Global trends in libraries and librarianship

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KOLKATA TRAM LIBRARY: DEFINING NEW HORIZON FOR MOBILE LIBRARY IN INDIA

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Abstract

Tram service was introduced in Calcutta for making transportation easy, but at present it is dying, failing to cope with the rat race of the city. Similarly, public libraries of Kolkata rather than West Bengal, are also not being able to provide service to the users as the number of libraries getting close is increasing day by day due to several reasons. Hence, the scenario is such that in-spite of having enthusiastic readers the libraries are not being able to extend its service to them. This is where the importance of mobile libraries stood out. The West Bengal Transport Corporation Limited took the initiative to connect the two dieing services (that is the tram service and the public libraries) and bring out a new age solution, which is the Kolkata Tram Library. With positive hopes of serving the library users of Kolkata, the route of the tram library binds together the general users who wish to visit public libraries as well as academic library users. This paper describes the need, operations and importance of the Kolkata Tram Library in today's society.

Keywords - Unconventional Library, Library Movement in Kolkata, New Age Library, Public Library, Green Library, Reviving Tram Services

INTRODUCTION

Kolkata is not only personified as "City of Joy" but also as 'Tilottoma Kolkata" (in Bengali), that means the city has been formed by layers over layers in due course of time and 'tram' has become a part of tradition in growing of the city. In British India, the tram service was first introduced in the then capital city Calcutta for easy transportation. The tram service first originated in 1807, and on 1873 it was started in India. At first tram used to be a two-coach vehicle which was driven by horses. The first route was 3.9 km long from Armenia Ghat to Sealdah. Afterwards the horse driven tram was replaced by steam powered tram. Ultimately, on 1902, the first electric tram service started from Khidirpur.

Evidences proves that not only in Kolkata but other cities of India like Bombay, Chennai, Kanpur, Delhi, Patna, Bavnagar also had enjoyed tram services at some point of time, but unlike Kolkata none has put effort to continue with it.

Now let put back our focus to our relevant topic Mobile Library. As this topic has been in concern in recent time as to reach out to people who are unable to come into the light of formal education. Though this mobile library concept is not anything that new to the society, rather decades old examples shows that the idea has been into practice.

On 1925 Rabindranath Tagore founded a mobile library with 200 books in Bengal between Santiniketan to Sriniketan (Datta, R., & Das, B., 2018). He named it Chalantika. During this time, it became very popular. The number of books of this mobile library reached 1504 books during 1939.S.R. Ranganathan who is commonly known as the Father of Indian Library Science inaugurated a unique library at Melavasal, a village near Mannargudi on 21 October, 1931. The library was actually bullock cart filled with books (B.Kolappan, 2021). Rao Bahadur S.V. Kanagasabai Pillai who was a Mannargudi-based engineer proposed such an idea. The cart used to resemble a shape of a small stall that used to visit nearby villages, especially during the Tamil months of 'Chithirai' and 'Aippasi' because there would be lesser farming activities on those months. The idea of the library was to inculcate the reading habit in people.

Now if we focus on the present scenario of the status public libraries of Kolkata or rather say West Bengal, then the reality would be heart breaking because hundreds of public libraries are getting closed and inaccessible day by day. There are many socio-political reasons behind such a pathetic condition. Thus, bringing these two ebbs and flows together, a novel library service has been launched in the city since 30 th September, 2020. The Kolkata tram library is such a positive initiative taken

by The West Bengal Transport Corporation Limited which helps to revive the two ailing service sectors (that is the Tram service and the library service) at a time. Thus, being a new age mobile library, the Kolkata Tram Library brings its information repository to the reader when the reader is unable to come to the library. As a result, the reader can easily retrieve the information according to his needs.

OBJECTIVES The primary objective of this article is to comprehend the new initiative of mobile library movement

in Kolkata in-order to perceive the state-of-art idea of converting a Tram into a Library and to look into the activities and facilities of the Kolkata Tram Library.

RESEARCH METHODOLOGY The authors have collected the necessary data for writing this article, primarily from secondary

sources like newspaper clippings and youtube videos on this topic. By analyzing the data necessary information has been collected.

LITERATURE REVIEW

Kolkata Tram Library is basically a mobile library. Its main goal is that the library brings its information repository to the reader when the reader is unable to come to the library. As a result, the reader can easily retrieve the information according to his needs.

R.A.P.S Senevirathna (2021) in his article named as A Study on the Mobile Library Services in the Public Libraries: With reference to the Public Libraries in Matara District, Sri Lanka.' showed how public libraries can connect people with libraries through extension services through mobile libraries. This article also shows how popular this service can become.

Riya Datta & Biswajit Das (2018) in their article named as 'The 21st century mobile library: redefining the concept with Rabindranath Tagore's Chalanticka.' The article shows how Rabindranath Tagore introduced mobile library in Santiniketan and Bengal. And how much this effort affects the current mobile library service.

DISCUSSION
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Activities of the Tram library -

• As earlier said, that this Tram library passes by a total of more than 30 institutions of all levels of educational institutions (Schools, Colleges, Universities) on its way, so students of all these institutions can enjoy the service of this mobile library that avails books of various subjects including literature and magazine, along with books for various competitive exams. As a result, this library is able to fulfil the needs of many readers.

•*Free Wi-Fi service is available.*

• Activities such as book publishing, book reading and storytelling, Tram Litfest and even literary festival programs are being planned and organized at times in this tram library.

• The ticket price of this tram library is only Rs.20/-. More variety of services are envisaged in future to increase the popularity of mobile library.

One more initiative for children

From 2020, India's first Tram Library was created for children, which was inaugurated on 14 th November, 2020. This was a joint initiative of The West Bengal Transport Corporation Limited and A.P.J. Anand Children Library. This library is named as The Kolkata Young Readers Tramcar. Books in both English and Bengali languages are available in this library. Oxford Bookstores stood next to this library with their vast collection of children literature. Apart from all these, paintings by various local artists enhances the beauty of this tram library.

No fare is charged for children below 18 years of age. Girls under Kanyashree Scheme (under 18 years) can also avail this service. Parents or guardians accompanying their children need to pay a nominal fare. However, elderly people without children are not allowed to board this tram.

LIMITATION

No feedback from the users of this library have been taken. No data have been statistically analyzed in this paper.
CONCLUSION

Undoubtedly the initiative to start Kolkata Tram Library has added new feather to the crown of 'Tilottama Kolkata'. This mobile library also serves as the new age concept of green library which is in trend at present. The lesser carbon footprint makes the tram library serve as a green library as well. Such initiatives are indeed a matter of pride especially looking at present condition of the public libraries in West Bengal. Thus, the library is binding bridge between two dieing service sectors to serve according a new concept. But, in reality the success of such a library depends on the needs of readers   or   passengers.

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An Exploratory Study on the Role of Artificial Intelligence in Library Cataloguing

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Abstract

Technological advancements have facilitated the integration of Artificial Intelligence (AI) across various industries, aiming to enhance precision and efficiency. In the domain of libraries, efforts have been made to automate tasks such as collection development, indexing, abstracting, user recommendations, reference services, and data analysis. The primary objective is to identify and analyze global initiatives employing AI in cataloguing, with a particular focus on subject heading implementation. Additionally, the study examines the implications of these initiatives within the Indian context. Employing an exploratory research approach, this study examines published literature to explore real-world cases of AI implementation in cataloguing. It investigates the development contexts and challenges associated with the adoption of AI in this domain. The findings suggest that while the development of fully automated systems remains challenging, AI systems can serve as valuable aids to human cataloguers, offering suggestions and acting as auxiliary units. In the Indian context, although research on the development of fully automated systems is limited, much of the cataloguing is carried out through copy cataloguing practices. This research provides valuable guidance for decision-makers in library management and information science, highlighting the potential benefits and challenges associated with the integration of AI in cataloguing practices.

Keywords: Artificial Intelligence (AI); Library Cataloguing; Expert Systems; Cataloguing Automation; Tagging

Introduction

Advancements in Internet technology have transformed information communication, shifting from traditional card catalogues to Machine Readable Catalogue (MARC) records. However, alongside its benefits, the Internet also introduces considerable noise. While librarians assign subject headings to

enhance accessibility, users often search using keywords, leading to discrepancies (Schreur, 2020). Schreur highlights the manual nature of catalogue metadata creation, limited access points, and the challenge of ensuring resource discoverability. To address these issues, libraries are adopting cooperative cataloguing, linked data, semantic web technologies, and artificial intelligence (AI) tools. The lack of quality control mechanisms has prompted increased exploration of AI solutions (Monyela, 2020). Through the semantic web, libraries can convert their cataloguing data into linked open data (Ayodeji et al., 2022). AI-based cataloguing utilizes machine learning algorithms, natural language processing (NLP) methods, and automated AI techniques (Chhetri, 2023). Many library professionals advocate for the application of AI in cataloguing (Walker & Jiang, 2019; Wójcik, 2020; Omehia, 2020). Harisanty et al. (2023) emphasize the potential benefits of AI in this context. Chaoying (2021) also underscores the importance of AI tools in library cataloguing.

Artificial Intelligence in Library Cataloguing

Research objectives of this research are:

1. What is the overview of efforts to automate cataloguing around the World?
2. What are the implications of automated cataloguing for India?

For this, real world prototypes are identified from observing the published academic literature on artificial intelligence and cataloguing in libraries.

1. What is the overview of efforts to automate cataloguing around the World?

Typically, expert systems are classified within the realm of Artificial Intelligence (AI). These systems utilize encoded human expertise to address a variety of problem-solving tasks (Williams & Sochats, 1996). The application of AI in cataloguing dates back to the 1970s, exemplified by initiatives like the Library of Congress' RECON project aimed at converting catalogue records. Similarly, the National Library of Estonia's KRATT project utilized the Estonian Subject Thesaurus to establish a subject index. Furthermore, efforts such as the ESSCAPE (Expert Systems for Simple Choice of Access Points for Entries) project at the University of Exeter in England aimed to generate comprehensive catalogue records.Clarke & Cronin (1983) propose two potential roles for expert systems in cataloguing: assistance for human cataloguers or autonomous generation of catalogues without human intervention.

Most expert systems devised for cataloguing purposes have been designed with an assistive function, serving as supplementary tools to aid subject cataloguers in decision-making processes. In this capacity, these systems offer proposed subject headings for consideration by cataloguers, who ultimately retain full control over the cataloguing process, allowing them to align selections with the subject matter of the material being catalogued. Notable examples of such assistive systems include

HEADS at Teesside Polytechnic, Catalyst 2 at the University of Strathclyde, Catalyst at the University of California, and the Expert Cataloguing Assistant Project at the National Library of Medicine, among others (Chang, 1990; Ercegovac & Borko, 1992; Muqueem, 2014; Weiss, 1994; Zainab & Silva, 1998). These systems streamline the cataloguing workflow by offering cataloguers valuable suggestions and support, thereby improving efficiency and accuracy in the cataloguing process.

Numerous systems have been developed with the objective of automating cataloguing processes. For example, the ESSCAPE (Expert Systems for Simple Choice of Access Points for Entries) system at the University of Exeter in England, AutoCAT at the Technical University of Darmstadt in Germany, and the PETRUS Project at Deutsche Nationalbibliografie (German National Bibliography) are noteworthy instances (Endres-Niggemeyer & Knorz, 1987; Hjerppe & Olander, 1989; Schöning-Walter, 2010). Furthermore, initiatives such as MedIndEx at the National Library of Medicine and the Title Proper Project by Ling Hwey Jeng (Jeng, 1986) are also notable examples. Annif at the National Library of Finland, and the Automated Title Page Project have also contributed significantly to the endeavor of automation in cataloguing tasks (Asula et al., 2021; Michelson, 1991; Short, 2019). These systems represent efforts to streamline and expedite cataloguing processes by automating tasks that were traditionally performed by human cataloguers. According to Olmstadt (2000), the five major

cataloguing expert system prototypes at the time were
implemented with varying levels of success, yet none found widespread use in the daily cataloguing activities of professionals. Additionally, it's noteworthy that these expert systems are not universally applicable; rather, they are tailored to address specific cataloguing challenges. For instance, AutoCAT focuses on cataloguing journal titles, while projects like the Expert Cataloguing Assistant Project and NAMA specialize in handling personal names. Similarly, MAPPER is designed for cartographic sources, CONFER for conference proceedings, and initiatives such as the Title Proper Project and the Automated Title Page Project concentrate on identifying title proper. Developing and maintaining an expert system for cataloguing presents significant challenges, requiring substantial infrastructure, funding, technological resources, subject expertise, and professional proficiency in computer programming. Such endeavors are typically feasible for larger libraries equipped with the necessary resources.

These systems aim to emulate human decision-making processes by drawing on a wealth of previously catalogued instances. Therefore, to ensure efficiency, a large corpus of data is essential for training the system. Additionally, an effective expert system for cataloguing must be scalable and exhibit minimal error rates. Furthermore, Cloete et al. (2003) argue that cataloguers may possess a limited understanding of subjects and are susceptible to personal and cultural biases, highlighting potential challenges in cataloguing accuracy (Smith, 2022). Until recently, scant research existed on

cataloguing expertise and its transferability to expert systems. One significant limitation of expert systems is their difficulty in handling ambiguity, a common feature of cataloguing tasks (Olmstadt, 2000).

1. What are the implications of automated cataloguing for India?

In developing nations like India, where original cataloguing records are often scarce, a significant portion of cataloguing tasks relies on copy cataloguing—a method involving the importation of pre-catalogued machine-readable records (Chandrakar & Arora, 2010). However, the advent of AI technologies such as ChatGPT holds promise for augmenting the accuracy and efficiency of cataloguing processes. By leveraging information from the title and other relevant details of a library item, ChatGPT has demonstrated the capability to generate a comprehensive list of subject headings (Zakaria & Abdullah Sani, 2024). Recently, Brzustowicz (2023) successfully utilized ChatGPT to generate MARC records, affirming its ability to produce precise and consistent catalogue entries. The integration of ChatGPT into cataloguing workflows has the potential to significantly streamline operations, ensuring greater efficiency, accuracy, and minimizing biases in catalogue entries.

Thus far, only the assistive type of expert systems has attained moderate success, as noted by Clarke & Cronin (1983). A significant challenge arises in the context of developing countries, where a considerable proportion of libraries are small-scale establishments constrained by various limitations, hindering their ability to develop prototypes or expert systems. Despite the global prominence of open-source integrated library management systems like Koha, adoption remains incomplete across many libraries. Although large libraries have endeavored to harness the potential of AI in cataloguing, progress has been constrained by formidable obstacles, including the need to encode highly structured instructions based on standards such as AACR2 (Mogali, 2014). While ChatGPT offers smaller libraries a valuable resource for generating catalogue content, it is essential to recognize that it cannot fully replace human involvement in the cataloguing process (Adetayo, 2023).

Conclusion

In conclusion, the rise of Internet technology has revolutionized information communication, transitioning traditional card catalogues to Machine Readable Catalogue (MARC) records. Despite this advancement, challenges persist, such as the abundance of information online and the discrepancy between assigned metadata and user search queries. Efforts to enhance resource discoverability and identification have led to the adoption of strategies like cooperative cataloguing, linked data, and AI tools.

AI, particularly expert systems, has played a vital role in cataloguing since the 1970s, offering assistance to cataloguers in decision-making processes. However, challenges remain in developing

universally applicable systems tailored to specific cataloguing challenges. In developing countries like India, AI technologies like ChatGPT hold promise for streamlining cataloguing processes, but human involvement remains crucial. Overall, while AI offers potential for revolutionizing cataloguing practices, ongoing research and collaboration are needed to address challenges and fully realize its benefits across libraries.

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The Role of Libraries in Promoting and Implementing Digital Literacy Skills in India

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Abstract

The goal of the article is to better understand how libraries can support digital literacy in the modern world. Concerns about the methods for improving digital literacy abilities were listed, including training programs for digital skills and access to technology that fosters these abilities. We also talked a lot about the things that make it difficult to promote digital literacy in the digital age. This study focuses on open access journal Indian articles and limited by paid up databases. Traditional libraries benefit greatly from the addition of digital collections. They significantly contribute to the development of digital literacy by providing opportunities for people to engage with digital information, hone their digital abilities, and navigate the online world with ease.

Key Words: Digital Literacy, Digital Tools, ICT, Information, Digital Library.

Introduction

Digital literacy in the twenty-first century refers to the skills needed to use technology properly and successfully. Terms such as Facebook, smartphones, the Internet, and the World Wide Web are relatively new compared to what was taught in schools twenty years ago. To put it simply, digital literacy is the capacity to apply both fundamental and sophisticated computing abilities. It's a technique for creating multimodal text that incorporates additional media, such as audio and video. According to Tejedor et al., there is a "gap between higher education and 21st-century skills," and academic institutions must now adapt their approach to promote precise, definite, and intentionally valid digital literacy techniques that link the advancement of more recent fields of expertise with the enhancement of current user abilities.

Digital literacy is the process of understanding technology and how to use it. The ability to find, evaluate, create, and transmit data is a capability of ICTs. The ability to use data and communication technology for finding, evaluating, creating, and communicating data that calls for both specialized and intellectual skills is known as digital literacy. The library played a crucial role in advancing literacy, education, and information access by providing physical locations and collections of books, journals, and other items for public use. Libraries have diversified their services in the digital age by

adding digital libraries, which are online portals that provide users with access to digital information and services. Digital libraries are electronic holding rooms for digital content, including databases, e-books, e-journals, and multimedia. By using the internet or specialized library software, they let users to search, browse, and retrieve digital resources from a remote location. Digital libraries are a valuable addition to traditional libraries. By giving people the chance to interact with digital content, develop digital skills, and skilfully traverse the online environment, they greatly aid in the development of digital literacy.

Digital library according to UNESCO IITE (2006:6) is "a collection of digital representations of information content, along with hardware, software, and personnel to support the functions of a traditional library plus knowledge worker operations like searching, browsing, and navigation". This in some way is advantageous to the librarians as developing digital libraries saves cost of buying duplicate copies of books, as one digital format could be accessed by many users at the same time without causing any damage to the original copy. But how digital literate are the library users? Because in order to access, use or manage information online individuals require digital literacy (UNESCO, 2011:3)

Literature Review

Ganaie S.A,.(2013) The significance of library services in higher education is emphasized by the study that University Libraries are encouraging digital literacy through an Indian viewpoint. There are mentions of the use of UGC Infonet, Nlist, INDCAT, Document Delivery through JCC, OJUS, Shodhganga, and Indest.Information gatekeepers, as opposed to information custodians, are now librarians thanks to the usage of ICT. Librarians are now called "cybrarians," and they are essential to using the web-based resources available on the internet, as opposed to being storekeepers. India will surely benefit from the establishment of an academic community that includes academics, students, and faculty members with information literacy competencies as it moves toward becoming a knowledge-based society. Sharma,J.(2016).The examination of public libraries' contribution to the rise in digital literacy in our culture is the main topic of this essay. The many forms of digital literacy shed light on the necessity of digital literacy for the advancement of digital literacy in society. The topic of digital literacy focuses on how public libraries contribute to the rise of digital literacy in our

society. Professionals at public libraries need to assist anyone of any age who is really interested. Enable them to acquire digital literacy through the use of contemporary technologies. They require access to heard copied information about the new technology they are learning about in the public library. In their home, they always have access to the copies to see and read. People who are unaware of digital literacy should also be made aware by public libraries.Odu, A. O., and Omosigho, N. A.

(2017).The purpose of this study is to identify prevalent digital literacy behaviors among college students on social media. This study employs a mixed-method approach, utilizing an open-ended questionnaire, interviews with university students in Yogyakarta, and data search utilizing a digital literacy scale. The study's findings show that participants with high levels of digital literacy go through a process of assessing accurate information, personally examining reliable sources and sharing their conclusions with close friends and family. Inamdar,S.A,.(2021). Libraries are in a unique position to guarantee that everyone has access to the tools and resources they need to improve their digital literacy skills and to help close the digital gap. Through the provision of technology, digital resources, and training programs, libraries can assist people of all ages and backgrounds in acquiring the necessary skills to comfortably and effectively navigate the digital world. Libraries will play an even more crucial role in fostering digital literacy as society continues to rely more and more on digital technology. Libraries are therefore essential to our digital future because they give everyone

access to information and education while also encouraging digital inclusion. The secondary sources of data used in this study include journals, articles, websites, and research papers.

Devi,S.,&Kumar.R.(2023)In this study, the digital literacy of Indian Library and Information Science Professionals at Indian Institutes of Technology (IITs) is evaluated, and its correlation with the provision of research support services to their institutional researchers in the digital age is investigated. Data was collected for this study using a simple random sampling technique, and staff members of the IIT library's email addresses were sent along with the Google form. A total of 56 responses were supplied by library professionals. Each respondent claims to be able to utilize plagiarism detection software, browse the internet, and download documents from websites, e-docs, and e-databases.

Purpose of the research paper

The purpose of this paper is to investigate what digital literacy is and its implications on digital libraries in India. The study considered the following research questions to guide the search for the literature data.

What is digital literacy? What is the importance of Digital Literacy? To know what is digital Library and implementation of digital literacies in Indian libraries.

Methodology

A qualitative technique was used in the study's research design. Databases and online journal articles were employed. A conclusion was reached afterdata was gathered through content analysis. The process entails identifying the words, phrases, anddatabases that are utilized.

Limitation

The study focuses on open access journal Indian articles and limited by paid up databases.

Digital Literacy

Digital literacy covers the physical operations of digital devices and the software operations in those devices (UNESCO, 2018). It includes the capacity to use a range of digital tools for safety and wellbeing as well as to search, navigate, create, communicate, and cooperate. It also involves critical thinking and information analysis. These abilities are necessary for people to engage in modern society in a successful manner.

Definition of Digital Literacy

The American Library Association (ALA) defines digital literacy as "the ability to use information and communication technologies to find, evaluate, create, and communicate information, requiring both cognitive and technical skills."

According to Paul Glister, "Digital Literacy is the ability to understand information and more important- to evaluate and integrate information in multiple formats that the computer can deliver. Being able to evaluate and interpret information is critical you cannot understand information you find on the internet without evaluating its sources and placing."

Importance of Digital Literacy

Libraries are in a unique position to guarantee that everyone has access to the tools and resources they need to improve their digital literacy skills and to help close the digital gap. Through the provision of technology, digital resources, and training programs, libraries can assist people of all ages and backgrounds in acquiring the necessary skills to comfortably and effectively navigate the digital world. Libraries will play an even more crucial role in fostering digital literacy as society continues to rely more and more on digital technology. Libraries are therefore essential to our digital future because they give everyone access to information and education while also encouraging digital

inclusion. The secondary sources of data used in this study include journals, articles, websites, and research papers.

Digital Library

One contemporary sort of information retrieval system is the digital library. Because the collections are digitally saved and always available via computers or mobile devices, it is referred to as virtual. These characteristics of libraries are referred to as "digital libraries," "virtual libraries," "electronic libraries," "institutional repositories," "library without walls," and so forth. "Digital Library" is the most suitable and often used term for these types of libraries.

It makes definition of digital library more confusing. Seadle and Greifeneder (2007) highlighted one of the best digital library definitions given by the National Science Foundation (NSF), USA in 1999. NSF defines digital library as, "store materials in electronic format and manipulate large collection of those materials effectively". Cleveland (1998) defined digital library is as "World Wide Web". He supported his definition by the large number of documents being gathered by Web and that can be searched. Layman (2017) enforced to treat digital library, cyber space and information technology as important aspects of library development. He specified role of digital libraries is the key to achieve holistic development in information oriented globalization. Broadly, following are the main objectives of a digital library

Implementation of Digital Literacy in Libraries

 Libraries can offer chances for community members to work together and exchange their digital expertise. This can involve organizing gatherings for digital storytelling, coding workshops, and hackathons, among other things. By providing materials and training in many languages and addressing cultural factors linked to technology use, libraries help foster digital literacy in diverse populations. By educating patrons how to assess digital material and spot false or misleading information, libraries may support the development of critical thinking abilities in their patrons. Screen readers and text-to-speech software are examples of assistive technologies that libraries can offer to help people with impairments be more digitally accessible. Digital history and culture can be preserved in part through libraries. In order to preserve digital resources for future generations, they can gather and preserve social media postings, blogs, and WebPages.

Recommendations

Libraries that provide information services to communities can work together to implement literacy initiatives and trainings. To find, assess, and effectively utilize the information they require, library

Libraries should hire more ICT-inclined and digitally literate librarians to lead these programs and hold regular seminars or workshops to educate their patrons on the value of digital literacies.

Conclusion

Going through the studies we conclude that, access to digital resources, technological education, and programs that support the development of the skills necessary for them to use the internet safely and morally. Libraries may also encourage digital citizenship and open access to information by providing a welcome and safe environment for people to experiment and engage with technology. Libraries may aid in closing the digital divide and advancing digital inclusion for all by acting as a centre for digital learning and discovery. Libraries will continue to be a crucial institution for encouraging digital literacy in the years to come as technology plays an ever-more-important role in education, the workforce, and daily life.

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Evaluating the Digital Information Literacy Skills:
A User Perspective Study of University of Kerala and
Manonmaniam Sundaranar University

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In the dynamic environment of Arts and Science Colleges, the library stands as a vital center for knowledge acquisition and dissemination. However, in today's digital landscape, literacy encompasses more than traditional texts, expanding into the digital domain. Within this framework, digital information literacy emerges as an essential skill set for library users, enabling them to effectively navigate the vast array of digital resources available. This paper seeks to evaluate the digital information literacy skills of users in Arts and Science Colleges and explore their perceptions of their own digital literacy levels. A multi-stage systematic sampling method was employed to select samples. Data were collected from 766 users of Arts and Science Colleges affiliated with Manonmaniam Sundaranar University and the University of Kerala through a structured questionnaire. The analysis involved Descriptive statistics, Chi-square analysis, P and t values. The significant findings revealed that majority of the users (65.7 percent) have a moderate level of digital information literacy skills, users from the University of Kerala have more digital information literacy skills than the users of Manonmaniam Sundaranar University and users differ significantly on digital information literacy skills based on University and the digital information literacy skills scores of both universities follow the normal distribution.

Keywords: Digital information literacy   skills, library users,   academic library, digital information products and services,

1. Introduction

The rapid development of science and technology has made digital information literacy indispensable in the knowledge economy era, emphasizing the need for colleges to enhance students' information competencies through library resources and education programs (Murugan et al., 2019). In order to help students, find and assess the best information sources, librarians play a critical role in improving their digital information literacy. It has been demonstrated that successful user education initiatives in college libraries greatly raise users' levels of digital information literacy and change their usage habits.

Many studies have shown how important it is for students in Arts and Science Universities to have digital information literacy abilities. Research indicates that there is an increasing need to raise students' levels of digital information literacy (Alagu & Thanuskodi, 2018). Studies reveal that digital information literacy levels are favourably correlated with attributes such network computer technology, the capacity for independent learning, and the general calibre of educators and learners

(Kappi & Biradar, 2022). Furthermore, research indicates that students frequently have difficulties in gaining access to and efficiently employing electronic information resources (Alagu & Thanuskodi, 2018). To promote greater utilization of available information sources, colleges must priorities raising students' satisfaction levels and raising their awareness of e-resources. Through the implementation of suitable solutions and the resolution of these concerns, colleges of Arts and Sciences can considerably improve their students' digital information literacy.

2. Literature Review

Many regions have carried out studies on the digital information literacy proficiency of college students majoring in Arts and Sciences. The digital information literacy of Tamil Nadu students was investigated by (Batcha et al., 2014) and Manthiramoorthi (2019), with an emphasis on digital competency and awareness of digital information literacy. (Biju & Yasmin, 2019) expanded this study to include female students in Keralan government Arts and science colleges, investigating their search engine preferences, digital information requirements, and search tactics. All of these findings point to the need for college students to have better digital information literacy, especially when it comes to digital content.

Although these users often possess strong digital information literacy abilities, Rahyadi (2022) discovered that there is still space for development, especially in the areas of access and ethical issues. (Rameshkumar & Venkatachalam 2015) highlighted the value of reading habits in expanding one's knowledge and recommended that libraries offer a range of resources to encourage these habits. Science faculty members' worries over students' research skills and integrity were brought to light by Inyang (2019), highlighting the need for additional help in these areas. In addition to highlighting the importance of public libraries in meeting information and learning demands, Mondal (2015) found that high school pupils lacked comprehension of digital information literacy and lifelong learning ideas. All of these results point to the necessity of ongoing assistance and instruction in digital information literacy, especially in access, legal consideration and research skills.

3. Objectives

1.   To assess the digital information literacy skills of the users in Arts and Science Colleges.

2.   To evaluate the opinion of the users about their digital information literacy skills

4. Statement of the Problem

First and foremost, the article seeks to analyse users' digital information literacy skills within Arts and Science Colleges. This entails evaluating users' ability to locate, appraise, and apply digital information resources related to their academic fields. Second, the study aims to assess users' subjective perceptions of their level of digital information literacy skills. Tailoring effective interventions requires an understanding of users' opinions of their competency levels, problems faced, and areas for progress. Even while digital information literacy is becoming more and more important in higher education, there is still a lot of missing knowledge about how to evaluate it in the context of Arts and Science Colleges, especially when looking at it from the viewpoint of the user. By offering thorough insights into the state of digital information literacy at these institutions, our study aims to

close this gap. By tackling these goals, the research hopes to aid in the creation of plans and programmes that will improve the digital information literacy abilities of users in Arts and Science Colleges, ultimately equipping them for success in the classroom and lifetime learning.

5. Significance of the study

Gaining an understanding of the digital information literacy skills of users in Arts and Science Colleges might be a useful way to assess how well the existing educational programmes are preparing students to navigate and use digital information resources. The results of this study can help guide efforts to build curricula by pinpointing areas where students may be deficient in digital information literacy skills and where further instruction or resources may be required to better prepare college students for success in the classroom and in the workplace in the digital age. Enhancing college students' digital information literacy can help advance research in Arts and Science fields by empowering them to efficiently access, assess, and use digital resources for their academic work. By enabling people to interact with digital information critically, separate reliable sources from false information, and take part in democratic processes more successfully, improving digital information literacy can also have wider societal effects.

6. Methodology

Primary data was used for the study and was collected from PG, and Ph.D scholars of Arts and Science colleges affiliated to Manonmaniam Sundaranar University and University of Kerala. A total of 766 were selected as a sample. Multi-stage systematic sampling method was used for the selection of samples. According to the plan of enquiry, relevant data from the respondents were collected through a pre-tested structured questionnaire. The data collected for the study were processed and analysed with the help of SPSS version 21. Simple and advanced statistical tools were used to analyse the data. Mathematical tools like frequency, percentage and chi-square, P and t values were used for the analysis of multiple responses.

7. Analysis and Interpretation

Digital information literacy skills of users

Digital information literacy refers to the ability to effectively find, evaluate, and use digital information from various sources while also understanding information privacy, security, and ethics issues. Users are expected to be information literate to access information from the complex information format in the emerging electronic environment. Users in the higher education system are expected to be more information literate than normal users and to use the right information in the right way by adhering to information ethics. Generally, PG, and Ph.D scholars are found to be using the libraries of Arts and Science colleges more frequently than the undergraduate students. So, the digital information literacy skills and opinion of the users are further analysed and summarized under the headings.

7.1 Descriptive statistics on digital information literacy skills scores

The descriptive statistics obtained from the respondents' digital information literacy skills scores are summarized in Table1.

<div align="center">Table 1</div>

<div align="center">Descriptive statistics on digital information literacy skills scores</div>

S.No	Statistics			Standard Error
1	Mean		44.61	0.262
2	95% confidence interval of mean		44.10	
			45.13	
3	Median		44.00	
4	Std. Deviation		7.263	
5	Skewness		0.266	0.088
6	Kurtosis		-0.461	0.176
7	Minimum		26	
8	Maximum		60	
9	Range		34	
10	Percentiles	25	39.00	
		50	44.00	
		75	49.00	
11	Inter-quartile Range	10		

Source: Primary data

Table 1 shows that the mean digital information literacy skills scores of the respondents are 44.61 with a standard error 0.262. The 95% confidence interval of the mean is between 44.10 and 45.13. This indicates that the population mean falls between 44.10 and 45.13. The minimum and maximum digital information literacy scores are respectively 26 and 60. Thus, statistics on the digital information literacy of respondents indicate that they have medium-level digital information literacy skills. The standard deviation 7.26 shows that there are deviations in digital information literacy skills scores among the respondents. Further, the median score is 44, which is very closer to the mean score. The maximum and minimum scores are respectively 26 and 60. The mean score as well as skewness and kurtosis show that the tendency of digital information literacy skills score follows normality.

7.2 Normality of digital information literacy skills score

In addition to descriptive statistics, the normality of the score is confirmed by plotting the histogram and frequency curve. The histogram and frequency curve based on the digital information literacy skills scores of respondents is depicted in Figure- 1.
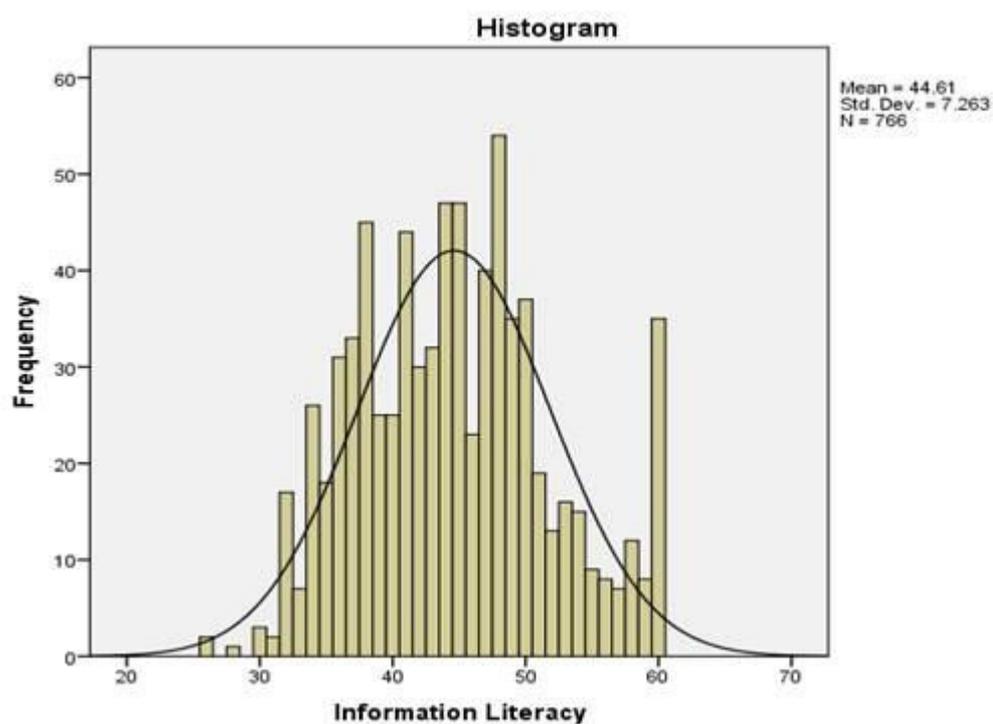
Figure 1: Digital information literacy skills of Users

Figure 1 clearly shows that the digital information literacy scores of users from Arts and Science college libraries of both universities follow the normal distribution. Hence, all inferential statistics about the populations can be derived appropriately. 7.3 Level of digital information literacy skills

The respondents for the digital information literacy scores are library users from Arts and Science colleges affiliated to Manonmaniam Sundaranar University and University of Kerala. They are further categorized into low, medium and high based on the mean (M) and standard deviation (σ). Respondents with score between (M+σ) and (M-σ) are categorized as moderate information literate. Respondents with score above (M+σ) fall in high and those below (M-σ) are categorized as low in digital information literacy. The user's levels of digital information literacy skills are summarized in Table 2.

Table 2

Level of digital information literacy

S.No	Digital information literacy level	No. of Respondents	Percent
1	Low	140	18.3
2	Moderate	503	65.7
3	High	123	16.1
		766	100

Source: Primary data

Table 2 discloses that the majority of the users (65.7 percent) have moderate level of digital information literacy skills. The table also shows that 16.7 percent 18.3 percent respectively have high and low level of digital information literacy skills.

7.4 University wise level of digital information literacy skills

The digital information literacy scores of the respondents are further analysed based on University. Chi-square analysis is carried out to determine the significant association, if any between University and level of digital information literacy skills. The details of analysis are provided in Table 3.

Table 3

University wise level of digital information literacy skills

S.No	Digital information literacy skills level	Manonmaniam Sundaranar University	University of Kerala	Total	Chi-square Value
1	Low	81(21.1)	59(15.4)	140(18.3)	20.97*
2	Moderate	263(68.7)	240(62.7)	503(65.7)	
3	High	39(10.2)	84(21.9)	123(16.1)	
Total		383(100)	383(100)	766(100)	

Source: Primary data; Note: Items inside the parenthesis are in percent; Significant at 0.05 level

Table 3 shows that 21.9 percent of the respondents from University of Kerala have high digital information literacy skills, whereas only 10.2 percent respondents from Manonmaniam Sundaranar University have high digital information literacy. Similarly, 15.4 percent of respondents from University of Kerala are low in digital information literacy skills while the corresponding category from Manonmanim Sundaranar University is 21.1 percent. Similarly, 68.7 percent of respondents from Manonmaniam Sundaranar University are categorized as moderate and the corresponding category in University of Kerala is 62.7 percent. Thus, it is interpreted that users of Arts and Science colleges affiliated to University of Kerala have more digital information literacy skills than the users of Manonmaniam Sundaranar University.

Further, Chi-square analysis is carried out to determine the association between the level of digital information literacy skills and University. Table 3 reveals that the calculated value of Chi-square is significant at 0.05 level. Thus, the level of digital information literacy is significantly associated with the University.

7.5 Gender-wise comparison of digital information literacy skills

The digital information literacy scores of the respondents are further compared based on their gender using the student t-test. The details of analysis are given in Table 4.

Table 4

Gender-wise comparison of digital information literacy

S.No	Gender	N	Mean	Std.Dev	t value	p value & Significance
1	Male	255	43.81	6.51	2.17	0.03
2	Female	511	45.02	7.58		Significant
Total		766	44.61	7.26		

Source: Primary data; Note: Significant at 0.05 level

The mean and standard deviation of digital information literacy scores revealed that female respondents have more digital information literacy than their counterparts. This indicates that users in the female category of Arts and Science colleges affiliated to both Manonmaniam Sundaranar University and University of Kerala have more digital information literacy skills than males.

Testing of Hypothesis: There is no significant difference in digital information literacy skills among the users of Arts and Science colleges based on gender

Table 4 reveal that the calculated value of t is 2.17 with p value 0.03 which is significant at 0.05 level. Hence, the null hypothesis is rejected at 0.05 level. Thus, users of Arts and Science colleges differ significantly on digital information literacy skills based on gender. Gender influences the digital information literacy of users in Arts and Science colleges affiliated to both universities.

7.6 University-wise comparison of digital information literacy skills

As per the second objectives of the study, the digital information literacy skills scores of users of Manonmaniam Sundaranar University and University of Kerala are compared based on the University using a student t-test. The details are summarized in Table 5.

Table 5

University wise comparison of digital information literacy

S.No	University	N	Mean	Std.Dev	*t* value	*p* value & Significance
1	Manonmaniam Sundaranar University	383	43.37	6.63	4.81	0.00 Significant
2	Kerala University	383	45.86	7.64		
Total		766	44.61	7.26		

Source: Primary data; Note: Significant at 0.05 level

Table 5 shows that the mean and standard deviation of digital information literacy skills scores of respondents belong to both universities. The mean score indicates that respondents from University of Kerala have more digital information literacy skills than Manonmaniam Sundaranar University. The significant difference if any in digital information literacy skills among the users based on the University is analysed.

Testing of Hypothesis: There is no significant difference in digital information literacy skills among the users of Arts and Science colleges based on the University

It is clear from Table 5 that the calculated value of t is 4.81 with p value less than 0.05 is significant at 0.05 level and so the null hypothesis is rejected at 0.05 level. Therefore, it is inferred that users of Arts and Science colleges differ significantly on digital information literacy skills based on University.

7.7 Age-wise comparison of digital information literacy skills

The age of the respondents influences theirdigital information literacy skills and use of digital library resources and services. Younger generationsare more conversant with the digital technology than others. The digital information literacy scoresofthe respondents are further compared with their age. The details of analysis are provided in Table6.

Table 6

Age wise comparison of digital information literacy

S.No	Age	N	Mean	Std. Dev	Source of Variation	df	Mean Square	F Value
1	20-29	438	46.47	7.29	Between	2	1771.9	36.7*
2	30-39	171	41.91	6.62				$p < 0.05$
3	40 and Above	157	42.38	6.23	Within	763	48.24	
Total		766	44.61	7.26				

Source: Primary data; Note: Significant at 0.05 level

Table 6 shows that respondents of the age group 20-29 have more digital information literacy skills than others. This indicates users of the younger generation have more digital information literacy than others. Differences in digital information literacy scores are found among the respondents of various age groups.

Testing of Hypothesis: There is no significant difference in digital information literacy skills among the users of Arts and Science colleges based on age

Table 6 also reveals that the calculated value of F is 36.7 at (2, 763) degrees of freedom, which is significant at 0.05 level. Therefore, the null hypothesis is rejected at 0.05 level. Hence, it is inferred that users of Arts and Science Colleges differ significantly on digital information literacy based on age.

7.8 Discipline-wise comparison of digital information literacy skills

The digital information literacy of the respondents is further compared based on their discipline to find the significant difference, if any, using analysis of variance. The details of analysis are presented in Table 7.

Table 7

Discipline wise comparison of digital information literacy

S.No	Discipline	N	Mean	Std. Dev	Source of Variation	df	Mean Square	F Value
1	Arts	279	42.9	6.94	Between	2	559.94	10.89*
2	Science	272	46.21	7.53	Within	763	51.42	p<0.05
3	Social Science	215	44.4	6.95				
	Total	766	44.61	7.26				

Source: Primary data; Note: Value is significant at 0.05 level

Table 7 informs that the mean digital information literacy score is more among the Science discipline followed by Social science and Arts. This indicates that users of Science discipline have more digital information literacy skills among the users of Arts and Science colleges affiliated to both universities.

Testing of Hypothesis: There is no significant difference in digital information literacy among the users of Arts and Science Colleges based on discipline

Table 7 reveals that the calculated value of F is 10.89 with p<0.05 at (2, 763) degrees of freedom is significant at 0.05 level. Thus, the null hypothesis is rejected at 0.05 level. Hence, users of Arts and Science college libraries differ significantly on digital information literacy based on discipline. Thus, students from Science discipline have more digital information literacy than other disciplines irrespective of the University.

7.9 Frequency of library visits and digital information literacy skills

Users of the library are expected to visit the library more frequently to access information from various sources, which directly or indirectly influences their digital information literacy skills. Hence, the digital information literacy of the respondents is compared based on their frequency of visits to the library. The details of analysis are summarized in Table 8.

Table 8

Frequency of library visits and digital information literacy skills

S.No	Frequency of Library Visits	N	Mean	Std. Dev.	Source of Variation	df	Mean Square	F Value
1	Daily	172	43.81	7.14	Between	4	188.68	3.62*
2	2-3 times in a week	227	45.51	7.46	Within	761	52.03	$p<0.05$
3	Once in a Week	193	44.41	7.33				
4	Once in fortnightly	77	42.65	6.40				
5	Occasionally	97	45.89	7.09				
	Total	766	44.61	7.26				

Source: Primary data; Note: Significant at 0.05 level

Table 8 shows that those who visit the library 2-3 times a week have more digital information literacy than those who visit daily and those who visit occasionally have more digital information literacy than others. It indicates that those who have more digital information literacy visit the library less frequently. It is interpreted that digital information literacy influences the library access behavior of users in Arts and Science College libraries affiliated to both universities.

Testing of Hypothesis: There is no significant difference in digital information literacy skills among the users of Arts and Science colleges based on their frequency of library visits.

Table 8 reveals that the calculated value of F is 362 with p value less than 0.05 at (4, 761) degree of freedom is significant. Therefore, the null hypothesis is rejected at 0.05 level. This indicates that users differ significantly on digital information literacy skills based on the frequency of their library visits.

Hence, users of the Arts and Science college libraries of both Manonmaniam Sundaranar University and University of Kerala have a moderate level of digital information literacy skills. Users differ significantly on digital information literacy skills based on University, users affiliated to University of Kerala have more digital information literacy skills than the users affiliated to Manonmaniam Sundaranar University.

8. Conclusion

In conclusion, this study provides valuable insights into users' digital information literacy levels in Arts and Science colleges. Objective assessments and user evaluations shed light on the effectiveness

of current educational programs in equipping students with essential digital skills. The findings underscore the importance of tailored curriculum development and resource allocation to address areas of deficiency and enhance students' preparedness for academic and professional success in the digital age. Moreover, the study highlights the critical role of digital information literacy skills in advancing research within the Arts and Science disciplines and its broader societal implications in fostering critical engagement with digital information and democratic participation.

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Assessing the characteristics of retracted articles in the data science domain

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Abstract

The present study aims to assess the characteristics of the retracted articles in the data science domain. Data for the study were collected by accessing the Retraction Watch database by searching the domain "Data Science". The study's findings revealed that 894 articles were retracted from 2002 to 2023. The rate of retraction increased with the year with the highest retraction recorded in 2023 with 478 (53.47%) articles. China produced the highest number of retracted pieces of literature with 639 (71.48%) articles. With 540 (60.40%), Hindawi was the top publisher with the most questionable articles. The Computational Intelligence and Neuroscience journal published by Hindawi had the highest number of retractions with 13.53% of the total retractions. The major reason for the retraction was identified as randomly generated content or unreliable results (23.60%) followed by plagiarism (14.54%). The study's findings give insights into keeping the integrity and reliability of the scientific research.

Keywords: Data science, Retraction, Plagiarism, Research ethics

Introduction

Human growth is based on research, a continuous desire for knowledge that stimulates creativity, guides judgments and expands our understanding. By revealing new information, ideas, and insights, research deepens our understanding of the world we live in. Sometimes, a few research papers don't follow the rules about how research should be done. When this happens, the publishers that publish these papers take them back, or "retract" them. Retraction denotes the official removal of research work from the corpus of scientific publications.

According to the Oxford English Dictionary retraction is defined as "the action of drawing or pulling something back or in; the fact or condition of being drawn in or contracted; power to pull something back" (*Oxford English Dictionary*, 2023)

They take this action due to the possibility that these publications include errors or issues, such as

plagiarism, data fabrication, or inadequate information verification. It is significant because it contributes to the integrity and reliability of research ("'Integrity in Scientific Research: Creating an Environment That Promotes Responsible Conduct,'" 2003)

Data science is an interdisciplinary academic field and the demand for the same is expected to grow rapidly in the coming years. Data science can be defined as "the study of scientific principles that explain data and how they relate to each other". Research on data science is increasing which would lead to a higher number of scientific publications. At the same time, higher publications may lead to higher retraction also (Steen et al., 2013). There is no previous research on the retraction of articles from the data science domain and the present study is carried out to fill this gap.

Objectives of the study

1. To find out the publisher-wise retraction of data science articles.

2. To find out the country-wise retraction of data science articles

3. To find out the major reasons for the retraction of data science articles.

Past studies

Bozzo et al., (2017) investigated the frequency and reason for the withdrawal of cancer articles. They found that a total of 571 publications on cancer were retracted and most of the retractions (76.4%) have happened in the last ten years. Academic fraud was the major reason for the retraction of papers, which is 28.1% of the total retraction rate. The other major reasons cited were scientific errors (24.2%), duplicate article publishing (18.2%), plagiarism (14.4%), problems in authorship (3.9%), and ethical concerns (2.1%). King et al. (2018) investigated the characteristics of retracted articles from surgery. The y reported that from 1991 to 2015, a total of 184 articles were retracted and the average length of retraction was 3.6 years. The most frequent grounds for withdrawal were duplication (35.3%), violations of the institutional review board (18.5%), faked data (14.7%), data mistakes (9.8%), author dispute (8.2%), plagiarism (7.6%), copyright infringement (2.2%), financial disclosure violations (0.5%), and consent (0.5). Bakker and Riegelman (2018) studied the retraction of mental health literature by using the Retraction Watch database. They revealed that a total of 144 literature on mental health were retracted. Aspura et al. (2018) carried out an inquiry to examine the prevalence, features, and causes of Malaysian papers that have been retracted. They searched Scopus databases and the Web of Science to find Malaysian journals that have been retracted.92 conference papers and 33 journal articles, totalling 125 Malaysian publications, were retracted between 2009 and June 2017. The number of retracted publications increased dramatically between 2010 and 2012,

accounting for 42 (33.6%) and 41 (32.8%) of the 125 retracted articles, respectively. Rapani et al. (2020) attempted to thoroughly examine the characteristics of articles in the dental area that were retracted. There were 180 retracted papers found, with the first one appearing in 2001. Compared to 2009–2013, there was a 47% rise in retractions during the most recent four-year period (2014–2018) (64 and 94 retracted publications, respectively). The most frequent cause of retraction was misconduct on the part of the author (65.0%), followed by sincere scientific errors (12.2%) and publisher-related problems (10.6%). Asia accounted for 55.6% of the research that was withdrawn, with 49 papers produced in India (27.2%). The study conducted by Ajiferuke and Adekannbi (2020) sought to examine the LIS journals' procedures for retraction and correction. The study, which selected papers from the information science and library science discipline of the Web of Science, aimed to investigate the withdrawal and amendment policies of the LIS journals and then looked at the features of the publications that were retracted in those journals between 1996 and 2016. During that time,

LIS journals had 517 corrections and 5 retractions. While plagiarism, duplication of effort, irreproducible outcomes, and methodological flaws were among the reasons for paper withdrawal, the majority of revisions made to journals in LIS journals were minor.

Methodology

To collect the data for the present investigation, the Retraction Watch database was accessed during the first week of October 2023. The domain "Data Science" was searched by using the subject search tag available in the database. No other search parameters were set. The search results were then exported to an Excel file for the ensuing analysis. The results included the title of the retracted article, year of retraction, nature of retraction, country of retraction, publisher, journal, sub-domain, reason for the retraction etc. The collected data was subjected to descriptive analysis using the per cent and frequency method and presented in tables and graphs. The data set which was collected and used for the analysis has been uploaded to Figshare and can be accessed at https://figshare.com/articles/dataset/DATA_SET_OF_RETRACTIONS/25859248.

Analysis and interpretation

Year-wise retraction of data science articles

Data in Table 1 shows the year-wise distribution of retracted data science articles. There were 894 total retracted papers in data science as traced by the Retraction Watch database. It is clear from the table that the highest number of retracted articles were recorded recently i.e., 2023 with 478 outputs (53.47%), followed by 2022 with 188 (21.03%). The least number of retractions were recorded in the years 2002 and 2003 with 1 publication which is 0.11% of the total retraction.

Table:1 Year-wise distribution of retracted data science articles

| Year	N	%	Year	N	%
2002	1	0.11	2015	13	1.45
2003	1	0.11	2016	14	1.57
2007	5	0.56	2017	13	1.45
2008	3	0.34	2018	10	1.12
2009	26	2.91	2019	20	2.24
2010	12	1.34	2020	21	2.35
2011	13	1.45	2021	56	6.26
2012	5	0.56	2022	188	21.03
2013	8	0.89	2023	478	53.47
2014	7	0.78			
Total				894	100%

Country-wise retraction of data science articles

There were 51 countries over the globe whose data science articles got retracted and the top 10 countries are depicted in Figure 1. As per the figure, the highest number of outputs were retracted from China with 639 (71.48%) articles followed by India with 100 (11.19%). Iran, Bangladesh, and the United States published 15 (1.68%), 14 (1.57%) and 12 (1.34%) articles respectively. Ethiopia published 9 (1.01%) articles. Both Saudi Arabia and South Korea Published 8(0.89%) retracted articles and other countries included in the top 10 were Iraq and Australia with 7 (0.78%) and 6 (0.67%) retracted articles respectively.

Publisher-wise retraction of data science articles

There was a total of 32 publishers who published the data science articles which were retracted. Out

of these, the top 10 publishers were displayed in Figure 2. The highest number of retracted articles were published by Hindawi with 540 (60.40%) articles followed by IEEE: Institute of Electrical and Electronic Engineers with 106 (11.86%). The number of retracted articles which Springer published was 82 (9.12) while it was 34 (3.80%) by SAGE Publications and 24 (2.68%) by Elsevier.

Figure 2: Publisher-wise retraction
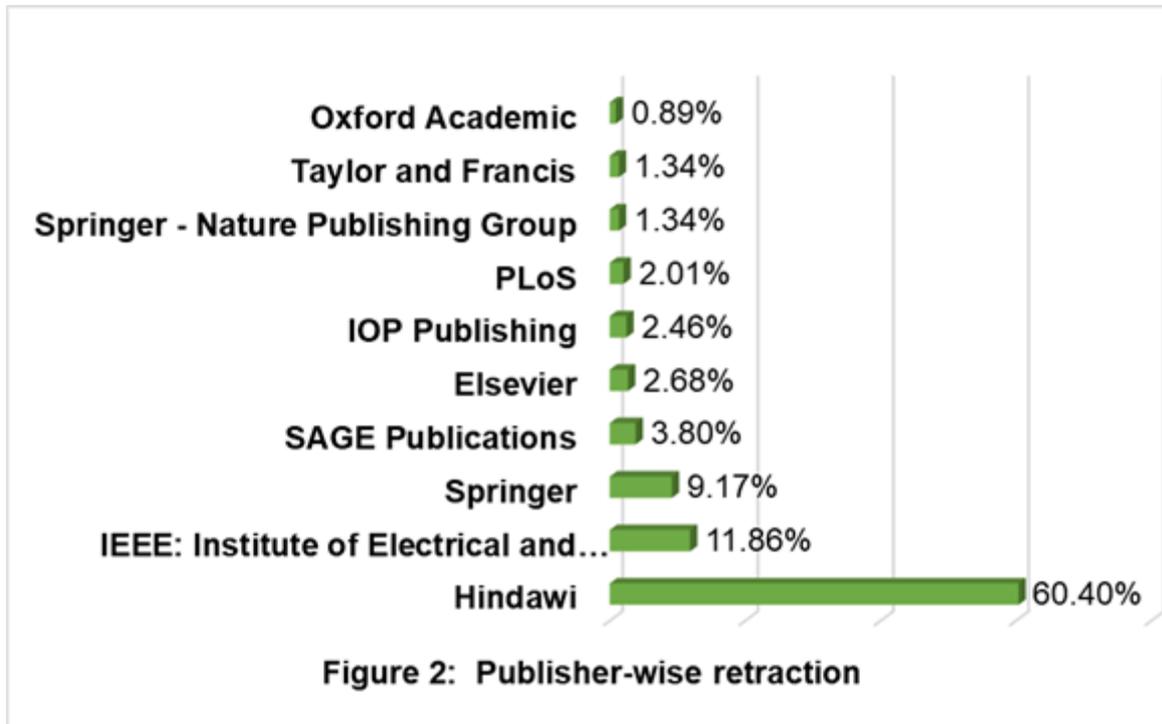
Journal-wise retraction of data science articles

The total of 894 articles that got retracted belonged to 180 journals and the top 10 journals are displayed in Figure 3. The highest number of retracted articles were published in Computational Intelligence and Neuroscience journal with 121 (13.53%) articles which is a publication of Hindawi. The second journal with the top retraction was the Journal of Healthcare Engineering with 92 (10.29%) total retractions followed by Wireless Communications and Mobile Computing with 86 (9.62%) articles.
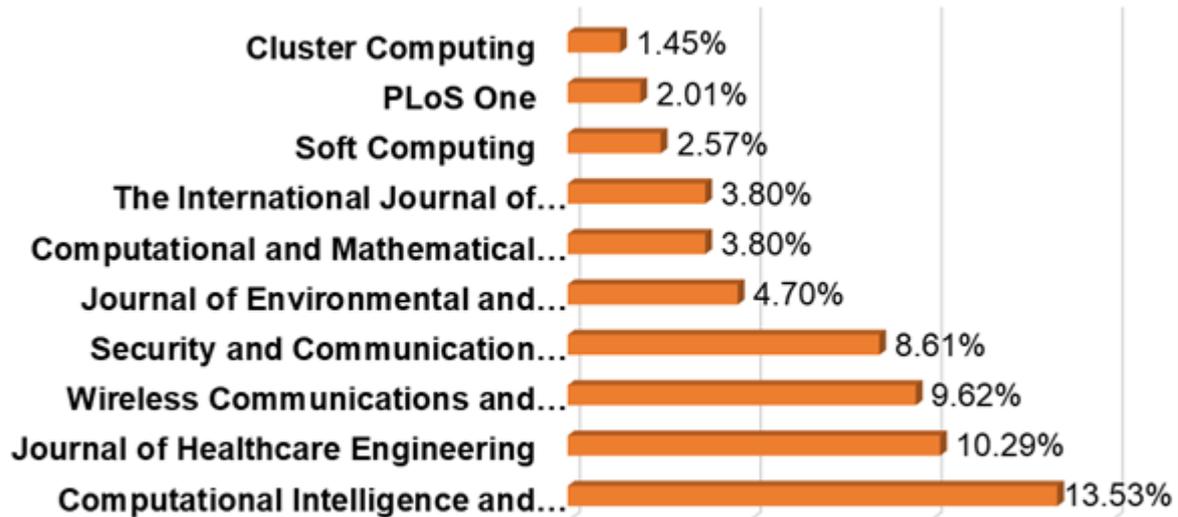
Figure 3: Journal - wise retractions

Reason for retraction of data science articles

The data in Table 2 depicts the reasons for the retraction of data science articles. The major reason for the retraction according to the retraction watch database was randomly generated content/ unreliable results. A total of 211 (23.60%) articles were retracted citing this issue. The next major reason was the plagiarism of text with 130 (14.54%) total retractions. A total of 120 articles were retracted due to plagiarism from peer review and dissertations or theses.16 (1.79%) articles were retracted due to no or limited information.

Table 2: Reasons for retraction of data science articles

Sl.No	Reasons for retraction	N	%
1	Randomly generated content /unreliable results	211	23.60
2	Plagiarism of text	130	14.54
3	Plagiarism of article /taken via peer review	70	7.83
4	Plagiarism of article /taken from dissertation/thesis	50	5.59
5	Limited or no information /withdrawal	39	4.36
6	Plagiarism of article	39	4.36
7	Limited or no information /plagiarism of text /withdrawal	37	4.14
8	Limited or no information /unreliable results	37	4.14
9	Limited or no information /objections by third-party	24	2.68
10	Limited or no information	16	1.79

Findings, Discussion and Conclusion

The present study is carried out to assess the retraction rate of data science articles which is considered a first of its kind of study concerning the above-mentioned domain. The study reports interesting findings. The retraction of data science articles is increasing and, on the rise, especially in recent times. A possible reason could be the popularity of the data science domain recently (Grieneisen & Zhang, 2012). Not only data science, retracted articles in other domains also are on the rise which has

been confirmed in previous studies (Kumar & Siwach, 2024). Another major finding was that China produced the highest number of retracted articles. The result is consistent with a previous study which reported that 75% of 250 retracted articles are from China (Bhatt, 2021; Xiao et al., 2022). The Chinese government has made large R&D investments, offering major financial support for academic pursuits and scientific research. This may lead to the production of more literature by academics and researchers pressuring them to "Publish or Perish". It was also observed that India contributed a good per cent to the overall retraction. Publisher-wise retraction showed that Hindawi, a subsidiary of Wiley produced the highest number of retracted articles. Reports show that not only in the data science domain but nearly 8000 articles from other domains published by Hindawi were also pulled down in 2023 due to various reasons, including the reasons that we reported in the current study (Talukdar, 2023)

Based on the findings of the current study, it can be concluded that the scientific misconduct among data science researchers is escalating. Nevertheless, better systems are still required to make researchers aware of the retraction and stop this.

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METAVERSE IN LIBRARIES

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Abstract

Metaverse is the technology of the recent future. In the Five Laws of Library Science Dr.S.R. Ranganathan, the Father of Indian Library Science, writes the fifth law as 'Library is a growing organism'. This holds true in all the ages. Library is not a static one with just bricks and walls rather it is with life and energy to grow bigger and bigger to include all the changes (may be technological, social, behavioural, cultural) and all the generations. Library is growing as the humanity grows. As the present day generation (Gen z) prefer more to be online and virtual, library also started virtual and online platforms. Library started to help people to be competent with the metaliteracy, computer literacy, information literacy and internet literacy to become the lifelong learners and to be fruitful in the career life, personal life and social life. Technology is getting ready for next leap what is called Metaverse where people get an immersive 3D experience with the help of Virtual Reality (VR), Augmented Reality (AR), Block Chain Technology etc. This paper explores in to the nature and scope of Metaverse. This is a theoretical paper which goes into the details of start of Metaverse, the working of Metaverse, the technologies needed for Metaverse and also about Metaverse in libraries which can be otherwise called as Metaverse libraries. The literature review throws light into certain examples of libraries practicing Metaverse technologies in the services they provide. The study affirms the need for getting fit into the technological change either by bringing VR into our library or by bringing our library into VR.

Key words –. Metaverse, Metaverse libraries, virtual reality, block chain technology, Life-long learning.

Introduction: The winds of change speed faster than a rocket in flight! This is particularly true of the present-day field of Information Technology (IT) that throws up revolutionary innovations at a mindboggling speed. Developments that take place in any major area of human civilization in one year of the 21st century is equivalent what took place in 4 or 5 years in the 20th century. OECD (Organization for Economic Cooperation and Development) observes that the possibilities for prosperity and development in the areas of economic, social and environment in the coming 25 years will be at least equal to what was experienced in the whole of 20th century.

The cumulative rate of growth and development in the areas of health, education, economy, social life, science and defence, to name a just a few such areas, owe much to IT revolution. The field of IT that provides the growth impetus for these fields, is itself straining at the leash to make communication faster and cheaper, and to achieve speed and economy with smaller and smaller instruments.

IT has turned the whole world into a single village, wired and networked into an entity that is

constantly exchanging information. From the age of wired communication we moved into the atmosphere of wireless communication (Wi-Fi) using radio frequency for the transmission of data with limited bandwidth, and to Li-Fi which, while being a wireless communication system, is the next generation of Wi-Fi communication; Li-Fi uses pulses of light for transmission of data with unlimited bandwidth.

Change is inevitable. But the present speed of change has the common man gasping; keeping up with the changes that take place around him isn't easy. If grappling with reality, physical reality at the most elemental, is complicated enough, having to grapple with virtual reality is a totally different matter. The fateful COVID-19 has acted as a catalyst to push mankind further and faster into the realm of virtual reality. Observations and studies into the developments that take place around the globe, reveal that the combination of physical reality, virtual reality and augmented reality are the main theme behind the Metaverse - the topic of this paper.

Metaverse: The word 'Metaverse' made its presence felt strongly from the time that the parent company of 'WhatsApp', 'Facebook' and 'Instagram' changed its name to 'Meta' on the day 28th October 2021.It was the intention of Facebook CEO Mark Zuckerberg that the new name of the company should echo 'Metaverse,' which is the name for shared online 3D virtual space. 'Metaverse' is set to be the future generation of internet. In other words, the future generation technology is Metaverse.

The word 'Metaverse' first appeared in the science fiction "Snow Crash," written by Neal Stephenson, and published in the year 1992. Stephenson introduces Metaverse with the meaning "beyond the universe". It's a combination of two Greek words 'meta' and 'verse'. 'Meta' means 'beyond,' and 'verse' denotes the meaning 'universe'.

In Stephenson's novel the world is in a perishing state, the world itself beset by certain calamities that took place in the universe. As a consequence, people are forced to spend their time indoors. Literally people got isolated in their rooms. Under such circumstances people begin to explore and find out certain other methods for socialization and creative connections with other people with the help of certain digital gadgets. Thus they create a space of their own choice, which is space beyond their actual space. Such a space may be thought as persistent, immersive 3D virtual environment. People thus spend time in that newly created space, managing to do everything from business to entertainment. This space is what Stephenson called Metaverse. Metaverse is an artificial universe of our own choice, created by the use of digital gadgets and technology; it is a space where people are able to explore life its fullest, so that they can escape from the unwanted, boring and fateful situations of life.

When we read Stephenson's novel against background of today's world order, we get a feeling that the novelist as a futurist. Whatever he portrayed in the novel appear to have happened to the humanity. People all over the world got locked in whatever place they were for a long time due to the pandemic COVID-19. Businesses, industries, universities, schools, entertainment centres and everything else got locked down and people were in quarantine. Even State and National boundaries were closed or were under strict control; airports were closed, flights were cancelled and aeroplanes were grounded. After the first phase of fear and bewilderment, the tech world came with a helping hand assisting people to be virtually connected with others in real time. Business meets were scheduled, national and international conferences took place, class room teaching started. The difference? Everything was

online! Even when sick and confined to a room and to oneself, people were able to be connected with others

as well as to carry out their routine works efficiently and effectively. No time and money were spent for travel; people were not tired of commuting, making their way to their work-destination through the city traffic. This was possible, thanks to the highly advanced technological innovations like google meet, zoom and the like.

Recent research reveals that humanity is getting ready for another huge leap towards Metaverse as portrayed in 'Snow Crash' by Neal Stephenson. World's leading companies of digital communication technology like Facebook, Microsoft and such other companies are jointly investing huge sums to realise the concept of Metaverse. The currently evolving Metaverse is far from the seamlessly integrated world that Stevenson envisions, and it has grown beyond the concept of immersive 3D virtual world. The emerging Metaverse includes the physical world (with its things, places, and actors) and the internet that helps to interact with virtual environments in real time. The novel gave expression to the way the emerging technology has developed. It also had the capacity to influence the imagination and artistry of its users too.

The concept of Metaverse is dense and is far from being simple, as the following extract clearly shows. "The Metaverse is a digital reality that combines aspects of social media, online gaming, augmented reality (AR), virtual reality (VR), and cryptocurrencies to allow users to interact virtually. Augmented reality overlays visual elements, sound, and other sensory input onto real-world settings to enhance the user experience. In contrast, virtual reality is entirely virtual and enhances fictional realities."

The working of Metaverse: Metaverse is simulated virtual reality and 3D universe at the same time. It is created by merging various kinds of virtual spaces. To enter into this created virtual 3D world or Metaverse, users need to create their own virtual identities in the form of 'avatars' (again digital).The user can enter into this virtual 3D world with the help of the avatar and can move around for various purposes like shopping, playing, attending concerts, meeting friends just like as if they occur in the real physical world. Without stepping out of one's home one can have an immersive user experience. In this virtual tour, if the user finds a shop of his/her interest and wants to make a purchase, it can be done and the ordered item will be delivered to the address given.

Technologies needed for Metaverse: To function properly within Metaverse there needs to have a combination of several cutting-edge technologies. The needed technologies are:

Virtual Reality (VR): In virtual reality we use computer technology to create simulated environments. It gives the user an immersive experience instead just of viewing a digital screen. The user feels like being placed inside what the person views right at the moment. (It is worthwhile to remember that the first 3D Indian film was "My Dear Kuttichathan" – a Malayalam film released in the year 1984, directed by Jijo Punnoose and produced by his father Navodaya Appachan under the banner Navodaya Studio.)

There are three types of Virtual Realities: (1) Non-Immersive Virtual Reality, (2) Semi-Immersive Virtual Reality, and (3) Fully Immersive Virtual Reality. Experts say that fully immersive virtual reality is yet to be developed fully. Fully immersive virtual reality provides most realistic simulation

experience. Actually virtual reality trick the human brain and visual capability by a combination of hardware and software; the brain and the eyes are thus given an experience of immersive experience. All the five sensory organs are overpowered with the help of the hardware, while with the help of the software a virtual environment is created.

Augmented Reality (AR): Augmented Reality integrates digital information and digital environment with that of the user's environment in real time. When virtual reality creates a completely artificial environment, Augmented Reality gives the user a real-world environment experience.AR blends the digital and 3D objects and pictures with that of an individual's perception of the real world.AR delivers all sensory pulses like sound, smell, heat or cold to the user through devices like smartphones or special glasses.

The necessary technology is required to have hardware components like processors, sensors and a display and input unit. If the device is mobile, it can have inbuilt hardware with sensors, including camera and GPS (Global Positioning System). In order to enhance the experience of the users, Augmented Reality combines existing real world environment and virtual world. Virtual Reality, on the other hand, helps the people to get immersed in an entirely different environment, i.e. a virtual environment, which was created and engendered by computers.

High-speed Internet or 5G technology: To create and experience Metaverse, there has to be high speed internet or 5G internet. 5G is the latest generation of internet, and this network is designed to connect virtually everyone and everything together. It is designed to deliver multi-Gigabytes per Second (Gbps) with high reliability and connectivity to a massive number of Internet of Things (IoT) devices. 5G also reduces the latency i.e. the gap between the transmissions of data packets. In other words, the gap between sending the data packet and receiving the data packet at the other end is greatly reduced.

d.   Non-Fungible Token (NFT): Fungible means transferable. Non-Fungible Token means non-transferable token. NFTs are created to uniquely mark a digital asset, whether it be digital art, music, games or any other form of digital collections. The main feature of NFT is that it cannot be forged or manipulated. It can be transferred or exchanged for digital currencies like bitcoins, which is a cryptocurrency. The importance of NFT in metaspace is that, to enter into the metaspace, or to customise a metaspace of one's own choice, the person needs to depend on digital collections which need to be purchased. All the digital collections or digital assets are stored in the digital world with unique NFT.

Cryptocurrency and block-chain Technology: Cryptocurrency serves as a medium of exchange in the digital world. As it is built using the technology of cryptography, and as it is encrypted, it is safe and secure. In the digital world we purchase and sell NFT – the digital assets (digital assets are of three different types – cryptocurrencies (e.g., bitcoin) crypto commodities (e.g., digital arts, music, games etc.) and crypto tokens, e.g. NFT) in exchange for cryptocurrency or bitcoin. The trading is conducted using the block-chain technology which is a decentralised ledger of all the transactions that take place all the world over. Because of the simple reason that it is decentralised, it is not possible or easy to play fraud or hack and collapse the system.

Differences between Metaverse and Internet: The very purpose of Metaverse and that of internet is different. On the internet one person can be online without necessarily being in interaction with other

people. On theotherhand,thefoundationofMetaverseitselfislaidontheconceptofdigitalhuman interaction. InMetaversepeoplesharethesamevirtualuniversetogether,whetheritbeforwork, study or play.AsMarkZuckerbergexplains,"It'saboutdeliveringasenseofpresencelikeyou're right there withanotherperson,andthat'stheholygrailofonlineandsocialexperience."

Metaverse andLibraries:Duetotheincreasingpopularityofvideoamongtheyounggenerationof 21st century, VirtualWorldandAugmentedWorldwith3Dexperiencearebecomingthenormalway of life.'WebkinzWorld'(atoy-to-lifegame),'PixieHollow;(30-minutetelevisionspecialbroadcast on November 19,2011)and'Pokémon'aregoodexamples,wherewonderfulthingslikestuffed animals comingaliveonline,andchildrencreatingfairiesandflyingintoanonlineworldhappen. Many commercialcompanieshaveconstructedvirtualspacesfortheirbusinesslikeadvertising, marketing andtradingwithinSecondLife(SL)–whichwaslaunchedin2003byLindenLab.

Second Lifeisasimulated3Dcreatedbyuserscalledresidents.Notonlybusinesspeopleand multinationalcompaniesareinterestedinSecondLife,butevenlibrariansandeducatorsare networking in large numbers in the virtual world of Second Life.

We have severalsuccessstoriesoflibrariesthathavebenefitedfromSecondLife.Thebestexample is the AllianceLibrarySystemofIllinois.TheystartedaprojectinSecondLifeinApril2006.Within a year, there wasahugeincreaseintheparticipatinglibrarians.Tobeexact,therewere800librarians and 50 librariesaroundtheglobe.Spencer(2008)observesthattheAllianceLibrarySystemwasan inspiration formanylibrariestostartapresenceinSecondLiferelativelyatalowcostforthepurpose of education relatedislands.Thesedevelopmentstookplacein2006itself.Afternearly16years,now the technologyaswellastheusershaveexpandedandincreasedenormously.Thefollowingtable depicts the totalnumberofusersofselectedvirtualplatformsworldwideasofOctober2021:

Table 01

Total users of selected virtual platforms worldwide as of October 2021

Web 3.0 virtual worlds	50,000
Non-fungible tokens	412,578
Blockchain gaming	2,364,576
Decentralized finance	3,450,000
Global crypto	220,000,000
Gaming/eSports	250,000,000
Facebook	2,970,000,000

Source:https://www.statista.com/statistics/1280597/global-total-users-virtual-platforms/

In a webinar session Dr. Valerie Hill, Director of Community Virtual Library, shared her experience and expertise as librarian and professor in information science with a focus on virtual environment. In her narrative she showcased a community virtual library; it is a real library but in the virtual world it has a main branch in Second Life. According to her the supremacy of the print age is over. The printed word ruled the world from 1500 (with the advent of Guttenberg printing press) to 2000.

We now have to balance the rich heritage of the glorious past with the exciting potential for innovation in the future. The librarians need to train themselves and their clients to excel in metaliteracy in this connected world. To quote T Scott Plutchak, "It may be that the great age of libraries is waning, but I am here to tell you that the great age of librarians is just beginning. It's up to you to decide if you want to be a part of it." In this digital age, or virtual age or age of metaverse, the willing librarians with innovative and creative skill can take the lead in helping and moulding the people to be competent to paly one's role in this virtual world efficiently and effectively. Such librarians necessarily need to be the advocates of digital citizenship and metaliteracy. Dr Valerie Hill proposes two ways to be a virtual librarian, and they are 1) bring VR into the library, and 2) bring our library into VR.A virtual world library or metaverse library can offer all the services a traditional library can provide plus many more other services. The additional services may be:

· Book discussions

- Resources in new media formats

- Workshops and seminars

- Tours and immersive experiences etc.

In no way the libraries, its infrastructure or its services can remain the same as it has been till now. The fast growing technology calls for quick adaptation. It is expected to take at least 5 to 10 years for the concept of metaspace to fully evolve. Libraries and librarians cannot remain relevant without absorbing such emerging concepts. Either we must bring VR to our library or we must bring our library to VR. At the same time, there are concerns that every library need to face. The major concerns are about the successful operation of the metaverse libraries. In this area, the concerns pointed out by Dr.Valerie Hill are:

i. Too many choices or overabundance of Simulated spaces

ii. The problem of accessibility

iii. The ever persistent problem of digital divide

iv. Lack of interoperability which is also very common with digital devices.

v. Addiction to simulated reality

vi. Privacy issues

vii. Mental health issues

Some important statistics on metaverse: It is relevant to include certain statistics on metaverse that are available in the internet. These are screenshots of the tables that are available. The statistics shows the benefits, dangers or shortcomings, reasons for joining the metaverse, the growth and acceptance of metaverse by humanity in their varied life circumstances etc.
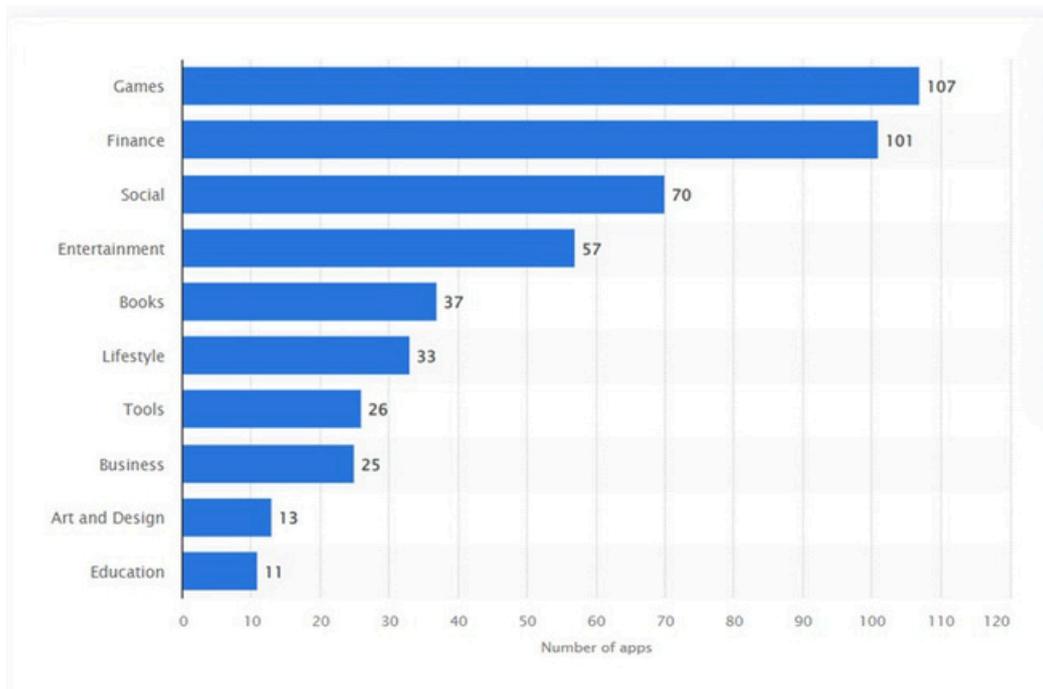
Table 02

Major reasons joining metaverse according to internet users worldwide 2021
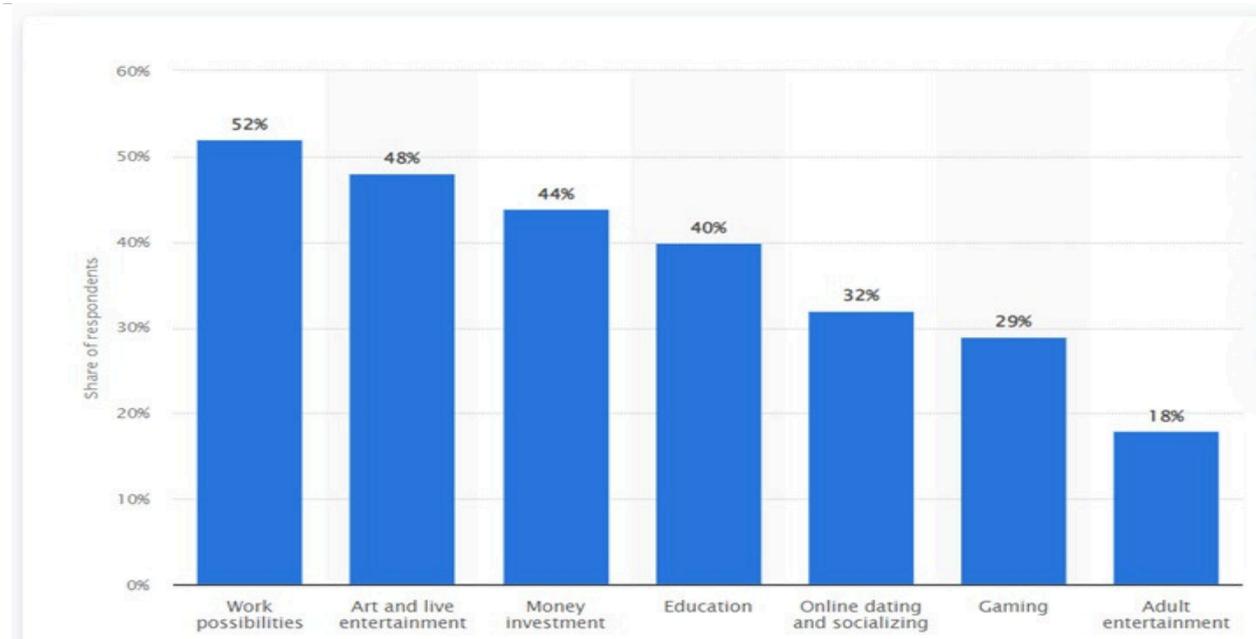
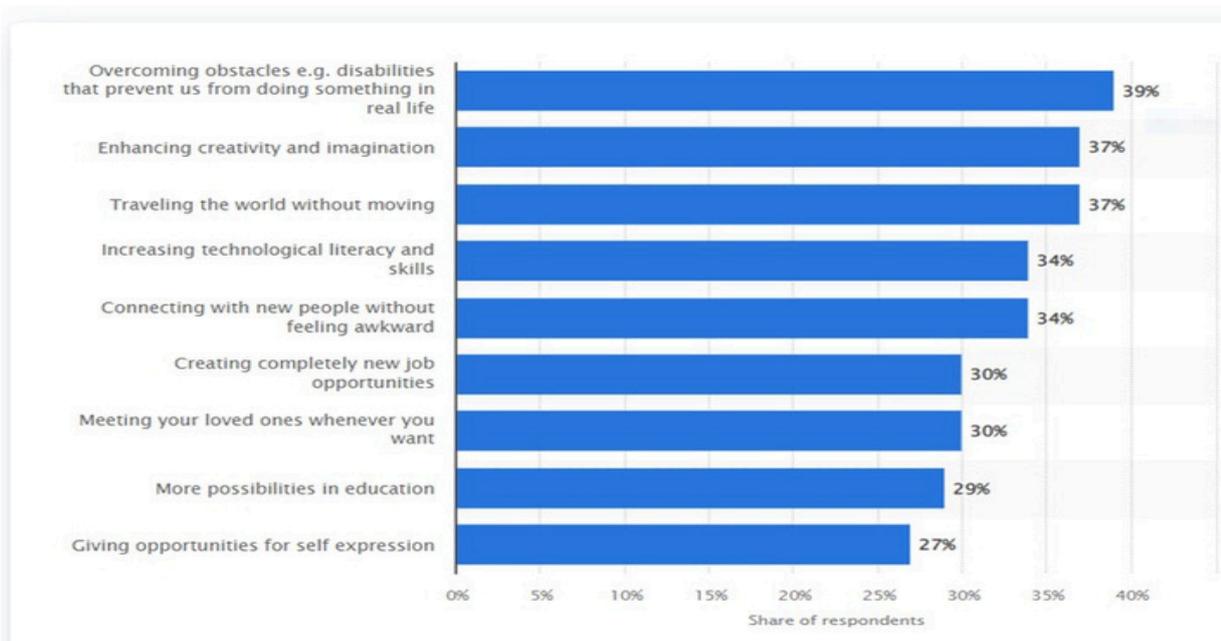Source:https://www.statista.com/statistics/1288870/reasons-joining-metaverse/

Table 03

Number of mobile apps with the keyword "metaverse" in their name or description as of February 2022, by category

Source:https://www.statista.com/statistics/1289589/apps-with-metaverse-in-their-name-by-category/

Table 04
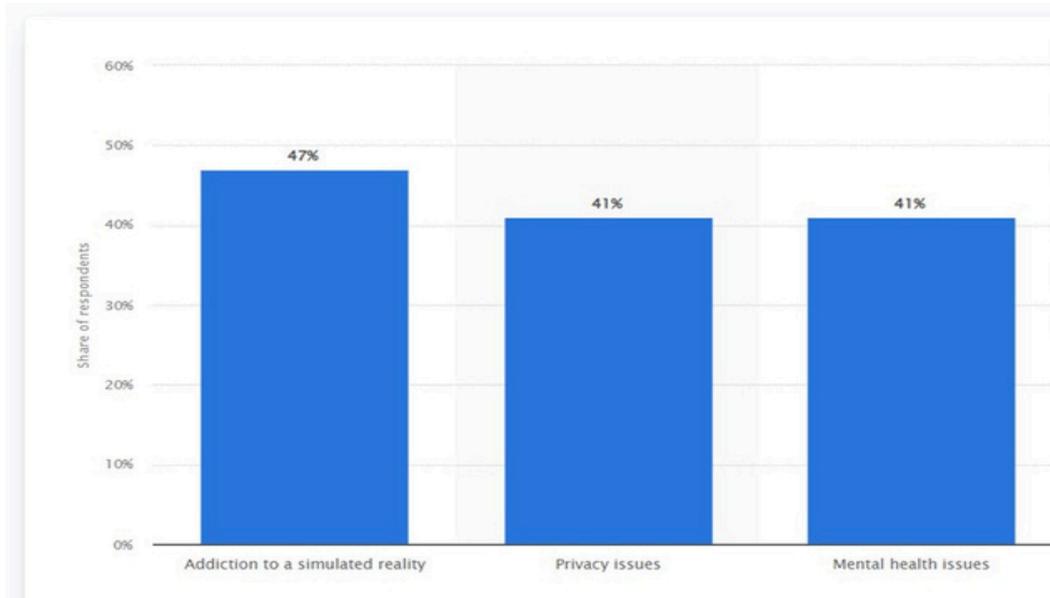
Leading benefits of the metaverse worldwide in 2021

Source: https://www.statista.com/statistics/1285117/metaverse-benefits

Table 05

Dangers of the metaverse accordingtointernet users worldwide in 2021

Source: https://www.statista.com/statistics/1288822/metaverse-dangers/

Conclusion: The history tells us that the librarians were always been the pioneers of the virtual world. They still now take the leadership in introducing and adapting latest technologies to the library and thereby to the education sector as a whole. Holding the conventional rich traditions of the library itself calls for the librarians to accommodate latest services required of the IT revolution. Next major leap the world expect is the metaverse – a universe beyond the actual universe. The situation brings in a great opportunity and challenge for the librarians to find out the best possible ways of connecting the users with the information world. Of course there are librarians who have proved success in the way of bringing VR into the library, by making use of the advanced technologies needed for metaverse.

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Integration of Internet of things in Libraries

Application and Impact

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ABSTRACT

Many libraries have adopted IoT technologies to serve their user community. Internet,sensors,RFID etc minimise human intervention in library operations and thereby the Internet of things play a vital role in the routine operations. In this paper, the application,advantages, disadvantages,impact and future of Internet of things in libraries are discussed.IoT can help libraries remain relevant and efficient in the digital age.The integration of the Internet of Things in libraries has the potential to enhance their functionality,services and user experience. **Keywords: Internet of things, RFID Tags,RFID Readers, Environmental Monitoring Systems,Occupancy Sensors, Smart Shelves,Digital Signage,Self-Service Kiosks, advantages and disadvantages of IoT in libraries, Data-driven insights**.

1. Introduction

The Internet of Things (IoT) refers to the network of physical objects or things embedded with sensors, software and other technologies that enable them to connect and exchange data with other devices and systems over the internet.These interconnected devices can range from simple household appliances to complex industrial machines. Various tasks are performed by these devices autonomously or with minimal human intervention. These devices can communicate and interact with each other.This paper tries to explain the application and impact of Internet of things in Libraries.We know that present day Libraries are trying to change the conventional concept about libraries. Library professionals seek the help of internet and other technologies to satisfy the various user needs. The Internet of Things brought drastic changes in libraries by improving operational efficiency. It is revolutionizing libraries by enhancing user experience and enabling innovative services. This digital age lead the generations to a virtual world . Libraries are becoming smart with the integration of Internet of Things(IoT).

2. Internet of Things

The phrase "Internet of Things " was first coined by Kevin Ashton in 1999 while he was working at Procter &Gamble. He used this term to describe a system where objects in the physical form are connected to the internet and these objects can communicate with each other.Identification , sensing and communication are the three levels at which IoT technically works (Bansal et al., 2018). Smart Thermostats,Smart Home Hubs,Smart Lighting Systems,Smart Security Cameras,Fitness Trackers, Smart appliances, Connected Cars,Industrial IoT devices are a few examples of IoT devices.As the name indicates; every IoT devices act as smart objects.

Smart Cities, Blockchain, IoT powered with 5G Technology, Traffic Management,Digital Twins,Edge Computing,Metaverse are the latest IoT trends ("Top IoT Trends," 2024).

3. **Application of IoT in Libraries** With the help of various IoT devices, library operations became

easy and effective.These devices
enable libraries for better understanding and effective responding to the patron needs. RFID
Tags,RFID Readers, Environmental Monitoring Systems,Occupancy Sensors, Smart Shelves,Digital
Signage,Seif-Service Kiosks, Book Recommendation Systems etc are some of the IoT devices
commonly used in libraries.Following are the various application of Internet of Things in libraries:-

v Asset Tracking: In libraries, tracking of books, equipments and others assets can easily be done
with the help of IoT sensors.Locating items and Managing inventory became easier.
v Environmental monitoring: Environmental conditions like air quality, moisture and temperature
may badly affect the library books and other materials.Monitoring by IoT devices ensures
preservation of these materials.

v Space Utilization: IoT sensors can track occupancy and usage of library spaces.It helps to optimize
layout and resource allocation.
v Security and Access Control: Smartlocks, surveillance cameras and access control systems etc help
in security enhancing.
v Energy Management and smart lighting: Brightness can be adjusted based on natural light levels
and occupancy by the IoT-connected lighting systems and thereby it helps in energy savings.
v Enhanced Patron Services: Real-time information is shared to the patrons by IoT-enabled kiosks
and mobile apps.
v Book Recommendations: Borrowing patterns and user preferences can be analysed by IoT devices
and thereby offer personalized book recommendations.
4. **Advantages of IoT in Libraries**

Diminished human exertion,time saving,Improved knowledge Acquisition,Real time information,
Increment security etc are some of the advantages of application of IoT in libraries
(Muthumari,2021).Integration with digital services,efficient resource management, enhanced patron
experience,Improved accessibility, data-driven decision making, remote monitoring and control etc
are some other advantages of IoT application in libraries.

5. **Disadvantages and challenges of IoT in Libraries**

v Privacy and Security Concerns: The data collected by IoT devices may include personal
information about library patrons.It should be secured properly otherwise this data can be vulnerable
to breaches.The use of IoT can lead to increased surveillance of users, potentially infringing on
privacy rights.

v   High Implementation Costs: Installing IoTdevices and the necessary infrastructure can be
costly.Maintenance and upgrading of IoT systems may strain library budgets.
v Compatibility and integration issues.

v Dependence on internet connectivity: Any disruption in internet connection can hinder their functionality.

v Technical challenges: Lack of technical expertise in libraries raise serious problems, managing of large number of IoT devices can be complex and time-consuming.

v Data management : Management and storage of the large amount of data generated by IoT devices is another challenge.

v Health Concerns: The prolonged exposure to the electromagnetic fields may cause serious health issues.

v Resistance to change: The library staff and patrons may prefer traditional methods of operation and they may resist the adoption of new technologies

6. Impact of Internet of Things in libraries

The libraries became smart with the integration of internet of Things technology.Its impact is multifaceted and significant.Improved Efficiency is the first one to point out.

Improved Efficiency: The library processes such as inventory management, asset tracking,environmental monitoring etc are automated by the IoT devices.It reduced manual intervention and helps freeing up staff time. It helps to satisfy the fourth law of Library Science.

v Optimized Resource Management: IoT devices enables better decision making regarding resource allocation and space utilization. Remember the fifth law " Library is a growing organism" in this situation. The space problem faced by many libraries are being managed effectively by these IoT technologies.

v Enhanced security:The safety and security of library facilities and library resources were improved with IoT integration.

v Data-driven insights : data collected on user behaviour, library usage patterns, resource utilization etc helps to make data-driven decisions .These decisions will reflect in the improved library operations and services.

v Cost Savings: Through efficient operations and reduced consumption of energy , the IoT technologies financially help the libraries.

v Preservation of materials: The library documents are to be preserved for the future generations.The IoT monitoring system for environmental conditions helps to extend the life span of documents.

v Enhanced User experience:The IoT technologies provide the patrons with access to real-time information,interactive experiences and user-friendly services.

Overall, the traditional library services and operations were revolutionized by the impact of Internet of Things. In this digital age , dynamic needs of patrons can be satisfied only with the help of IoT.

7. **Future of IoT in Libraries** The Integration of IoT may bring vast changes in the function and

services of libraries.Its future is an

exciting one.IoT can change the library buildings to smart buildings by creating smart shelves that track the document movements.The sensors involved in it can monitor heat and humidity which badly affects the documents.The devices having high communication capabilities serves the patrons based on their interests and preferences.The patrons may get chances to interact with different kinds of information including the virtual one (Pujar,2015). IoT can enhance efficiency and give statistics on different library services, user needs and user satisfaction. Resource management can be improved by the implementation of IoT and it will create more interesting experiences for the patrons.

8. **Conclusion**

The world is moving to smart technologies day by day. Every thing act as smart devices in this IoT age. Libraries will be more and more smart with the emerging trends and technologies.The multifaceted IoT devices play a vital role in this digital age and enable the librarians to provide efficient and effective services to the patrons.

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Transforming Kerala toa knowledge economy

Potential global challenges andopportunities in open science

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Introduction

With the multitude of initiatives under the Knowledge Economy Mission1, the Kerala state, through its recent Budget 2022–23, firmly established its aim in transitioning to a knowledge economy—an economy that creates, consumes, and disseminates knowledge to foster growth and development. To fully participate in the knowledge economy, a state ideally needs inclusive strategies that include but are not limited to, an adequate institutional framework, good education, a strong communications infrastructure, and a supportive financing environment, which are open and free to assimilate and absorb the global exchange and transfers2. While Kerala has several favourable resources existing, it has to act on many other sectors to make a successful transition to the knowledge economy. While the State's budget proposed a slew of schemes to improve human resource competencies, what received scant attention was the importance of developing institutional structures that would ensure a robust ecosystem for promoting a knowledge-based economy3.

In this context, UNESCO's recommendation of open science4, for equality, inclusion and democratization of knowledge is incomplete without a Southern perspective. Therefore, as the Kerala model[1] is very popular for high social development indicators albeit low economic development indices[2], the researcher intends to conduct fieldwork[3] among various institutions in Kerala to get the details on how the academic institutions make policies in knowledge creation in the face of complex global challenges, and how different factors such as open science, institutional infrastructures, and knowledge management shape those policies and thereby contribute to the reformation of the global knowledge production ecosystem.

Literature review

Open science initiatives and policies

This study revealed the major global open science movements5 and some of their policies. Starting from the global initiatives towards open access—the Budapest Open Access Initiative, Bethesda

Statement on Open Access Publishing, Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities, cOAlition S and its Plan S initiative, to UNESCO recommendation, the Group of Seven, Open Science Policy Platform Recommendations by European Commission, SPARC Europe, LIBER, the San Francisco Declaration on Research Assessment (DORA), the European Research Council and OECD, as well as international scientific societies, associations, and industry publishing organizations, such as the International Science Council, the International Science Association and the STM Publishing International Association. I have also been updated with the various open-access initiatives from India, such as the National Digital Library of India (NDLI), Vigyan Prasar Digital Library Indian Academy of Sciences (IAS), Indian National Science Academy (INSA), Vidyanidhi, IISc e-print archives, NISCAIR research journals, Shodhganga, Initiatives for manuscripts on cultural heritage, IndiaRxiv, and the ultimate "One Nation-One Subscription" model.

The Latin American Council of Social Sciences (CLACSO), SciELO (Scientific Electronic Library Online), Redalyc, Latindex and La Referencia are some examples of decentralised platforms for e-publication of open-access journals from Ibero-American countries.6 Besides, Initiatives like Open Research Europe which ensures fast publication and open peer review for outcomes of Horizon 2020-funded projects; Scholastica as software for the publication process and blockchain-based technologies have been highlighted.7

Another huge movement in this area is the Diamond OA journal study Funded by Science Europe and Plan S.8 Besides, some of the most common pre-print servers that have helped promote Open Science include arXiv, bioRxiv, ChemRxiv etc. Open Science Framework by the Centre of Open Science is another initiative in the domain of open data.9

Apart from that, Biesenbender et al. (2019)10 studied cases in Italy, the Netherlands and Germany and identified that through institutionalized Current Research Information Systems (CRIS) infrastructure, open-access repositories can be integrated into CRIS. Additionally, Bardi11 (2018) presents the OpenAIRE service, which fosters transparent evaluation of results and facilitates the reproducibility of science for research communities by providing the open science infrastructure to do so.

To explain the policies in OS, Alejandra Manco6 stated that the main geopolitical aspects of open science policies described in the literature are the relations between international, regional, and national policies. Daniela De Filippo et al12 analysed the activities of open science in Spain and underlined the government's and other non-academic actors leading role in the implementation of open science policies and the funding of open science research, showing how the open science movement has crossed the boundaries of academia. Jean-Claude Burgelman13 reiterated the role of artificial intelligence (AI) from an open science perspective. He also emphasised the importance of

FAIR guidelines and the European Open Science Cloud. Sh. Moradi et al14 found that the majority of the OS policies were generally related to the recommendations for the performance of research data repositories and the management criteria. He also indicated the need for an appropriate OS platform. However, it is very imperative to note that the whole paradigm of open science and its social contract is being challenged by various "enemies" or adversaries15.

Potential global challenges in open science

My statement would not be complete without mentioning the potential global challenges and pernicious effects of global scholarly communication. To put it bluntly, the process of knowledge creation is 'acutely political'. It is imperative to note that the inclusion of the global south should be a commitment of the mainstream academia, yet a distant dream for those working at the peripheries of dominant systems of knowledge production. There is a phenomenon of the captive mind in the non-Western world which is imitative and uncreative and whose thinking is based on Western modes of thought. This captivity is self-induced and is fertile ground for the implementation of intellectual imperialism16. My research also explores the paradoxes in the democratizing claims of Open science based on the Global North, examining the gendered, classed, neo-colonial and neoliberal exploitation of hegemonic OS17 initiatives. For instance, the land struggle of indigenous people (Adivasis) of Kerala18. Besides, the study focuses on epistemic injustice19 and challenges the monopoly of institutionalized (and marketized) knowledge production.

Similarly, the marginalization of southern knowledge production20 by patronizing emerging low-quality publishers as predators and the linguistic injustice21 in terms of the predominance of the English language is also a problem. To add on, access to scientific literature has been denied to the majority of scholars outside the limited elite academic institutions. Paper piracy22, therefore, has been claimed owing to the guerrilla-warfare attempt to pirate all papers out of the paywall. A few efforts are being made to address these unethical practices in scholarly publishing, but a comprehensive solution is unlikely to occur until all scientific literature is made open-access. Given the reality that numerous serious issues ought to be addressed immediately, gender representation has yet to be a concern in the Southern knowledge production ecosystem.

Challenges and opportunities in Kerala

While open science offers many benefits, implementing them in a place like Kerala presents intricacies. The following considerations are useful for comprehending the local context.

1. Lack of infrastructure

Kerala's knowledge production ecosystem may lack the infrastructure necessary for open science practices. College libraries face challenges in terms of technology, digital repositories, and data and knowledge management systems. The literature suggests that innovative solutions are necessary to address such issues27.

2.Awareness and training

Awareness of open science practices among college librarians is limited. Training and capacity building are important to empower library professionals with the knowledge and skills required to support scholarly communication. Successful strategies for raising awareness and encouraging a culture of open science have been documented in the literature28.

3. Collaborative networks

Collaborative networks with academic institutions and researchers are vital in advancing open science initiatives. Many studies highlighted the role of college libraries as facilitators of such collaborations, fostering community engagement and knowledge dissemination29.

4. Policy advocacy

Supportive policies at the local level and regional levels are mandatory for promoting open science in Kerala. Understanding the policy landscape and potential challenges and pernicious effects of open science is a key step for college libraries seeking to influence policy changes

Hence, the researchers started working on preliminary research to develop open science policies in Kerala, India and prepared a business model for the "Open Science Press." (figure 1) The proposal sought to open up science in the global south by exerting diplomatic pressure on the mainstream global knowledge production ecosystem. Its foundations include the five schools of thought23 in open science, the recommendation by UNESCO4, the 8 ambitions of EC's Open Science policy platform24, insight from other multilateral organizations in OS24, Porter's competitive forces model adapted to the scholarly publishing business25, STM report and the global epistemological challenges in scholarly communication8.
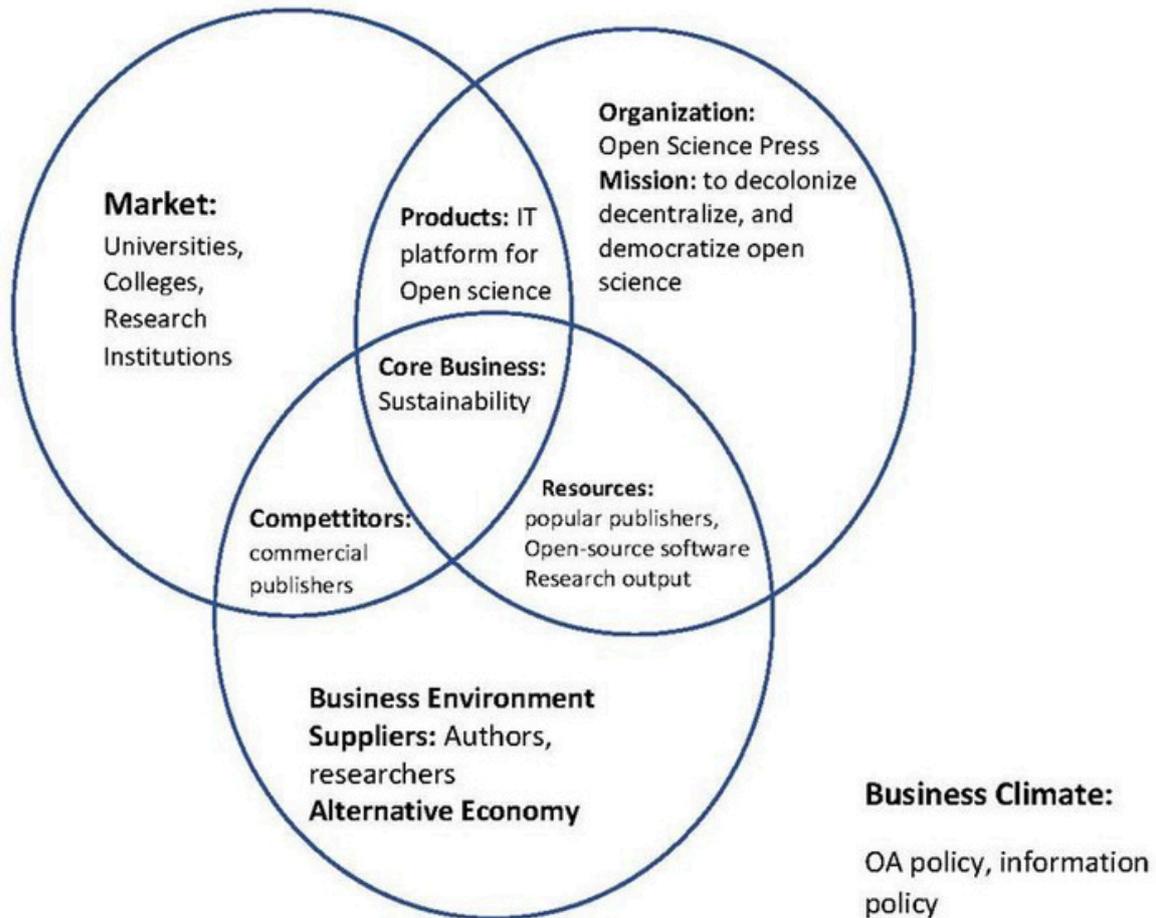
Figure 1: Business Model for Open Science Press

To respect the time and effort of scholars, the researcher would like to introduce the "Ruby OA Publishing" business model, where all the articles would be free to read and authors would receive a reward and loyalty for their articles published in the journal. publisher acts like an autonomous body of every private and public institution's library registered under Open Science Press and provides services like Institutional repositories, open peer review, open data, open education resources, and open research platforms for researchers. It is hoped that, unlike Western countries, the emergence of the vast number of private and public universities in Asian countries26 in recent decades will make the RUBY Open Access model sustainable.

To avoid the lack of human capital, the researcher wanted to combine both academic and popular publishing dynamically, which helps in the typesetting, copy-editing, formatting, metadata preparation and translation.

Conclusion

In summary, the present study reveals the global trends and principles of open science practices and policies. It also underscores the context-specific challenges and opportunities faced by college libraries in Kerala as they navigate the path toward open science and adapt to the changing scholarly publishing landscape. Additionally, the current study proposed an innovative business model for the Open Science Press. Further studies are required to assess the current status of open science practices and policies in Kerala, with a particular focus on identifying the challenges and opportunities for evolving scholarly communication.

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