layouts. Exposure to a variety of viewpoints, enhancement of the educational process, and development of a feeling of community within the academic environment are among the advantages of collaborative learning. Technology is essential in making this possible since it allows for virtual cooperation through the use of digital tools, internet platforms, and multimedia resources. To foster a feeling of common academic purpose and to reaffirm that learning is a collaborative endeavour, libraries are hosting interactive learning events, workshops, and group study sessions (Ari, 2018).

Collaborative spaces support the growth and development of library collections. Since it brings users from diverse fields together and promotes interdisciplinary collaboration, use and contribution of open-access resources. Collaborative spaces pave new platforms for discussing recent technological advancements, and new resources, thus it broadens the collection. Diverse user engagement can increase special collections and their usage and visibility enhancing the exploration of comprehensive collections.

Sustainable Collection

According to William Walters (2023), a "sustainable collection" is one that can be preserved throughout time without suffering from major deterioration and has a budget that allows for both the timely purchase of key monographic materials and ongoing access to serial resources. A collection is generally considered economically viable if the rate of price increases does not outpace the rate of rise in the library acquisitions budget. The growth of a sustainable collection depends on the work required to preserve materials for future generations and to at least partially separate them from commercial publishers. The preservation of library resources, or the safeguarding of cultural assets and property by preventing physical degradation, damage, and loss of information content, is one of the broader administrative concerns associated with library sustainability. This primary requirement includes tasks like appropriate storage, handling, reformatting, and replacing resources that have been stored; these tasks must to be carried out with an eye towards sustainability. The same holds true for other common library activities that go hand in hand with preservation, such creating waste (like scrap) materials, figuring out how to recycle items rather than throwing them in the trash, selecting "greener" alternatives when making supply purchases, etc (Meschede & Henkel, 2018).

Libraries can "green" their collection processes by choosing items that support green practices, removing things that prioritize recycling and reusing, and choosing materials that adhere to the idea of lowering the carbon footprint that an organization leaves behind. There is still debate, nevertheless, regarding the environmental impact of substituting electronic resources for print books in print collections. The economic, social, and environmental sustainability of "Big Deals" depends on several factors, such as the choice of relevant and cost-effective publisher bundles, the duration of time that previously purchased resources are accessible, user satisfaction, the eco-friendliness of storage, and techniques. The long-term viability of "Big Deals" in terms of the economy, society, and environment depends on several variables, including the selection of pertinent and reasonably priced publisher packages, the length of time that access to previously purchased resources is granted, user satisfaction, the environmental friendliness of storage, and strategies for publicizing library resources and making them widely accessible (Connell, 2010).

The Sustainable Shelves Programme provides a significant solution for getting rid of outdated books. This effort, managed by Baker & Taylor and collections, makes use of a logistics provider to allow libraries worldwide to sell books that have been weeded out or removed from circulation. After that, the logistics business picks up the

books, determines their worth, divides them into recyclable and resaleable categories, and rewards the library appropriately. Libraries have had to adapt to the growing demand for seamless and rapid digital interactions. To reach more people beyond branch walls, this has led to the digitization of various services and the use of new technologies. Furthermore, libraries have a far smaller environmental effect when these digital alternatives are used. For example, libraries can use PressReader to give members access to over 7,000 foreign newspapers and journals instead of delivering print copies to their branch. Libraries and publishers may work together to reduce the environmental impact of information sharing by sharing trustworthy, thoroughly researched materials. This way, media literacy may be increased without negatively impacting the environment (Banks, 2023).

Challenges Faced

Budgetary issues: The rapid growth of priceless electronic resources poses difficulties for librarians in terms of acquisition, de-acquisition, selection, and preservation techniques, among other collection development issues.

Information explosion: In an increasingly digital world, collection creation has grown more challenging. Librarians must go beyond conventional sources to improve the discoverability and accessibility of research materials stored in repositories and on the public internet.

Diverse user needs: Users from various categories demand for wide variety of resources may challenge librarian to understand which is to be included and which is to be excluded from the collection.

Technical integration: To maintain digital collections, certain technical infrastructures are required. Implementing and maintaining these are challenges.

Open access and licensing issues: When budgets are unstable and subscription fees for databases and e-journals, high costs may lead to accessibility challenges. Also, the complex licensing agreements create usage limitations and restrictions (Herzog, 2004).

Conclusion

The paper emphasizes the dynamic and changing role of library collection building in the digital era. This study provides a proper approach and useful insights to libraries by examining significant trends, analysing the influence of technology, and offering a strategic framework. The paper examines academic publications, industry reports, and case studies to find and synthesize information regarding existing and developing methods in library collection development. Investigating the transition to digital collections, which include e-books, online journals, and multimedia resources. The findings emphasise the necessity of taking a user-centric, and capitalising on technology improvements to create collections that are varied, accessible, and responsive to the needs of future

generations. The collection idea will probably be redesigned or removed in the next ten years to allow for dynamic access to an infinite number of information products, which bodes well for libraries. To remain viable, libraries need to reconsider their approaches to collection and service.

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IMPACT OF TRADITIONAL ART EDUCATION ON SOCIETAL DEVELOPMENT: INSIGHTS FROM KERALA KALAMANDALAM

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Introduction

Art institutions are vital to the social and cultural development of society. They preserve and promote traditional art forms, offering a platform for artists to showcase their talents. Moreover, these institutions provide educational programs that not only pass down traditional techniques and knowledge to younger generations but also foster a sense of community and cultural identity (Clover, 2015; Salayo et al., 2021; Okonkwo, 2014).

Kerala Kalamandalam, a renowned art institution in India, is a prime example of how the Gurukula model helps preserve culture. Established in 1930 by the visionary poet Vallathol Narayana Menon and his associate Manakkulam Mukundaraja, Kerala Kalamandalam has played a pivotal role in safeguarding and promoting Kerala's rich artistic heritage. The institution offers training from the 8th standard through graduation in various art forms, as well as post-graduate and research programs. This rigorous training, rooted in the Gurukula tradition, fosters discipline, teamwork, and a deep appreciation for the arts among students, shaping their identities and behaviours (Divakaran et al., 2022).

Kerala Kalamandalam ensures the survival of classical art forms such as Kathakali, Mohiniyattam, Koodiyattam, Panchavadyam, Thullal, Mridangam, and Carnatic music. It also plays a crucial role in countering radicalism and promoting peace by cultivating respect for cultural differences and a love for harmony (Lueraj, 2021). Through its comprehensive curriculum and immersive learning environment, Kerala Kalamandalam has become a beacon of hope, influencing the cultural and moral fabric of the community. The institution's dedication to preserving and disseminating traditional art forms has profoundly impacted society's structural and cultural development (Sharma & Thatte, 2021).

Art institutions also foster social development by organizing events, exhibitions, and performances that bring people together, promoting social interaction and cohesion. These events can help break down cultural barriers and foster a better understanding and

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appreciation of different cultural traditions and practices. Additionally, the presence of art institutions in a community can have economic benefits, attracting tourists and art enthusiasts, and contributing to the local economy.

Through its rigorous curriculum and holistic approach to education, Kerala Kalamandalam has produced generations of artists who have excelled in their art and become cultural ambassadors, spreading the rich heritage of Kerala and India globally. Their contributions have enriched the cultural tapestry and fostered a sense of identity, pride, and unity among communities.

In conclusion, traditional art education, as exemplified by institutions like Kerala Kalamandalam, plays a pivotal role in preserving cultural heritage and contributes to society's holistic development by nurturing creativity, fostering a deep understanding of cultural diversity, and promoting social cohesion. Understanding the relationship between art and culture is crucial in appreciating the societal impact of traditional art education. Kerala Kalamandalam, known for its pioneering role in preserving and promoting classical art forms, serves as an exemplary institution that has left an indelible mark on the region's cultural and social fabric (Nafsika, 2019; Guo, 2023).

The primary objective of this research paper is to explore and document Kerala Kalamandalam's multifaceted impact on the societal development of the region. By examining the institution's role in preserving and promoting traditional art forms, nurturing cultural identity, and fostering social harmony, this paper aims to highlight the crucial contribution of traditional art education to the holistic progress of society. The specific objectives include understanding the art education methodology of Kerala Kalamandalam, identifying how these institutions influence the cultural development of society and protect artistic and social values, and evaluating the scope and value of art education in the present scenario.

Kerala Kalamandalam's unique Gurukula system of education, which emphasizes personal guidance, mentorship, and a strong student-teacher relationship, is fundamental to its approach to art education. These principles, drawn from traditional Indian arts, ensure the thorough transmission of knowledge and skills and cultivate a deep bond between the teacher and student, fostering a respectful and harmonious learning environment (Raina, 2019).

Objectives of the study

- To examine how the Gurukula model of education employed by Kerala Kalamandalam promotes the preservation and transmission of Kerala's cultural heritage.
- To analyse the role of Kerala Kalamandalam in shaping the identities, behaviours, and moral values of its students through a holistic education in classical art forms.
- To investigate Kerala Kalamandalam's contribution to fostering social harmony, countering radicalism, and promoting cultural understanding within the community.

Significance of the Study

Kerala Kalamandalam, founded in 1930 by poet Vallathol Narayana Menon and Manakkulam Mukundaraja, has evolved into a crucial cultural centre dedicated to teaching traditional Kerala art forms such as Kathakali, Mohiniyattam, Koodiyattam, Thullal, and classical South Indian music and percussion. Since 2007, it has functioned as a Deemed University for Art and Culture, underscoring its importance in the cultural landscape.

The significance of this study lies in exploring how Kerala Kalamandalam has transcended its origins, bringing art forms from temple compounds and provincial courts into the public sphere. This transition has democratized access to these traditional arts, allowing individuals to learn and perform regardless of community, caste, or religion. The institution has thus played a pivotal role in breaking down social barriers and fostering a secular appreciation for these art forms.

Vallathol Narayana Menon's insistence on retaining the quintessence of the ancient Gurukula system is central to this study. The intimate bond between preceptor and disciple in this system is seen as a priceless gift of Indian educational culture, one that Vallathol himself benefited from and deeply valued. By preserving this time-honoured practice, Kerala Kalamandalam has not only ensured the meticulous transmission of artistic skills and knowledge but also fostered a deep cultural and moral grounding in its students.

This study aims to highlight the multifaceted impact of Kerala Kalamandalam on societal development. It will examine how the institution's unique educational methodology promotes the preservation and transmission of Kerala's cultural heritage. Additionally, the study will analyse the role of Kerala Kalamandalam in shaping the identities, behaviours, and moral values of its students through holistic education. Finally, it will investigate the institution's contribution to fostering social harmony, countering radicalism, and promoting cultural understanding within the community.

Through these explorations, the study will underscore the vital role of traditional art education in preserving cultural heritage and contributing to the holistic development of society. Kerala Kalamandalam serves as a model of how such institutions can impact societal development by nurturing creativity, fostering cultural diversity, and promoting social cohesion.

Scope of the Study

The scope of this study encompasses an in-depth analysis of the multifaceted impact of Kerala Kalamandalam on the societal development of the region. The study will focus on several key areas:

1. Institutional Role: This research will delve into Kerala Kalamandalam's pivotal role in preserving and promoting traditional Kerala art forms, including Kathakali, Mohiniyattam, Koodiyattam, Thullal, and classical South Indian music and

percussion. Since its founding in 1930 by poet Vallathol Narayana Menon and Manakkulam Mukunda Raja, and functioning as a Deemed University for Art and Culture since 2007, the institution has grown into a crucial cultural centre.

2. Cultural Identity: The study will investigate how Kerala Kalamandalam nurture's cultural identity and fosters a deep appreciation for the arts among its students through the Gurukula model of education. This model emphasizes personal guidance, mentorship, and a strong student-teacher relationship, promoting an indefinable intimacy between the preceptor and the disciple. The institution's rigorous training, beginning from the 8th standard and extending to post-graduation and research programs, plays a significant role in shaping the identities, behaviours, and moral values of its students.
3. Social Harmony: The research will analyse Kerala Kalamandalam's contribution to fostering social harmony, countering radicalism, and promoting cultural understanding within the community. By offering opportunities for aspirants to learn and perform these art forms beyond the barriers of community, caste, and religion, the institution has broadened the aesthetic space for the arts in a secular climate.

Comparative Analysis: While the study will primarily focus on Kerala Kalamandalam, it will also provide a comparative analysis with other art education institutions in India to highlight differences in educational methodologies and impacts.

Limitations of the Study

Despite its comprehensive approach, the study acknowledges several limitations:

1. Data Constraints: The research will primarily rely on available literature, interviews, and observations within Kerala Kalamandalam. As a result, the findings may be influenced by the perspectives and experiences of individuals involved with the institution.
2. Temporal Context: This study is constrained to the temporal context of the present scenario and the historical development up to the current period. Future changes in educational practices or societal impacts may not be captured.
3. Comparative Limitations: The study does not include a detailed examination of the infrastructure and curriculum development of other art education institutions in South India due to time constraints. The unique educational model of Kerala Kalamandalam, based on the Gurukula system, is distinct and may not be directly comparable to other institutions.
4. Unique Educational Model: The peculiarity of the subject matter means the teaching methodology adopted at Kerala Kalamandalam is distinctive. The institution's focus on intensive individual attention from master teachers limits the number of admissions, which may affect the generalizability of the findings.

Kerala Kalamandalam promotes international associations, serving as a central

link with the global scientific and artistic community. The institution's engagement with international research has facilitated significant cultural exchanges, influencing both Eastern and Western artistic landscapes. Through collaborative projects and support from various cultural organizations, Kerala Kalamandalam has contributed to a greater appreciation of Indian art forms on a global stage. The institution's comprehensive curriculum, encompassing vocal and instrumental music, makeup, and costuming, fosters well-rounded artistic development in students.

This study aims to provide valuable insights into the multifaceted impact of Kerala Kalamandalam on cultural and societal development. While the study acknowledges its constraints, it underscores the need for further research to expand the understanding of traditional art education's broader implications on societal development. Kerala Kalamandalam's unique educational approach, international associations, and comprehensive curriculum highlight its pivotal role in promoting, preserving, and disseminating traditional art forms while fostering social and economic mobility.

Methodology

In this qualitative study, our methodology focuses on exploring the development of Kerala Kalamandalam and gathered data from various published sources such as textbooks, booklets, magazines, and articles that discuss the institution's origin and growth. Additionally, we conducted an unstructured questionnaire with veteran artists in Kathakali, Koodiyattam, and Mohiniyattam to capture their experiences and perspectives on Kerala Kalamandalam's influence. These data sources were chosen to provide a comprehensive understanding of the institution's historical significance and educational practices.

Our data analysis involved a hypothetical approach, where we explored potential impacts and implications of Kerala Kalamandalam's educational model and cultural initiatives. This analysis was complemented by a thorough literature study, which formed the basis for framing our findings and interpretations. The literature study provided a concise yet comprehensive overview of Kerala Kalamandalam's role in preserving and promoting traditional art forms in Kerala. Despite the study's limitations, such as the subjectivity of qualitative data and the availability of published materials, our methodology provides valuable insights into Kerala Kalamandalam's impact on cultural and societal development. We believe that our findings will contribute to a better understanding of the institution's significance in the preservation and promotion of traditional art forms in Kerala.

Results and Discussions

Gurukula Vidhyabhyasam: The Residential Learning Experience at Kerala Kalamandalam

Kerala Kalamandalam distinguishes itself through its distinctive approach to art education. The institution embraces *Gurukula Vidhyabhyasam*, a residential

learning system reminiscent of ancient Indian tradition, where students reside within the institution from the 8th grade onwards. This immersive experience is complemented by *sadhakam*, a rigorous training regimen designed to cultivate discipline and hone artistic skills. Physical conditioning, including exercises to enhance flexibility, is prioritized, while meticulous attention is given to facial expressions and the subtle nuances of eye movement, elements crucial for captivating stage presence. Given the importance of gestures, or mudras, in these art forms, their mastery forms an integral part of the curriculum.

A Unique Approach to Arts Education: Kalamandalam's Emphasis on Practice and Performance

Kalamandalam was started mainly for the growth and development of Kerala arts such as Kathakali, Koodiyattam, and Mohiniyattam. Therefore, the main purpose of the education method here is to protect the beauty of such arts without getting lost. Theoretical aspects such as the history of arts, growth reforms, aesthetics, and practical training through rigorous daily practice are acquired through Kalamandalam. Unlike other universities that follow the period system, Kalamandalam's educational method is to teach practical classes of three hours duration with emphasis on applied study of art along with other theoretical subjects. Through this, the students who complete their studies from Kalamandalam will get clear knowledge about all the areas of the studied art. Also, unlike other universities, the monthly stage presentations that are part of the study and other programs offered by Kalamandalam are all ways for students to develop stage experience and demonstrate excellence in their art. But to introduce his art to the outside world, knowledge of foreign languages including English is essential. Its deficiency exists in the education system of Kerala Kalamandalam.

Navigating a Changing Landscape: Challenges to Traditional Art Institutions

In our increasingly digital world, where technology often overshadows other aspects of life, the arts remain essential. While independent art instruction has become prevalent, with professional teachers offering specialized training, formal art institutions play a vital role in preserving the integrity and beauty of traditional art forms. These institutions provide a structured learning environment where time-honoured methods and practices are passed down to new generations.

However, art institutions face challenges as fewer students pursue art as their sole vocation. Many opt to study art alongside other disciplines, leading to a decline in enrolment at dedicated art schools. This trend threatens the very existence of these institutions, even as the need for art's transformative power remains. Art has the capacity to inspire joy, cultivate moral sensibility, and ignite social change by exposing injustice. To safeguard cultural heritage and nurture human happiness, it is imperative that we support art institutions and ensure the transmission of these invaluable art forms to future generations.

Learning Through Openness and Compassion: Lessons from Shantiniketan

The art education centres should be provided with a student-friendly environment at all levels. *Santhinikethan,* a world-famous art education centre in West Bengal, is a typical example of student-centered education and the social commitment of the artists. The reputed artist *Cheroth, Murali,* reals his experiences from *Santhinikethan* taught him the openness of heart and compassion to all.

Evolving or fading? The Need to Adapt Traditional Art Forms

Art, by its very nature, is a dynamic force. Just as societies evolve, so too must artistic expressions adapt to reflect the changing times. While the legacy of colonialism may linger in our perspectives, it's crucial to embrace evolution in art. Modernizing the content of performances, while respecting the essence of tradition, is not merely acceptable but essential for art to remain relevant. The tendency to cling rigidly to the past, risking the potential loss of these art forms altogether, would be a disservice to their inherent vitality. The winds of change impact every aspect of our world, and art is no exception.

Conclusion

Kerala Kalamandalam stands as a beacon of traditional arts education, effectively transmitting the rich heritage of Kerala's performance arts through its unique approach. The institution's commitment to Gurukula Vidhyabhyasam fosters an immersive learning environment where rigorous practice and a deep understanding of artistic nuances are paramount. While Kalamandalam excels in cultivating practical expertise and stage presence, integrating modern language instruction, particularly English, could further empower students to share their art on a global stage.

Furthermore, in a rapidly changing world, the challenges faced by traditional art institutions like Kalamandalam highlight a broader need to support and sustain these invaluable cultural spaces. As exemplified by Shantiniketan's student-centric approach and emphasis on social responsibility, fostering open and compassionate learning environments – spaces where students can experience a "hybrid cultural model" and encounter diverse art forms – can further enrich the educational experience and cultivate a more holistic understanding of art's power. This resonates with the understanding that education, art, and culture are deeply intertwined, each shaping and enriching the other. By nurturing the next generation of artists and preserving these time-honoured traditions, institutions like Kerala Kalamandalam play a vital role in ensuring that the beauty and transformative power of art, a power capable of transcending societal boundaries, continues to inspire and enrich society. Kerala Kalamandalam's firm place on the world's cultural map is a testament to the enduring power of tradition and the importance of nurturing artistic expression for the betterment of humanity.

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LIBRARIES AS PROTAGONISTS OF PROGRESS IN ACHIEVING SUSTAINABLE DEVELOPMENT GOALS: A 2030 NARRATIVE

Gone Rangappa Naidu[1] & Dr Keshava[2]

Introduction

The Sustainable Development Goals (SDGs) are a set of 17 interconnected global goals with 169 Targets established by the United Nations in 2015 as part of the 2030 Agenda for Sustainable Development. These goals aim to address a wide range of global challenges, including poverty, inequality, climate change, environmental degradation, peace, and justice. The SDGs build on the successes and lessons learned from the Millennium Development Goals (MDGs), with a broader and more ambitious scope (Transforming Our World: The 2030 Agenda for Sustainable Development | Department of Economic and Social Affairs, n.d.). As we stand in mid-2024, it is imperative to evaluate the progress made towards these goals over the past nine years. This evaluation involves analyzing statistical data from various governments and non-governmental organizations (NGOs) at both national and international levels. By assessing the achievements and shortcomings from 2015 to June 2024, we can better understand the current trajectory and the pace at which we are advancing towards the SDGs.

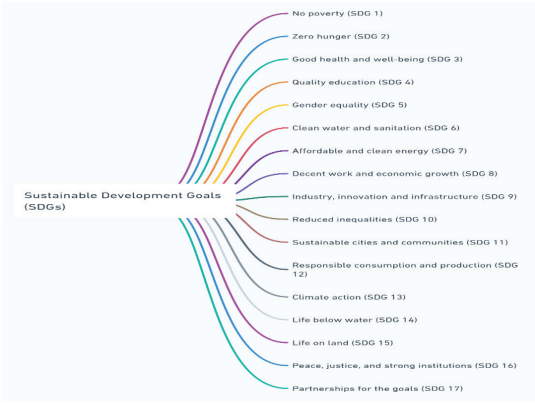


Fig.1: **The** UN 17 Sustainable Development Goals (SDGs)

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This analysis will provide crucial insights into the remaining challenges and the accelerated efforts required in the remaining five years and six months to achieve the targets set for 2030.

Objectives

- To explain how libraries contribute to the realization of specific Sustainable Development Goals (SDGs)
- To provide an overview of the current status of Sustainable Development Goals by analysing Reports published by National and International Organizations.
- To Compare the Progress of India with Global Progress in achieving SDGs.

Methodology

This paper utilizes a qualitative approach, drawing insights from a comprehensive review of academic literature and analysing reports on Progress in Achieving Sustainable development Goals released by various National and International Organizations. The methodology includes an analysis of Selected Goals Mentioned Below:

1. No Poverty
2. Zero Hunger
3. Good Health
4. Quality Education
5. Gender Equality.

Reaching Goals by 2030: Performance and Possibilities

No Poverty - End Poverty in all its forms everywhere

By 2030, the goal is to eradicate extreme poverty for all people worldwide, defined as living on less than $1.25 a day. According to the World Bank's Poverty and Inequality Platform, approximately 660 million people globally are currently living in extreme poverty. In India alone, about 140 million people, which constitutes around 13% of the country's population, are living conditions of extreme poverty (*World Bank Group - International Development, Poverty, & Sustainability*, n.d.).

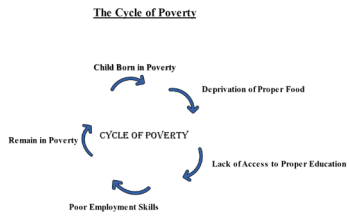


Fig.2: The Cycle of Poverty

Poverty directly impacts the achievement of several other Sustainable Development Goals (SDGs). Specifically, extreme poverty hinders progress towards

Zero Hunger (Goal 2): Poverty restricts access to proper nutrition and food security, continuing the cycle of hunger and malnutrition.

Good Health and Well-being (Goal 3): Those living in poverty often lack access to essential healthcare services, resulting in poorer health outcomes and higher mortality rates.

Quality Education (Goal 4): Financial constraints prevent many children from attending school, leading to lower educational attainment and reduced opportunities for economic advancement which will be affect the future of their family and remain in poverty cycle.

Gender Equality (Goal 5): Poverty disproportionately affects women and girls, limiting their access to resources and opportunities. A reduction in investment in girls' education further restricts them to traditional roles, such as household work. Decent Work and Economic Growth (Goal 8): Extreme poverty restricts individuals' ability to participate in the labour market, limiting economic growth and the development of decent work opportunities.

Eradicating poverty by 2030 will have a profound and positive impact on achieving these interconnected goals. By alleviating poverty, we can ensure better food security, improve health outcomes, enhance educational opportunities, promote gender equality, and foster economic growth and decent work for all. Addressing extreme poverty is thus a critical step in creating a more equitable and sustainable world.

How Libraries can Help People to come out of Poverty Cycle

Providing Information regarding Government Schemes. Libraries have the Information about various government Schemes which are specially designed for the Poor people in the society, Due to lack of quality education and access to information certain eligible beneficiaries are not able to avail any services. In this Regard the below mentioned possible things library staff can perform:

- Library authorities has to take initiative to Identify poor families in their library limits.
- Conducting Awareness Programmes about various government schemes and their eligibility criteria.
- Explain them Application Procedure and for the needy staff themselves can help in applying for availing beneficial schemes.

The primary responsibility of any library should be to empower individuals with the knowledge and resources they need to become well-informed and engaged members of society.

Organizing Skill Development Programmes

Libraries can also organize skill development programs that are customized to meet the specific needs of each district and its communities. These programs aim to

empower both educated and uneducated individuals by equipping them with relevant skills suited to the region's demands.

Tourism

If Library located where tourism sector is predominant then for the people in those regions will be getting benefit by Offering courses on hospitality management, tour guiding, cultural heritage preservation, and foreign languages to support local tourism industries.

Agriculture

If the Library located in areas where Agriculture is Predominant then Providing workshops on sustainable farming practices, crop management, organic farming, and agricultural technologies to enhance productivity and environmental sustainability. Providing Information to the farmers about best practices practicing in all over world. Farmers are more rely on traditional farming methods which incur huge input cost per hectare to cultivate. So Providing farmers a valuable and reliable Information in timely manner in their regional languages would greatly benefit the farmer community to make profit out of farming makes them to come out of the Poverty.

Industrial

Offering training in technical skills, industrial safety practices, manufacturing processes, and vocational skills relevant to local industries. Also libraries can collaborate with the Industries to provide better services to the communities with the aid of Corporate Social Responsibility (CSR) funds to organize Training Programmes and to procure Tools and Machineries requirement for user training.

Information Technology (IT)

Offering courses on computer literacy will be attract more users to the Libraries, IT industry having enough potential to employ more number of people with the skills like coding, software development, cybersecurity, and digital marketing to prepare individuals for careers in the tech industry. Libraries can also Create a List of Freely available courses and their benefits and Disseminate the Information to the unemployed, with the use of Selective Dissemination of Service (SDI) libraries can also provide information about Job vacancies available to the registered members based on their skills and Interests.

Supporting local artists and artisans

Supporting local artists and artisans with workshops on visual arts, performing arts, crafts, digital media, and creative entrepreneurship skills to market their products with the various Marketing Skills would help them in marketing their produced Products in National and International Markets. It increasing demand for local Arts and Crafts also helps in boosting Tourism in that area which will create more jobs.

To effectively provide training in the aforementioned skills, library staff may not always possess the required expertise. Therefore, libraries can collaborate with domain experts to conduct specialized programs. Additionally, partnerships with NGOs dedicated to social causes can further enhance program delivery and impact, leveraging their experience and resources to better serve the community's educational needs.

By addressing these specific regional needs through targeted skill development programs, libraries can play a vital role in enhancing economic opportunities, fostering community development, and empowering individuals with the skills will break the shackles of poverty chains and helps them to come out of Poverty. Coming out of poverty in turn yields the positive results in achieving other Sustainable Development Goals (SDGs) which are mentioned above.

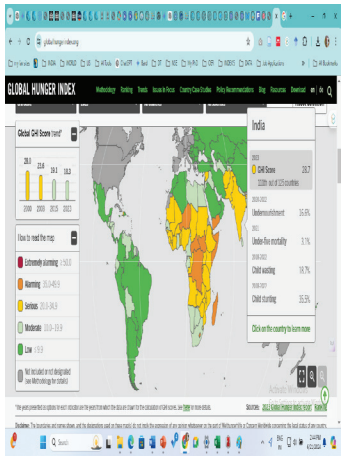
Zero Hunger

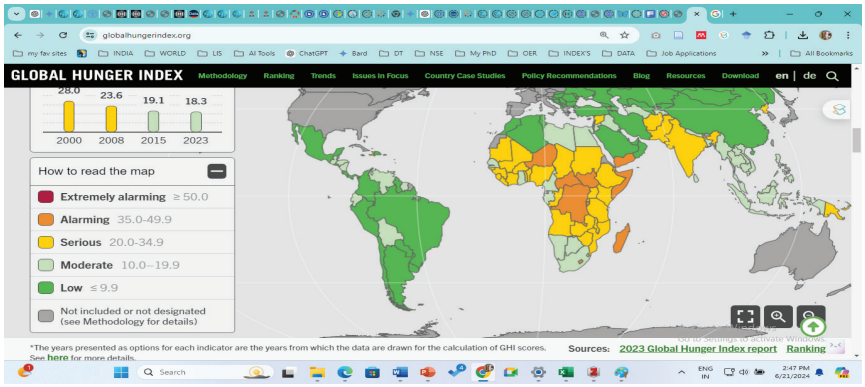
Where India Stands in Global Hunger Index (2023)

GHI Score (2023): India's GHI score is 28.7. The Global Hunger Index scores countries based on four indicators: undernourishment, child wasting, child stunting, and child mortality. A lower score indicates better performance in terms of reducing hunger. The scale typically ranges from 0 (no hunger) to 100 (extreme hunger).India is ranked 111th out of 125 countries (*Global Hunger Index Scores by 2023 GHI Rank*, n.d.). This indicates that India is among the lower-performing countries in terms of hunger and undernutrition.



Source: (Pirlea et al., n.d.).





Source: (*Global Hunger Index (GHI) - Peer-Reviewed Annual Publication Designed to Comprehensively Measure and Track Hunger at the Global, Regional, and Country Levels*, n.d.).

What can Libraries do to Achieve Zero Hunger by 2030?

- Key reasons to Hunger in any country is mismatch in Supply and Demand of Food,
- Poverty (even though food is available people may not in a position to afford it). We already discussed how Libraries can help in alleviate poverty. Now we will discuss here how libraries can address Supply and Demand mismatch of Food in the society.

Supply side Issues: Food Production

To meet the ever-growing demand of food products we have to increase crop production but arable land is stable (limited) and in some cases depleting and becoming infertile due to heavy use of chemical fertilizers and other wrong practices.

- As a Library Information professional make sure the best scientific practices which are practised across the nations must be available to the farmers who are in library limits.

- Library authorities can disseminate the best practices through social media by creating Audio, Video and also in text format so that both educated and illiterate farmers can be aware of Scientific developments in the Agriculture Sector.
- Majority of farmers are relying on loans from informal sector especially from money lenders who charge high rate of interest, which make farmers remain in debt cycle which will negatively affect their investment for the next crop. In this regard library staff can provide various formal lending options available, Documents required and Information about interest rates would be great assistance to farmers.
- Majority of the farmers are not Insurance their crops which will adversely affect them due to crop loss. libraries can Provide Information about policy rates and benefits of Insurance policy to the farmers which help them in crop loss due to crop failure for various reasons.

Less Crop yield per hectare

By providing information to the farmers about high yielding variety seeds for the cultivation.Introducing them Organic farming where input cost will be less and give good crop production, in this regard in collaboration with agricultural scientist conduct a awareness programmes on how to make organic fertilizers in their farms with minimal effort by using agricultural wastage.

Wastage of Food

Due to lack of enough storage facilities every seasons lakhs of food getting wasted, to address this issue libraries can analyse the cropping pattern in their areas and take a initiative to collaborate with funding agencies and help in building storage areas. Library professionals can approach concern authorities and make sure the wastage of food is not happen.

Demand Side Issues

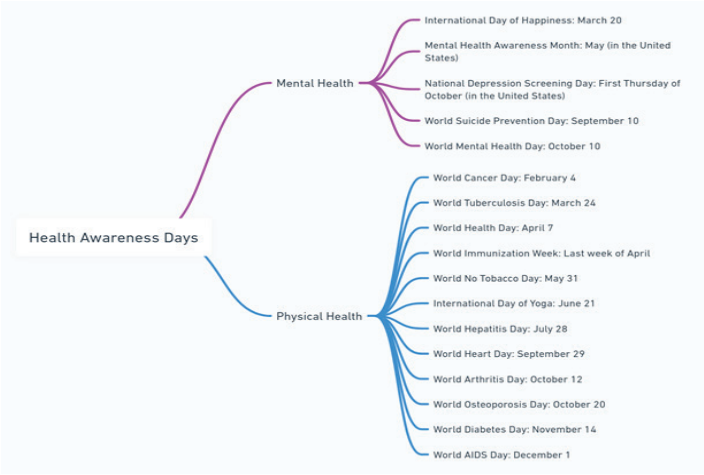
Population Growth

Growing population is also a cause of concern, recently India overcame China and become world most populous country. To feed 1.41 billion Indian Population is a challenging task. Every individual and organisation have to play their role to make sure that every one in this planet to have a square meal to eat. Libraries as organisations and library professionals as individuals has to take a lead role in this responsibility.

Good Health and Well-Being

Libraries play a crucial role in creating awareness and educating the public about important National and International days especially the dates which are mentioned in the below figure are important dates on Mental Health and Physical Health. On these days libraries can conduct programmes to create awareness among public about good health practices, some of the events which will be help in creating awareness have mentioned below.

- Conducting Essay writing competition on various topics like Happiness, Mental health, Benefits of Yoga, Health issues due to bad habits like smoking drinking and eating Junk food.
- Libraries can also call for a competition short film making on awareness about health and wellness programmes.
- On each of the following mentioned special days libraries can tie up with schools and colleges to spread awareness on Health information. Good Health is considered as Wealth, so as health information.
- Misinformation also growing concern now a days, to address these libraries has to come create a website where people can post their queries on misinformation to verify whether information is genuine or fake. Libraries can verify the source by approaching concern authorities or domain experts to give authenticate information to the public.
- Especially a misinformation of Health tips can adversely affect the person health and some times may cause to fatality. Information professionals has to pro-actively provide reliable and authenticate information in time.



Quality Education

What Annual Status of Education Report (ASER 2023: Beyond Basics) Says?

(Survey based on study of youth aged 14 to 18 years in rural India)

With 86.8% of 14-18-year-olds currently enrolled in educational institutions, libraries can play a crucial role in achieving 100% enrolment (*ASER-2023-Press-release1_English_16-Jan.Pdf*, n.d.). Libraries can create awareness among parents about the advantages of education and motivate them to ensure their children are enrolled. Library staff can also actively participate in identifying reasons why some children are not enrolled in school. If the reasons are monetary, they can suggest approaching a social welfare officer for possible assistance and support from the government.

Current State of Quality Education

Despite progress in educational enrolment, we face significant challenges in providing quality education. About 25% of students aged 14-18 still cannot read a Standard II level text fluently in their regional language, and more than half struggle with basic division (3-digit by 1-digit) problems.

Importance of Quality Education

Providing quality education is essential for eradicating poverty. Without quality education, achieving Goal 1 (No Poverty) becomes difficult, which in turn impacts the achievement of other Sustainable Development Goals (SDGs). Conversely, without eradicating poverty, it is challenging to provide quality education, creating a cyclical barrier to progress.

By addressing these aspects, libraries can help ensure that all children receive a quality education, which is fundamental for sustainable development and poverty eradication.

Gender Equality

At the current rate of progress, it is estimated that it will take up to 286 years to close gaps in legal protection and remove discriminatory laws, 140 years for women to be represented equally in positions of power and leadership in the workplace, and 47 years to achieve equal representation in national parliaments (United Nations, 2023). Women spend far more time on unpaid and domestic work than men, on average an additional 2.4 hours a day.

What Libraries Needs to do

Promoting Gender Equality Through Library Programs

Libraries are powerful hubs of knowledge and community engagement. Special programs conducted by libraries can play a significant role in promoting gender equality. This can include:

- Hosting workshops and seminars that discuss gender equality, women's rights, and related topics can raise awareness and foster dialogue within the community.
- Ensuring that libraries have a diverse collection of books, including those that highlight gender issues, women's achievements, and feminist perspectives. This helps in educating and empowering individuals.
- Display that showcase the contributions of women throughout history can inspire and educate visitors.
- Providing access to resources like legal aid, counseling services, and educational materials specifically tailored to address gender based challenges.

Skill Development Courses for Women's Economic Empowerment

Economic empowerment is crucial for women's independence and wellbeing. Organizing skill development courses can be a beneficial in achieving equality.

- Offering courses in fields such as IT, digital marketing, financial literacy, and entrepreneurship equips women with practical skills for employment or starting their businesses.
- Providing training in traditional crafts, vocational skills like tailoring, cooking, or handicrafts, can open up income generating opportunities for uneducated women.

Providing Access to Government Schemes for Women's Empowerment:

Many governments have schemes and programs specifically designed to promote women's empower ment. Libraries can play a crucial role in ensuring women are aware of and can access these schemes. This involves:

- Libraries can serve as information centres where women can learn about various government schemes related to education, healthcare, entrepreneurship, and financial assistance.
- Library staff can provide guidance and support to women in understanding the application procedures for different.
- Libraries can follow up with beneficiaries to ensure they are benefiting from the schemes and address any challenges they may face in accessing or utilizing the benefits.

Conclusion

Libraries play a pivotal role in the achievement of the Sustainable Development Goals (SDGs) by serving as active agents of change within their communities. As we approach the 2030 deadline, it is clear that concerted efforts and strategic planning are essential to meet the ambitious targets set by the United Nations. The progress made thus far highlights both the successes and the areas needing improvement. Libraries, with their vast resources and dedicated staff, are uniquely positioned to contribute to this global endeavor by promoting education, reducing inequalities, and supporting sustainable practices. It is imperative that library authorities continue to foster innovation, collaboration, and community engagement to ensure that libraries remain relevant and effective in the pursuit of a more equitable and sustainable future. The time for action is now, and the library community must rise to the challenge to ensure that they are not just remembered in history books but are recognized as key contributors to the success stories of the SDGs.

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