

Emerging Trends and Technologies in Library and Information Science



Anna Kaushik, Ashok Kumar, and Payel Biswas



Handbook of Research on Emerging Trends and Technologies in Library and Information Science

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Trends and Technologies in Library and Information Science

Chapter 1

SWOT Analysis of Internet of Things in the Library and Information Science Environment	1
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Internet of things (IoT) is emerging as a prominent phenomenon in every domain including library and information science. Thus, this study aims to define the internet of things (IoT) concept and further conducts the SWOT analysis of internet of things (IoT) in connection to the library and information science domain in order to know the different insights of the internet of things (IoT). This study may be useful for knowing the different aspects of the internet of things (IoT) phenomena.

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<i>Laura Bohuski, Western Kentucky University, USA</i>	

Environmentalism and climate change are hot topics of conversation in society today, but libraries have long been a supporter of the environmental movement and going green. Often libraries have shown their agreement with green movement ideas through the construction or renovation of green libraries. However, with decreasing budgets, many libraries cannot afford new construction or the fees associated with becoming green certified. How then can libraries continue to support the green movement while on a budget? This chapter argues that while green certification is a good goal to have, if libraries would switch their focus to the wellness of their employees and patrons instead, then libraries could still have a positive impact on the well-being of their communities and enact healthy and environmentally sound initiatives, while also staying within their budget.

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Wasim Rahaman, Indian Institute of Management, Ahmedabad, India

The present society is considered an information society. A society where the creation, distribution, use, integration, and manipulation of digital information have become the most significant activity in all aspects. Information is producing from every sector of any society, which has resulted in an information explosion. Modern technologies are also having a huge impact. So managing this voluminous information is really a tough job. Again WWW has opened the door to connect anyone or anything within a fraction of a second. This study discussed the Semantic Web and linked data technologies and their effect and application to libraries for the handling of various types of resources.

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Overcoming the Google Handicap: How to Incorporate Information Literacy Skills on a Junior College Library Website	43

Derek Stadler, LaGuardia Community College (CUNY), USA

This chapter illustrates how the author upgraded the library website at an urban junior college, evaluating the efficacy of the single search box and how to support information literacy. As a framework, the author used the United States Department of Energy's Root Cause Analysis Guidance Document, which illustrates root cause analysis, a process to uncover, analyze, and resolve issues or problems of user behavior relating to technology. A usability test of the library's website using student subjects supplied data for data collection. Events and causal factor analysis identified the causes of problems observed in the usability test and corrective actions required to mitigate them. Results determined what design strategies promote information literacy on a library website and if the single search box is the best fit for an urban junior college.

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Abhishek Kumar, INFLIBNET Centre, India

J. P. Singh Joorel, INFLIBNET Centre, India

The overall goal of any country is to create high quality, curriculum-based interactive content for all subjects and host them on a platform for the benefit of universities, colleges, and the worldwide academic community in open access. The Government of India has initiated several projects for the e-content development. One of important project is e-PG Pathshala, which is a gateway to PG courses. The bigger challenge to developed this is content creation. So, library professionals made a vital role during the phase of e-content development. This chapter focused on e-PG Pathshala project and how library professionals helped to develop the content. e-PG Pathshala has 15 courses, which comprises of 387 e-modules developed n four quadrants. The INFLIBNET Centre is an anchor institute for the courses of library and information science.

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Alignment of OER Platforms With SDGs: An Exploratory Study..... 77

Ratan Kumar Jha, TERI SAS, India

Shantanu Ganguly, TERI, India

Shesh Mishra, Banasthali Vidyapith, India

Given that India is a fast-developing country, education can play a transformative role in societal change in the country. However, disparities continue to persist in access to education, provisioning of quality education. This has been reiterated and manifested even in recently declared SDGs with specific reference to SDG 4. SDG 4 recognizes the need for inclusive education to drive the change. This chapter highlights the role and importance of OERs in transforming the education and making it more inclusive. More importantly, OERs can play a significant role in bridging the digital divide in the country by imparting access to education to both haves and have-nots. The chapter in this context focuses on comprehending the challenges, prospects, and finest practices connected with Indian Open Educational Resources (OER) initiatives. This chapter will also address some of the relevant queries or questions such as, ‘Why do Indian university, college, and school educators adopt—or are reluctant to adopt—OER?’

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Open Science and Its Impact on Libraries, Publishers, and Authors..... 97

Josiline Phiri Chigwada, Bindura University of Science Education, Zimbabwe

The open science movement enables the accessibility and reusability of research output across the globe. Researchers and other stakeholders in the research process can now easily collaborate to add to the body of knowledge. This chapter documents how open science is impacting the role of libraries, publishers, and authors in the digital era. A structured document analysis and web analysis were done to find out how authors, publishers, and librarians are affected by open science. It was found that librarians are taking advantage of open science to provide various information sources to patrons, the publishers are now charging article processing fees to make the journal articles open access upon publishing, and authors are now able to access many information sources during the research process and enjoy greater visibility of their research output. The author recommends the adoption of open science especially in the developing countries and the enactment of policies that support open science at national, regional, and international levels.

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The Technology Shift for MOOC-Based Libraries: The Need of Libraries for MOOCs..... 109

Triloki Pant, IIT, Allahabad, India

Swati Pant, Independent Researcher, India

Massive open online courses (MOOCs) have evolved in past decade and become one of the prominent parts of the higher education system. The MOOCs provided a promising platform to aspirants who wanted to study further to either enhance their educational status or learn new technologies. With the evolution of MOOC, many platforms started to offer such courses, and many of them are not free as these courses need to register with some nominal fee. The role and need of libraries come at this point for MOOC courses as the courses are bundled with corresponding study material. The print library needs to assist

e-library so that it may be compatible with the MOOCs and corresponding resources. The technological shift from print to e-library has a great impact on e-learning followed by MOOCs; however, the issue of MOOC libraries and resources is yet to be resolved to ensure the availability to all the users. The chapter deals with the need of library for MOOCs, its structure and technology shift from print library to e-library, along with the differentiation between e-learning and MOOCs.

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Payel Biswas, Institute of Urban Transport, India

According to information scientists, information is modified into knowledge by adding experience. Researchers need powerful and successful filters to help them stay abreast of literature in their field, as well as methods to track the impact of their own research in often very specialized areas of interest. Traditional mechanisms such as peer review and citation searching using bibliometrics are no longer sufficient tools to aid researchers. How can librarians become leaders and powerful allies in this new landscape? Enter the world of Altmetrics. Altmetrics, or alternative citation metrics, provides researchers and scholars with new ways to track influence across a wide range of media and platforms. Altmetrics are metrics and qualitative data that are complementary to traditional, citation-based metrics. Altmetrics is a field of web-based metrics that accounts for total author influence which also looks beyond journal and monographic citation counts to the social web. The aim of this chapter is to explain the concept of library and librarian involvement with altmetrics.

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Modes of Acquisition and Models of Licensing: The Electronic Sources of Information 132
Nazir Ahmad Bhat, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, India

The advent of electronic sources of information (ESIs), e-resources, or electronic information resources (EIRs) has brought a revolution in the information landscape during 21st century. This has led to a paradigm shift not only in the modes and mechanism of storage, access, and delivery, but the acquisition of information has also witnessed a prominent change. This chapter is a theoretical overview of some newly emerging and popular modes of acquisition currently available for libraries to acquire and subscribe electronic information resources. Due to a visible change in the nature of information storage, access, and delivery, publishers have brought about certain changes in the policies governing the sale of their products in electronic form. As such, new license models have emerged, of which some popular ones have been enlisted for the benefit of libraries. The basic criteria needed to be set in force for prompt assessment of e-resources have also been highlighted at the end of this chapter.

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Digital Libraries, Information Literacy, and Bibliometric and Scientometric Studies in Library and Information Science

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Dipankar Halder, NSOU, India

Traditional libraries were considered as the storehouse for books and available for kings and renowned personalities of the society. Later on, libraries were considered information centres, but with the emergence of ICT, the concept of traditional libraries was changed; the books were replaced by information, and now information is for use for dissemination not for preservation. Tremendous advancement in technological developments is taking place in the field of ICT, so the user demand to change according to change in technology, to meet the demand of users and the library were shifting from traditional libraries to digital libraries, electronic libraries, and virtual libraries. This chapter discusses the relationship between digital and traditional libraries. It takes a critical look at the belief that the information technology revolution has destroyed traditional libraries as well as the librarians working them.

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Information Literacy 156

Sulyman Sodeeq Abdulakeem, Federal Polytechnic, Offa, Nigeria

Adeyemi Yusuf Abiodun, University of Ilorin, Nigeria

Kolawole Adebayo Abel, Federal Polytechnic, Offa, Nigeria

This chapter distinguished the concept of information and literacy before it proceeded to discuss extensively the concept of information literacy, which is the ability to access, evaluate, organize, and use information from several information resources. The historical development of IL was as well traced. Some notable components of IL such as identifying, finding, evaluating, application, and acknowledgement were explained. The chapter went further and elucidated the qualities of an information literate person. Lastly, benefits and challenges of IL were discussed, and a conclusion followed appropriately.

Chapter 13

Is the Indian Library and Information Science Research Interdisciplinary? A Case Study Based on the Indian Citation Index Database 169

Swapan Kumar Patra, Tshwane University of Technology, South Africa

Anup Kumar Das, Jawaharlal Nehru University, India

This chapter is an attempt to map the interdisciplinary nature of Indian library and information science (LIS) research. For this purpose, citation information of 28 Indian LIS journals is considered from Indian Citation Index (ICI) database. ICI is a bibliographic and citation database of research journals published from India. In order to understand the anatomical pattern of citations, social networking software UCINET is used to map the citation network. The result shows that self-citations (about 23%) are the prevalent pattern of citations among Indian LIS journals. Beside this, citation pattern at large is confined to the subject of LIS (about 93%) area. Further, the analysis also shows that about 7% of articles are cited from non-LIS journals. However, citations of non-LIS fields are from a closely related field, for example, general science and technology, computer science, and so on. Thus, it can be concluded that Indian LIS research does not show true interdisciplinary nature.

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Research Patterns on the Social Networks and Media: A Scientometric Portrait 189

C. Baskaran, Alagappa University, India

The study analyses 11,941 total records on social networks and media retrieved from Web of Science database during the period of study. The predominantly records 2,576 (21.57%) of the publications brought out in 2018, followed by 2,281 (19.10%) records published in 2017. A majority of the publications, 2,207

(18.48%), were published from communication area, on account of the specific nature of the research concentrating on Social networks. Computer communications information systems area scores second with 1,172 (9.81%) of the publications. The study found that more than 10 publications contributed by an individual area out of 11,941 records during period. Liu Y has contributed 37 (0.31%) of the publications as top ranked author in the research.

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Initiatives of an Institutional Repository (IR) of the Academic Institutions in the Indian Scenario:
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C. Baskaran, Alagappa University, India

The chapter analyses that more than 60 academic and research institutions have set up their institutional repositories as indicated by ROAR (Registry of Open Access Repository) and DOAR (Directory of Open Access Repository) (e.g., IISc, IIMK, ISI, NCL, NIO, RRU, NAL, NIT, and so on). There are a few institutions that have not registered in ROAR or DOAR. IRs has been increasing worldwide. Currently, ROAR lists 1,793 and Open DOAR lists about 1,966 IRs all over the world. It is found that more institutions (47) installed the D-Space (62%). It is followed by e-prints adopted (26), and two institutions implemented OAR through GSDL.

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Impact of Digital Marketing on ICDL 2016 Event Promotion: A Success Story..... 216

Reeta Sharma, TERI, India

P. K. Bhattacharya, TERI, India

Shantanu Ganguly, TERI, India

Arun Kumar, TERI, India

Today's world is technology-driven. Technology has penetrated almost every sphere of human life. Digital marketing is one of the technologies that have attracted people from different age groups all over the world with their advanced nature of applications and uses. One of the foremost reasons why patrons like to use this technology is because these are not only user-friendly in nature and innovativeness but also carry the knowledge economies. Marketing and branding through digital media channels are very decent ventures that have steadily increased in value and are thereby considered safe and secure investments. In this chapter, the authors discuss a case study of ICDL 2016 conference where social media and other technology is widely used to market this event and catch prospective users.

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Swarup Kumar Raj, University of Calcutta, India

Kakoli De, University of Calcutta, India

Electronic resource management (ERM) is the system and technique used by library professionals to track the selection, acquisition, access, maintenance, usage, evaluation of a library's electronic resources. The innovation of ERM conducted in the University Library, University of Calcutta has been discussed. It provides innovative insights into how technology transfer has operated in the University Library for

digitising the documents. E-resources are a vital reference source for different types of library users. The main focus is on how ERM is done through the digitisation of resources in the digital library of the University of Calcutta. Digital libraries have been set up in all the campuses by the University Library System so that users can download e-resources from any campus. The University Library maintains an online catalogue for information search and retrieval. Theses have been digitised, and full texts are available. Through the innovation of the Digital Library System of the University, it would enhance the University's education and research value.

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In an open distance e-learning (ODEL) environment, the lack of infrastructure causes certain obstacles that result in students not utilising the learning management systems (LMS). The aim of this study was to examine the usability and reliability of myUnisa as the LMS used for teaching Information Science at the University of South Africa (UNISA). In the particular context, a quantitative research approach was followed, and a questionnaire was designed and distributed as a web survey in an attempt to reach scattered respondents. The research findings show that the majority of students appreciate myUnisa as being reliable in for information science students. Also, students find learning on myUnisa more convenient than face-to-face instruction, as it offers more flexibility. This study recommends all students being provided with the internet as an access tool as well as the provision of free internet access or lower charges in data bundles to all registered UNISA students.

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<i>A. V. Selvavinayagam, Indian Institute of Technology, Madras, India</i>	

The Purpose of this study is to investigate the current state of utilisation of resources and services available in selected engineering colleges in Chennai District. Questionnaire followed with the personal interview is the method chosen for data collection in this study. Out of the total of nine institutions, six are selected as sample for the purpose of the present study, representing almost 66% of the total institutions in Chennai District. From each institution, 100 respondents are selected as sample; the researchers have adopted a stratification method. To test the hypothesis, Chi-square test and ANOVA two-way model are applied. This study is the first of its kind on engineering college libraries of Chennai District. It relies not only on data supplied by respondents but also on verification by actual observation. It throws light on the current status of the use of ICT facilities and level of information literacy in the users of these libraries and tries to find the reasons behind their dissatisfaction.

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The study analyses faculty members from 39 engineering institutions where electronic information was accessed for their teaching and research in Coimbatore District. The study observed results that 176 (33.8%) of them are Masters in Engineering, 89 (17.1%) of them have done M.Sc. Engineering, 46 (8.8%) of them have completed M. Tech, and 87 (16.8%) of the respondents are Ph.D. holders. The majority of the respondents, 221 (42.5%), are assistant professors/lecturers/senior lecturers. Two hundred fifty-one (48.3%) respondents rated that information sought from e-books are “excellent” while 205 (39.4%) of the respondents rated them as “very good.” Two hundred eighty (53.8%) respondents “agree” that electronic journals save the time of the user while 219 (42.1%) of the respondents “strongly agree.” A miniscule number, 21 (4.0%), respondents “disagree.”

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Indigenous knowledge refers to the knowledge, innovations, and practices of indigenous communities. Ethnic groups are repository knowledge of herbal medicine. Many indigenous people use several plants for medicinal preparations, and these medicines are known as ethnomedicine. It has developed from experience gained over centuries. Species of ethnomedicinal plants are threatened in most of nations due to overexploitation, habitat loss, destructive harvesting techniques, unsustainable trade, and deforestation. Documented indigenous knowledge on ethnomedicine forms part of the documentary heritage of the nation. The chapter will provide a framework for design an information retrieval system for ethnomedicine or knowledge on medicinal plants that are used to manage human ailments. The framework will be prepared, established on the open source software (OSS), and is appropriate not only for documentation but also beneficial for retrieving domain-specific knowledge. The model provides a framework for resource integration digitally using Greenstone Digital Library (GSDL) software.

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Ameeta Sharma, IIS (Deemed), India

Numerous applications have been filed for patents based on bio-inventions in the Indian patent office. Although there is not any international patent, there is a system of international patent applications whereby the applicant may designate name of countries where they wish to file application for patents nationally. According to international patent classification, the concern class for such a patent applications is A61K36/00. More particularly, the international class (IC) A61K36/00 relates to medicinal preparations of undetermined constitution containing material from algae, lichens, fungi or plants, or derivatives thereof (e.g., traditional herbal medicines). International applications filings under patent cooperation treaty (PCT) for patent purposes can be accessed at the Patentscope (patent search tool of WIPO). All international patent applications for such TK-based inventions have been accessed online at Patentscope using the classification code A61K36 for this study.

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Ashley R. Norris, Jackson District Library, USA

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The organizational culture of a public library plays an important role in the successful achievement of its purpose and mission. Effectively serving patrons and the larger community is an overarching strategic goal of public library systems, and public library leaders who are supportive of workers and committed to promoting a culture of employee engagement hold the potential for enjoying numerous positive individual and organizational outcomes such as effective service work performance and increased customer service and satisfaction. This chapter highlights the benefits of fostering an environment of employee engagement and its enhancement on service work performance and customer service in public libraries.

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Sabuj Kumar Chaudhuri, University of Calcutta, India

Innovation has always been the creative endeavor throughout the history of human civilization. With the inception of intellectual property rights (IPR) to protect the innovations almost 500 years back, the free flow of knowledge was obstructed, and further advancement of knowledge is somehow stunted. Emerging open innovation system with the sharing of knowledge beyond geographical boundaries has opened a new door to many possibilities. India, with her vast pool of scientists and engineers, can become an innovation society with a judicious combination of IP and open innovation systems. This chapter seeks to contextualize the trajectory evolves due to philosophical conflict that arises among intellectual property rights (IPR), open innovation systems, innovation society formation in India. It inquires to find a realistic sustainable path.

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Foreword

It indeed a great pleasure in writing a foreword to book *Innovative Trends and New Technologies in Library and Information Science* being edited by my young fellow professionals Dr Anna Kaushik, Dr Ashok Kr. Garg and Ms Payal Biswas. The book seems a very innovative and creative work covering wide range of topics related to new and emerging library tools & technologies, challenges and opportunities vis a vis libraries and information centres in 21st Century. The book is collection of 25 chapters discussing entire gamut of modern librarianship and emerging technologies such as Internet of Things(IoT), e-resource management, open access, MOOCs, Altmetrics, IPR, Information Literacy, Information Assurance, Information Security and role of libraries in promoting UN Sustainable Development Goals etc. Due to time constraints, I was not having opportunity to go through the all chapters in the book except brief summary /abstracts.

During my 28 years professional journey, I have witnessed a total turnaround the way libraries are developed, used, and governed. I have opportunity to head some of the best and largest libraries in India such as Jawaharlal Nehru University, Tata Institute of Fundamental Research, Management Development Institute, Gurgaon, Institute of Management Technology, Ghaziabad, and Indira Gandhi National Centre for Arts. Starting from first job at a junior most position of Junior Documentation Assistant at Central Road Research Institute(CRRI-CSIR) to highest position in the field as Director & Head- Kala Nidhi (Level 15 equivalent to Additional Secretary)at Indira Gandhi National Centre for Arts(IGNCA) Ministry of Culture, Government of India, I always enjoyed implementing new and emerging technologies such as Library Automation, digitization & Digital Archiving, Remote Access, Web Scale Discovery Services, Institutional Repository, Plagiarism Detection Tools, Reference Management Tools and Altmetrics etc. My further exposure as Members of different committees in International Federation of Library Associations(IFLA), Executive Member of Board of Directors, Networked Digital Library of Theses and Dissertations, Expert Member of International Centre for Documentary Heritage(ICDH), South Korea, Digital Dunhuang Project, China and Member of International Advisory Committee of UNESCO Memory of the World Programme and many more have helped in contributing to development of libraries and archives.

My experience says that libraries worldwide are on crossroad and struggling for survival and facing an issue of identity crisis. Even many people have start raising questions about existence of libraries. “Libraries everywhere are under threat. After all, who needs a library today, when it is possible, without even getting out of bed, to find and read almost any book or article that has ever been published?” asked Steve Denning, in *Forbes*, April 18, 2016. Despite of Many experts have responded to such questions, an unending debate on why still we need libraries is going on. All users and Library administrators need to be educated about difference between Internet and Libraries, and role of libraries and librarians in digital

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era. Many of the chapters in this book have provided valuable insights to deal with such questions and also to develop a road map for libraries of the future. This book will also help librarians in understanding its new role and developing libraries as per the current needs of the users.

Worldwide Web has thrown new challenges related to accessibility, authenticity and reliability. I understand popular search engines like Google provides access to 15-20% web contents. You need specific search engines to penetrate Deep Web. This digital revolution has also opened up various information / data security concerns. Mapping emerging trends and technologies in library and information science domain is always beneficial approach in terms of measuring the growth and development of the domain. Thus, the aim of this book is to map the use of the different technologies, innovations, pedagogies, best practices and other trends are being used in the library and information science domain.

I am sure that this book will be considered as a worthy resource to the library and information science professionals. I would like to give my best wishes to the editors for this endeavour.

Ramesh C. Gaur

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Preface

Emerging trends and technologies are acting as the main driving forces for not only transforming the traditional education, services, learning patterns, accessibility of information and resources into digital mode but also helping in improving and enhancing the quality of the services, education, courses, products and so on. Emerging trends and technologies may include use of best practices, new innovations, new concepts, new pedagogies, cutting edge technologies and so on. Emerging trends and technologies are assisting greatly in adding new dimensions and values in the services, education, courses, products, catching desired information, resources etc. in the different disciplines including library and information science as well as providing facilities to disseminate the services, resources, education, resources, products etc in variety of formats and anywhere and anytime modes also. As such, emerging trends and technologies are playing pivotal roles in making services, resources, education, products, courses and so on more worthy and accessible to the users with ease and in user's demanded formats and modes. Hence, in this dramatic changing era, emerging trends and technologies are enforcing the library and information science professionals to use them in the library services, library and information science education, courses, resources, products, disseminating of the information and so on. Therefore, library and information science professionals are understanding, adopting and using emerging trends and technologies extensively in the library and information science domain. Because, by using emerging trends and technologies, the library and information professionals can make the library services, education, resources, courses, information, products etc. more worthy and present them to the users most effective manner in anywhere and anytime as well as in proactive mode. On the other hand, library and information science professionals are offering a variety of services to the academic community and contributing extensively towards meeting the information needs of the users as well as making the society literate. For instance, the library and information science professionals who are working in different types of libraries are catering user's information needs by providing right information or resource(s) to the right user in the right time. Besides this, libraries are also working as the most happening places for conducting different kinds of activities and acting as problem-solving juncture as well as assisting in building special communities through forums for different purposes. Apart from this, the library and information science professionals are continuously thinking about how they can improve and add value in their services, resources, courses, education, products by using different types of emerging trends and technologies. But, the contribution of Internet and Internet-based technologies, web-based resources and services, open sources, social media and so on should not be forgotten because above mentioned technologies, tools and services are acting as the main driving forces behind the emerging trends and technologies through which the library services, resources, courses, learning patterns, education and so on are transforming into online mode with the facilities to access them anywhere and anytime as well as playing very pivotal roles in making them more worthy in this technology-driven era. Resultant, the library and information

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science professionals are engaging themselves in new trends, innovations and emerging technologies by understanding, adopting and implementing them in library and information science domain for upgrading and adding more value in their services, resources, courses, education, products etc. and shifting the traditional libraries into digital library or virtual libraries. Thus, in the present era, a wide range of emerging trends and technologies are being used by library and information science professionals in the library and information science domain for various purposes. It is expected that more innovations and emerging trends as well as technologies are likely to be adopted and used in library and information science sphere in future. But, mapping the use of emerging trends and technologies in the library and information science domain is a big challenge and may be varied to the country to country and practices to practices basis. Therefore, to examine, the use of emerging innovations, trends, practices and technologies in library and information science domain in past, present and near-future era, editors felt to bring out a book on the titled “Handbook of Research on Emerging Trends and Technologies in Library and Information Science”.

This book provides a detailed picture of the emerging trends and technologies being used in the library and information science and divides into five sections titled as “Trends and Technologies in Library and Information Science”, Open Access Resources in Library and Information Science”, “Digital Libraries, Information Literacy, Bibliometric and Scientometric Studies in Library and Information Science”, Case Studies and Survey Studies in Library and Information Science” and “Miscellaneous Studies”. This book contains a total number of twenty-five chapters wherein each section consist of five chapters which are focusing on different issues concerning with emerging trends and technologies and library and information science area. This book is covering variety of issues concerning to the emerging trends and technologies, like use of Internet of Things (IoT) in library and information science domain, green libraries, use of semantic web technologies and linked data in libraries, open educational resources such as massive open online courses (MOOCs), e-PG Pathshala project and role of library and information science professionals, information literacy, digital libraries, electronic resources licensing and management, open science concepts, Google search engine study, bibliometric study, scientometric study, Altmetrics, survey studies on access and usages of electronics resources, case studies on digital marketing, Indian Citation Index, electronic resources management, institutional repositories, culture and information-seeking behaviours, knowledge integration through using open source software, value of employee, work performance and customer services, intellectual property rights and so on.

Through the studies of this book, we can say that this book entitled “Handbook of Research on Emerging Trends and Technologies in Library and Information Science” will be very useful to the library and information science professionals who are fascinating towards emerging trends and technologies and want to get engaged in emerging trends and technologies in diverse ways which include the understanding, adopting and using the emerging trends and technologies in libraries, library and information science institutions, library and information education, resources and for other purposes. Certainly, this book will be served as a worthy resource not only to the library and information science professionals but also for the other professionals who are associated with the different disciplines and have interest to know about the emerging trends and technologies taking place in the library and information science at the national as well as international levels.

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Section 1

Trends and Technologies in Library and Information Science

Chapter 1

SWOT Analysis of Internet of Things in the Library and Information Science Environment

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ABSTRACT

Internet of things (IoT) is emerging as a prominent phenomenon in every domain including library and information science. Thus, this study aims to define the internet of things (IoT) concept and further conducts the SWOT analysis of internet of things (IoT) in connection to the library and information science domain in order to know the different insights of the internet of things (IoT). This study may be useful for knowing the different aspects of the internet of things (IoT) phenomena.

INTRODUCTION

In this technology-driven era, Internet has become a superpower and made everything online as well as enable to the users to send and access information or resources anywhere and anytime in real-time mode with the help of human, computer and internet technologies. But, nowadays, Internet of Things (IoT) has come up as the big thing and latest addition in internet sphere and considering as a most prominent technology owing to reasons of connecting and communicating to the large numbers of devices and is presenting deeper impact not only in different disciplines including library and information science but also daily life of the people. Internet of Things (IoT) is also considered as a new version of the Internet and provide facilities to connect the so many things or objects and enabled them to communicate each other automatically without a human in real time mode through a single device or server or interface. Therefore, the library and information science professionals are attracting towards the Internet of Things (IoT) phenomena and getting familiar as well as thinking seriously towards how Internet of Things (IoT) technology can be adopted, implemented and utilized in the library and information science domain

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and can be supported by library and information science professionals. Thus, for proper understanding and making maximum usages of Internet of Things (IoT) technology in library and information science domain, the library and information science professionals must know about the internal and external issues as well as other insights of the Internet of Things (IoT) concept in the real situation. To measure the various potentials and other insights of the Internet of Things (IoT) technology, SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis can be considered to be an effective and appropriate instrument. (Humphrey, 2005) added that the framework of SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis was developed between the 1960s and 1970s at Stanford Research Institute in the USA, to analyze the business data of fortune 500 companies. A SWOT analysis may be defined as a framework that can be used to identify the insights from the different angles for the particular product, concept, project, place, person etc. Hence, SWOT analysis may be very helpful in making strategic planning, decision making, and to identify other insights in order to understand and implement a product, concept, project etc. successfully for various purposes. Thus, an effort through this study has made for conducting a SWOT analysis of Internet of Things (IoT) for understanding, participating, adopting, implementing, utilizing and supporting Internet of Things (IoT) technology in the library and information science domain.

LITERATURE REVIEW

The different study carried out on the diverse issues connected of the Internet of Things (IoT) and library and information science domain in which Fernandez (2015) defined the historical background of Internet of Things (IoT) and described the various potentials of Internet of Things (IoT) concept. This study further expressed the diverse roles of libraries in the Internet of Things (IoT) domain. Patel and Patel (2018) highlighted an overview of the Internet of Things (IoT) concept, This study also described the characteristics, technologies, architecture, application and future challenges of the Internet of Things (IoT). Ziegeldorf et al. (2014) highlighted the evolution steps of Internet of Things (IoT) concept and pointed out the threats of privacy issues in the Internet of Things (IoT) setting. Ibarra-Esquer et al. (2017) mapped the changes were taking place in the evolution of the Internet of Things (IoT) phenomena by using two steps approaches and six international databases. Atzori et al. (2017) presented different stages of evolution of the Internet of Things (IoT) and stated that IoT has different potentials and play vital roles to present societal problems and solutions. This study further presented the definition of the Internet of Things (IoT) in future perspectives. Haller (2010) elaborated the terms related to the Internet of Things (IoT) and described the relationship among these terms in detailed. Hoy (2015) critically argued the Internet of Things (IoT) phenomena and also highlighted the various challenges related to using the Internet of Things (IoT) in libraries setting by providing some examples of the libraries which are using the Internet of Things (IoT) technology in their service and resources. By conducting the literature review, Liang (2018) pointed out the different applications of the Internet of Things that can be used in libraries services. This study further argued the research challenges of the Internet of Things (IoT) in future perspective. Mishra et. al. (2016) conducted a bibliographic analysis of the literature published on the Internet of Things (IoT) in different databases by using three search terms. Xie et al. (2019) proposed a theoretical framework Internet of Things (IoT) based intelligent evacuation protocol in the libraries through gathering data from eight libraries of Vietnam and China. This intelligent evacuation protocol consists of five elements like the information base, the protocol base, the IoT sensors, the

information fusion system and the intelligent evacuation protocol generation system and contains four distinguishing characteristics such as scenario corresponding, precise evacuation, dynamic correction and intelligent decision-making. and can be used in emergency situations in the libraries. Veglio (2017) study stated that the Internet of Things (IoT) is providing great opportunities to do business at the global level by using Uppsala model which known as one of the effective model of international business. Li et al. (2016) discussed security issues in the Internet of Things (IoT) environment in detailed and also provide security requirement and solutions for security point of view in the four-layer framework such as sensing layer, network layer, service layer, and application layer. Atzori et al. (2011) discussed a new concept called social Internet of Things (IoT) based on the social network of intelligent objects and stated that social Internet of Things (IoT) can be able to develop trustworthy environment among human and things. Xu (2015) conducted the strength, weakness, opportunity and threat (SWOT) analysis of the domestic market of wearable sports equipment that based on Internet of Things (IoT) technology and found that it had opportunities and advantages in contrast to weaknesses and disadvantages. Li et al. (2016) conducted a SWOT analysis of the management of prefabrication housing production (MPHP) in Hong Kong and proposed an Internet of Things (IoT) enabled the platform to overcome from the weaknesses and threats found by conducting this SWOT analysis. Vandana et al. (2017) stated that the library management system can build by using of Internet of Things (IoT) technology. Wójcik (2016) discussed the various potentials of the Internet of Things (IoT) technology particular in libraries and presented the different areas of library services in which the Internet of Things (IoT) can be used. Liang and Chen (2018) pointed out the diverse challenges while using applications of the Internet of Things (IoT) in the libraries and discussed the points to adopt Internet of Things (IoT) in libraries in future perspectives. As such, none study was carried out on the SWOT analysis of Internet of Things (IoT) in library and information science domain.

OBJECTIVES OF THE STUDY

The objectives of this study are:-

- To define the Internet of Things (IoT) concept.
- To implement the SWOT analysis framework on the Internet of Things (IoT) concept.
- To identify the strengths, weaknesses, opportunities and threats of the Internet of Things (IoT) in library and information science domain.

WHAT IS INTERNET OF THINGS (IOT)

The concept of the Internet of Things (IoT) emerged in 1999 when Kevin Ashton (2009) firstly used the term “Internet of Things (IoT)” in his presentation for the Proctor and Gamble company project for making strengthen the supply chain management using radio frequency identification (RFID) and the Internet. Postscapes. (2018) stated that “in 2000 first internet-enabled refrigerator was developed by L.G. company. In 2005 “Internet of Things (IoT) ” was used by International Telecommunications Union in its published report called “Internet Telecommunications Union report”. In 2008, two initiatives were taking place towards the development of Internet of Things (IoT) concept, first, IPSO alliance was de-

veloped for promoting, Internet protocol-enabled network devices in the different sectors such as health, industries, customer services etc. Second, first European Internet of Things (IoT) conference was held. In 2011. The new version of Internet protocol was developed that called Internet Protocol 6 (IP6) which support strong connectivity among million of devices with more flexibility of networking standards. After that, the sufficient growth of the Internet of Things (IoT) was noticed year by year. Thus, Internet of Things (IoT) concept was emerged as big things all disciplines due to development of the advanced technologies, sensors, a new version of internet protocol, the emergence of networking agencies such as Amazon, GE, Cisco, IBM and connecting of the million of things or objects in the Internet environment. Cisco's Internet Business Solutions (2013) claimed that 50 billion devices will be connected in 2020. Greenough (2014) stated that as per the BI Intelligence report, the Internet of Things (IoT) concept will be emerged as a big thing at the worldwide level."

In the Internet of Things (IoT) environment, every things basically have an unique identification and can connect to the different things through the Internet, communicate each other automatically by using sensor and other advanced technologies but need to connect with any central device, interface, server in order to collect, analyse data and control data. Usages of advanced technologies and networking protocols while connecting different things can save energy and time in communication and accomplishing the tasks. Some people use different terms for the Internet of Things (IoT) namely ubiquitous computing, pervasive computing, smart devices, machine to machine communication etc.

Morgan (2014) described that "Internet of Things (IoT) is basically connecting any device with an on and off switch to the Internet (and/or to each other). The Internet of Things (IoT) is a giant network of connected 'things' (which also includes people). The relationship will be between people-people, people-things, and things-things".

Gartner (2015) stated that the Internet of Things (IoT) may be "The network of things which contain embedded technology for conversation and interact with their internal states or the external environment".

As such, Internet of Things can be defined as an online real-time environment wherein different objects or things can connect and able to communicate each other without human intervention by using sensors, advanced networking, internet protocol, radio frequency identifications(RFID), cloud computing, energy harvesting and other smart and wireless technologies or devices.

SWOT ANALYSIS OF INTERNET OF THINGS (IOT)

Table 1 presents strengths, weaknesses, opportunities and threats (SWOT) analysis of Internet of Things (IoT) in library and information science:

STRENGTHS

Five A's namely anything, anywhere, anytime, advanced technologies, automatic communication can be considered as some important features and strengths of the Internet of Things (IoT). As we can connect numbers of things that laying on different locations at any time through advanced technologies using internet connectivity and can be communicated with each other both sides in real time mode. Velev (2011) highlighted the various characteristics of the Internet of Things (IoT) and analyzed Internet of Things (IoT) from different angles. Internet of Things (IoT) can add value in already exists things, ser-

SWOT Analysis of Internet of Things in the Library and Information Science Environment

Table 1. SWOT analysis of Internet of Things (IoT)

SWOT Analysis	Description
Strengths	Connecting anything, anywhere and anytime, advance technologies and automatic communication. Able to enhance and add value in existing things, services and resources. Public interest and innovative technology. Save the valuable time of the users. Ease of use. More control and management over things. Environmental friendly. Cost reduction.
Weaknesses	Security and Privacy issues. No road map, parameters and standards Compatibility issues. High risk involvement. Data management issues. Trustworthiness. Access of copyright and third party resources.
Opportunities	Applications of IoT in library and information science domain. Support Ranganathan's five Laws of library and information science. Search, access, location and recommended based services and resources. Transforming things, services and resources in smart way. Promotion of information literacy. Guidelines and problem solving centre. Space for Internet of Things (IoT) activities. Skills and competency development.
Threats	Standard issues. Vulnerability issues. High cost. Users expectation issues. Fear to get unsuccessful. Customization and maintenance of apps and interfaces. Lack of technical skills, attitude and authority support. Return on Investment (RoI) issue. Sustainability of Internet of Things (IoT).

vices and resources of the libraries and library and information science courses and make the things, services and resources more valuable, serviceable and worthy for the users. Internet of Things (IoT) technology emerged as big phenomena in all disciplines including library and information science and considering as new innovative technology in the online sphere. Trees (2015) stated that the Internet of Things (IoT) has the ability to produce information and knowledge in new innovative ways. Thus, every professional and other persons are attracting towards the Internet of Things (IoT) concepts and understanding and trying to use IoT concepts into their respective working sectors including libraries, library and information science institutions and organizations. On the other hand, the Internet of Things (IoT) technology is extensively using in accomplishing the daily life-related works of the people. Therefore, public interest towards the Internet of Things (IoT) phenomena is raising at a massive level. Atzori et al. (2010) stated that the main strength of Internet of Things (IoT) can be counted as the deep impact on different aspects of the daily life and changing the behaviour of the users. As the Internet of Things (IoT) phenomena works on the one to many principles in which many things are connected and controlled by only one device or interface. As such, so many things can be managed simultaneously, thus the valuable time of users can be saved by using the Internet of Things (IoT) technology. Hence, Internet of Things (IoT) technology supports Ranganathan's fourth law of the library and information science "save the

time of the users” which can be counted as another major strength of the Internet of Things (IoT). In the Internet of Things (IoT) environment, large numbers of things can connect through a device or server or interface and able to communicate each other automatically without a human being, therefore, IoT can be used easily. By using the Internet of Things (IoT) technology, people can control and manage the large numbers of things easily because things are connected, operated and communicated each other automatically through a controlling device or interface. Thus, a human being needs not to go to control and manage the individual or each thing, this work can be done automatically by using applications of Internet of Things (IoT), hence, more control and management can do over things in the Internet of Things (IoT) sphere. Osmonbekov and Johnston (2018) examined the various potentials of the Internet of Things (IoT) technology in the business sector. Internet of Things (IoT) can be considered as an environmentally friendly and cost-reducing technology. Because using the Internet of Things (IoT) in library and information science domain, the library and information science professionals can save a lot of energy, human resources, time, cost of electricity etc. and connect, operate, communicate and manage so many things automatically and simultaneously by using single device at anywhere and anytime. As such, the Internet of Things (IoT) technology is supporting the green concept and can be considered as a cost-reducing technology.

WEAKNESSES

Security and privacy issues can be considered as the major weaknesses of the Internet of Things (IoT) technology. Because on the one hand, the large numbers of things are connected and produced large data in the Internet of Things (IoT) environment. Low bandwidth and less secure applications, as well as less secure Wi-Fi enabled devices, can be identified easy at public places which make them unprotected and can be the victim of hacking. As such, there is no predefined reliable system working to protect the large data absolutely. Encryption, authentication of data, identification management and other security provision are ensured the security issues in the Internet of Things (IoT) sphere. Mahmoud et al. (2015) highlighted the security as one of the main threat in the Internet of Things (IoT) sphere and stressed on to resolve this barrier in connection to use the Internet of Things (IoT) phenomena in the real situation. On the other hand, another major weakness of the Internet of Things can be the privacy of the data or information. Privacy can be defined as a set of rules through which individual data or information is accessed. In the Internet of Things (IoT) sphere, devices can become traceable at different locations and the personal privacy of the individual can be leaked. Therefore, the human rights of the library and information science can be violated. Miorandi et al.(2012) stated that developing a privacy preservation system to the applications of the Internet of Things (IoT) is a very big challenge. Thus, reliable data security and privacy mechanism are still in demand while using Internet of Things (IoT) technology in different disciplines including library and information science domain. The different manufacturers use a variety of technologies and platforms to develop the apps or things and different types of protocols to transfer the data among the things. While different things are connected using the Internet of Things technology, it is possible that the connected things, technologies and platforms may occur problems due to compatibility reasons. These situations can cause the problem of proper communication among the connected things in the Internet of Things (IoT) environment. As no fixed standards and road map framed for governance of Internet of Things (IoT) and connecting the things through IoT, therefore, there is always high risk involved for the library and information science professionals in terms of security of

data, privacy of data, misuse of data, trust on Internet of Things and so on. However, the making trustworthiness of the Internet of Things (IoT) is always a big task for the library and information science professionals. Coetzee and Eksteen (2011) pointed out the major challenges such as trust, privacy and security in connection to use the Internet of Things (IoT) effectively. A large amount of data produced due to reasons of many things are connected using the Internet of Things (IoT) technology. The management of this large data is a big task for the library and information science professionals. They have to find the ways how this large data can be properly stored, analyzed, valuable and usable in future. Thus, the management of large data in the Internet of Things (IoT) environment, can be considered as a weakness. Harwood and Garry (2017) emphasized how to develop trust while using the Internet of Things (IoT) applications and potentials. In the Internet of Things (IoT) environment, variety of the resources including copyright resources are connected for various purposes, but for accessing remotely some resources may come under the violation for copyright law and third-party access issues. Baranidharan (2018) highlighted the key challenges of using the Internet of Things (IoT)..

OPPORTUNITIES

Internet of Things (IoT) technology provides many opportunities for the library and information science professionals. The main opportunity can be counted as use of Internet of Things (IoT) applications in library and information science domain for connecting, communicating and presenting the services, resources, courses and other things in a smart way by using only one device or interface. Internet of Things (IoT) technology can add value and new dimensions into existing library services and resources and in library and information science courses. Nie (2017) highlighted that the Internet of Things (IoT) technology provided different opportunities to the university libraries especially for enhancing their services. Thus, the Internet of Things (IoT) technology provides a positive environment for the users in which they have opportunities to get alert services, proactive information and able to perform their personal works as well. By using a device or interface in the Internet of Things (IoT) sphere, users can search and access their desired resources and courses with ease, able to get location-based services or resources and recommendation based services anywhere and anytime. As Internet of Things technology provides opportunities to connect and communicate the lot many services and resources and other things simultaneously and automatically on the anywhere and anytime modes, therefore IoT brings the readers close to the books and resources, books can get their users and users can save their valuable time by finding and accessing to recommended services or resources on proactive mode. Hence, Internet of Things (IoT) technology supports Ranganathan's second, third and fourth laws of library science viz. "Every reader his/her book", "Every book its reader" and "Save the time of the user". Apart from this, Internet of Things (IoT) environment provides an opportunity to promote the information literacy among the users to get actual information and location of services, resources and sections and other updates prior to using them for various purposes. Makori (2017) stated that the Internet of Things (IoT) can able to promote and complete various tasks as well as adding more values into works and services offered by academic and research organisations. By using of Internet of Things (IoT) technology, library and information science professionals can do marketing of library services and resources and library and information science courses in a smart way with the help of social networking sites and social media tools and techniques. Kaladhar and Rao (2018) said that the Internet of Things (IoT) useful in transforming the libraries into smart libraries. In the Internet of Things (IoT) environment, library and information

science professionals can develop the space for Internet of Things (IoT) activities especially to develop the interfaces, apps, services, resources etc. and also can act as focal point to govern and support the Internet of Things (IoT) activities at large level. Library and information science professionals can develop and promote the guidelines regarding how to secure the data and privacy and so on. Pujar and Satyanarayana (2015) pointed out the different opportunities provided by the Internet of Things (IoT) in libraries setting and also discussed how the Internet of Things (IoT) presented impact on libraries services and resources. Internet of Things (IoT) technology provides great opportunity to the library and information science professionals to build a community for supporting Internet of Things (IoT) activities through a library and information science forum to share the experiences, lesson learned, problems, facts, solutions and other issues related to Internet of Things (IoT) in real-time mode. Apart from this, library and information science professionals can conduct face to face debates, special lecture of experts, seminars, workshops and conferences etc. on Internet of Things (IoT) and library and information science theme and also conduct the research on Internet of Things (IoT) and library and information science issues and problems. Qin (2018) emphasised to find the scope and different usage of Internet of Things (IoT) technology particularly in the library services and proposed model for using the Internet of Things (IoT) in libraries as well. Moreover, by using the Internet of Things (IoT) technology and its applications in the library and information science domain, the library and information science professionals can develop their technical skills and professional ethics towards understanding, adopting and supporting cutting edge technologies like Internet of Things through the library and information science domain.

THREATS

In the Internet of Things (IoT) environment, standards are helpful for connecting and communicating the things successfully in the real-time mode and adding value in connected things, services and resources. But, owing to the rapid growth of the Internet of Things (IoT) technology, dramatic changes in technologies and connecting a large number of things, it is hard to follow the standards. Hence, maintaining the standards in the Internet of Things (IoT) environment can be considered as a threat. Thus, enough attention should pay for maintaining and following the necessary standards in the Internet of Things (IoT) setting. As, in the Internet of Things (IoT) environment, different types of things including small things and big things are connected and communicated each other, therefore, hacking may be possible for particularly those small applications and things which developed on the basis of less or non-security measures. Thus, hacking is considered as a threat of Internet of Things (IoT). Covington and Carskadden (2013) discussed the threats in the Internet of Things (IoT) setting especially focusing on the security and privacy issues. The high cost can be considered as a threat in the internet of Things (IoT) setting. Because, at the initial level, high cost in terms of developing and maintaining of the technical infrastructure, interfaces, tools, human resources, network energy consumption and so on may be involved to successfully adopt, implement and use the Internet of Things (IoT) in library and information science domain especially in library services, resources and library and information science courses. Angelova et al. (2017) measured the different threats regarding using the Internet of Things (IoT) in the business sector. Sometimes Internet of Things (IoT) environment cannot able to meet the expectations of the users for which they are looking for. Resultant, users are not able to fulfill their information needs, thus, it can be treated as a threat. Fear of getting successful in the Internet of Things (IoT) environment is always considered as a threat. Because many times library and information science professionals are not able

to achieve the set goals made by them due various reasons such as lack of technical support, limited budget, attitude, time, supports and so on. Customization and maintenance of the Internet of Things (IoT) applications, devices, interfaces and other tools and techniques when required, can be considered as a major threat. Because, lack of technical skills, dramatic changes in technologies, lack of positive attitude, lack of fund, time constraint and due to other problems, library and information professionals can not able to do customization and proper maintenance of the Internet of Things (IoT) applications, devices, interfaces. Due to dramatic changes in technologies and technical innovations, library and information science professionals are always suffering from technical skills and getting expertise in a particular technology. Thus, they are not able to understand the technical issues of the newly evolved technologies like the Internet of Things (IoT) unless they undergo specialized training programmes. On the other hand, sometimes, library and information science professionals do not want to adopt and use the Internet of Things (IoT) in their respective working places due to reasons of lack of attitude of the library and information science professionals and authority support, hence, these may be counted as the threats of the Internet of Things (IoT) technology . Karahoca et al. (2018) examined the critical aspects affecting the individual's while adopting the Internet of Things (IoT) enabled products in the healthcare domain. Some time library and information science professionals are not able to get Return on Investment (RoI) in the Internet of Things (IoT) environment in the different terms like overall cost involved in using the IoT, effectiveness of the services and products, achievement of targets set for developing the IoT infrastructure, and satisfying the users and their information needs and so on. Thus, getting actual Return on Investment (RoI) in the Internet of Things (IoT) sphere may be counted as a threat. As no authentic standards and directions are made for the governance of the Internet of Things (IoT), therefore sustainability of the Internet of Things (IoT) can be considered as a threat. Shin and Jin Park (2017) discussed the challenges in designing and sustaining the Internet of Things (IoT). Internet of Things (IoT) technology has just entered in library and information science domain and not considered as an established and full reliable technology in library and information science. Hence, the sustainability of the Internet of Things (IoT) is a big question before the library and information science professionals in the present and future perspectives.

CONCLUSION

This study depicts that SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis is a very helpful instrument for knowing the various potentials and other insights of the Internet of Things (IoT). After identifying various insights of Internet of Things (IoT) by conducting SWOT analysis, library and information science professionals can able to do best utilization of Internet of Things (IoT) technology in library and information science domain especially by adding value in library services or resources and library and information science courses as well as in the user's choice personal works. Library and information science professionals should think seriously regarding finding the solutions against the challenges and threats discovered through the SWOT analysis of this study. This study further alerting library and information science professionals to develop a device or interface which can connect the services, resources, courses, and other things as per users demand and able to communicate with each other automatically by using the Internet of Things (IoT) applications in real time mode. This study is also stressing to establish the Internet of Things (IoT) technology as a trusted technology in library and information science domain.

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Chapter 2

What If Your Library Can't Go Green?

Promoting Wellness in Libraries

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ABSTRACT

Environmentalism and climate change are hot topics of conversation in society today, but libraries have long been a supporter of the environmental movement and going green. Often libraries have shown their agreement with green movement ideas through the construction or renovation of green libraries. However, with decreasing budgets, many libraries cannot afford new construction or the fees associated with becoming green certified. How then can libraries continue to support the green movement while on a budget? This chapter argues that while green certification is a good goal to have, if libraries would switch their focus to the wellness of their employees and patrons instead, then libraries could still have a positive impact on the well-being of their communities and enact healthy and environmentally sound initiatives, while also staying within their budget.

INTRODUCTION

Over the last century the green movement has grown in importance among the library community. For many libraries the main goal of this movement has been the construction of green libraries. However, with budgets falling drastically many libraries cannot afford the cost of building green. Luckily there are many changes, from increases in natural lighting to the creation of meditative spaces, that libraries can introduce that will encourage healthful changes within their communities for less than the cost of going green. This author argues that instead of focusing solely on creating environmentally green buildings, libraries should endeavour, through whatever means are available, to promote wellness in libraries. It is through the use of various aspects of the green movement, like green architecture, and other ideas such as wellness initiatives, that libraries can help the environment and support their community all while staying within reduced budgets.

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This chapter discusses green buildings and the green movement, including a brief history of the environmental movement, its development within the library science field, while also taking a look at some of the literature on green buildings, wellness, and sustainability. Further, the author discusses the benefits of creating green libraries, along with the limitations that hamper such green initiatives. Included in this discussion will be an examination of the Leadership in Energy and Environmental Design (LEED) certification and the standards a library must meet to become LEED certified, as well as examining other official forms of green certification. The examination of LEED and other certification standards will provide information on what improvements are considered important by these programs and the costs associated with official certification. Finally, this chapter discusses small steps that libraries can take to improve the overall wellness of their libraries. These steps are less extensive and more cost-effective than renovating to green standards or building a new library, while still creating a more inviting and productive atmosphere inside the library for students, employees, and patrons. A library does not have to be certified to green standards to promote both environmental health and community wellness.

A BRIEF HISTORY OF THE GREEN MOVEMENT AND LIBRARIES

The earliest predecessors of the modern green movement in the United States can be found at the end of the nineteenth century with the rise of the conservation movement. The conservation movement focused on the protection of wildlife areas, the creation of national parks and forests, and urban expansion. The first governmental regulations on air and water quality would not exist until after World War II with the Federal Water Pollution Control Act of 1948, which was followed almost a decade later by the Air Pollution Control Act of 1955 (WGBH Education Foundation [WGBH], n.d.). In 1970 the US government established the Environmental Protection Agency [EPA] to regulate environmental policy at the federal level. The creation of the EPA also heralded the creation of other government agencies meant to protect the environment. While the government was creating new agencies for environmental regulation, numerous green movements were growing within different areas of the US population, and the library community was one such area.

Antonelli discusses the history of the green library movement in her article “The Green Library Movement: An Overview and Beyond” (2008). Antonelli’s article states that the first articles on green libraries appeared in the 1990s in a special 1999 edition of the *Wilson Library Bulletin*. These five articles were followed by the creation of the *Green Library Journal*, a professional journal focused on the promotion of environmental literacy in the library profession. According to Antonelli, the first issue, released in January 1992, was contributed to by members of the American Library Association’s Task Force on the Environment, which had been formed four years earlier in 1989 (American Library Association [ALA], 2006, Antonelli, 2008). Antonelli’s article provides a thorough background on the growth of green library literature from the early 1990s through 2008. She then moves on to discuss what constitutes a green library, focusing on LEED certification and green architecture, before addressing green library programming, green education, and steps that libraries can take to continue promoting the green library movement. Another scholar who provides background on both the environmental movement and the rise of green library literature is Stoss. In his article “Libraries Taking the LEED: Green Libraries in Energy and Environmental Design,” Stoss (2010) gives a brief overview of LEEDs certification, the growth of green databases such as GreenFILE and Environment Complete from EBSCO, and briefly discusses how the green movement in libraries extends beyond green buildings.

What If Your Library Can't Go Green?

Both of the articles by Antonelli and Stoss provide overviews of both the established green library literature and the main steps that libraries have taken to support the green movement. Antonelli's article discusses many aspects of the green movement that exists within library literature. However, a lot of the current literature on green libraries concentrate on only one component of the green movement. For example, articles on green buildings are often separate from articles that cover other aspects of green libraries such as student wellness or sustainability initiatives. However, most of these articles and papers do not discuss how the different aspects of environmentalism in libraries—green architecture, sustainability, student and employee wellness, community outreach and education—can be used in conjunction to not only help the environment and increase the long term viability of libraries, but also improve the wellness of the libraries' employees, patrons, and community.

Beyond Antonelli's and Stoss's overview on the green library movement, the literature on green libraries covers a broad range of topics from articles about green architecture to sustainability to student and community wellness. In "The New Green Standard," Brown (2003) argues that green design and buildings put libraries on the cutting edge of design, but a movement that started in part as a way for libraries to save money long term, has turned into a way to now save money through improvement in human performance. Brown states, "Personnel require a much greater investment than building costs. Small improvements in human performance more than offset most of the cost of improved indoor environments" (Brown, 2003, p. 4). In a similar vein to Brown's article, Browning has written a series of articles highlighting the helpful effects that green architecture has on the people who work within office spaces. In "Healthier Workplaces, Happier Employees," Browning (2015) introduces the idea of biophilic design, where architects and designers incorporate nature, such as views of trees outside office windows or the addition of indoor water features, when planning or renovating a building. The inclusion of nature within office spaces, Browning claims, improves the health and productivity of employees enough that it offsets the extra costs of building using biophilic design. In a follow-up article "Biophilia, Buildings, and Your Brain" Browning (2016) takes his assertions about biophilic design a step further alleging that recent scientific studies indicate that the space you work in can impair or improve your cognitive functions. In this article, Browning discusses his fourteen patterns of biophilic design and what biological responses these patterns can produce in the workplace. While these are early claims and need more time and scientific evidence to be proven effective, Browning's observations combined with research on the impact of green building design shows that the design and composition of buildings indirectly impacts a person's mental and physical health as well as their efficiency at work.

Green architecture and design constitute a large portion of the green library movement, and it would be helpful to take any opportunity to improve the workplace. However, as Aulisio (2013) points out in his article, "Green Libraries are More Than Just Buildings" there is more to going green than the design of, and materials used to build, libraries. Aulisio argues that libraries that practice sustainability and sustainability education are often unintentionally excluded from receiving the title of a green library because they are unable to afford environmental certification from a company such as LEED. For Aulisio, green buildings are only one aspect of environmentalism, and he argues that libraries can become sustainability leaders even if they cannot afford a LEED certified building or they do not have the time to teach sustainability practices to students (Aulisio, 2013). In "Great Outdoor Spaces," Rodgers (2017) describes new and innovative ways libraries from around the country are creating outdoor spaces for their patrons. These spaces promote learning through educational programs and community gardens and also include the incorporation of design components such as bioswales; architectural designs that use

local landscaping to remove pollutants from rainwater runoff. Rodgers (2017) argument is that the best types of libraries do not limit themselves to their own four walls, but engage with their communities too.

Library literature covers more than buildings and nature when discussing the green library movement. As evidenced by Aulisio's (2013) article, sustainability is a large part of creating a green library. Going a step further, "Sustainability Challenge for Academic Libraries: Planning for the Future," by Jankowska and Marcum (2010) argues that libraries need to begin keeping track of their impact on the environment. These scholars maintain that libraries need to begin considering themselves as environmental consumers and work toward increasing their sustainability in a variety of ways. "Sustainable strategies need to be integrated into a platform for guiding future decisions about collections, library buildings, and the scale of preservation, digitalization, equipment, products, and library networking service efforts" (Jankowska & Marcum, 2010, p. 8). Horava (2010), in "Collection Management and Sustainability in the Digital Age: Chasing the Holy Grail," debates how libraries can increase their digital collections to increase their sustainability and believes that it is only with the cooperation of vendors that this can truly be achieved as the cost of digital collections continues to increase.

Sustainability and green buildings have made up the bulk of green library literature over the past few decades, but recently there has been a rise in wellness articles as well. Student and employee wellness has begun to play a major role in how libraries function and this has been reflected in literature such as "Supporting Student Wellness: 'De-stressing' Initiatives at Memorial University Libraries" by Rose, Godfrey, and Rose (2016). Rose, Godfrey, and Rose present ways in which their library instituted new programs to help students cope with stress, mental health, and wellness, particularly during finals. According to their article, two branches of the Memorial University Library brought in therapy dogs, created 'de-stressing' stations, and held yoga sessions in the libraries (Rose, Godfrey, Rose, 2016). In a survey conducted by the library, wellness programs such as late-night hours, free coffee, popcorn, tea, and the therapy dogs were considered successful by the students in helping reduce their overall stress at the end of the semester (Rose, Godfrey, Rose, 2016). With a similar idea in "A Collaborative Approach to College and University Student Health and Wellness" Fullerton (2011) asserts that collaboration across University departments is essential to increase student health and wellness. Fullerton's article examines the collaboration between university health centers and recreation departments that already exist on some campuses; Missouri Southern State University is one such example, so it is easy to see how Fullerton's ideas about cross-campus collaboration linking centrally located services for students could be implemented in a library focused on the wellness of its students.

Students and patrons are often the main focus of library initiatives or improvements, but employees should not be forgotten when discussing health and wellness. "An Investigation of Factors Impacting the Wellness of Academic Library Employees," by Lo and Herman (2017) revealed that librarians could feel extremely overwhelmed by their jobs depending on their age, the number of hours they work, and if their work aligned with their core values and beliefs. Libraries making employee wellness a priority is important to keeping employees healthy and productive. "Micro-breaks Matter: A Diary Study on the Effects of Energy Management Strategies on Occupational Well-being," by Zacher, Brailsford, and Parker (2014) studied how taking breaks and teaching employees about work-related strategies (e.g. setting a new goal) improve employee occupational well-being. They argue that workplaces need to build an organization that supports the use of micro-breaks and work-related strategies to improve the vitality of their workers, and in turn, improve their employees' work ethic.

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Improving the wellness of employees, students, and patrons and reducing the environmental impact of the libraries overall has been a growing concern within the library community. While green architecture and biophilic design play a large role in increasing the wellness and productivity of the library community, it can also be expensive. The following sections will detail the types of green certification that libraries can receive and the processes and costs involved with going green.

LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN

The most well-known system used in green building design and certification is the Leadership in Energy and Environmental Design certification, or LEED. LEED is a certification program developed by the U.S. Green Building Council which was established by Rick Fedrizzi, David Gottfried, and Mike Italiano in 1993 with, “a mission to promote sustainability-focused practices in the building industry” (U.S. Green Building Council, n.d.-a, para. 3). LEED was first released to the public in 2000 and since then, the U.S. Green Building Council website claims that LEED has become an international standard among environmentally sound buildings that certifies thousands of square feet per day (U.S. Green Building Council, n.d.-a). The LEED main website states that “LEED... is the most widely used green building rating system in the world” and that their certification system is available for almost all types of buildings, for entire communities, and for homes as well (U.S. Green Building Council, n.d.-h, para. 4).

Receiving LEED certification on a building is a sign that environmental and occupant health has been considered in the construction or renovation of the building. Since its’ unveiling, LEED has gone through multiple iterations with a new update to version 4.1 going into beta this year (U.S. Green Building Council, n.d.-k). The information provided in this chapter will reflect the information currently available about version 4. As such all information is subject to change, and the LEED website should be monitored for the most up to date information.

When discussing LEED certification most people assume that certification only occurs with new construction, but there are a variety of options to have a building or several buildings, LEED certified. The U.S. Green Building Council’s (n.d.-h) LEED website front page, lists six varieties of LEED certification: Building Design + Construction (BD+C), Interior Design + Construction (ID+C), Building Operations and Maintenance (O+M), Neighborhood Development (ND), LEED Recertification, and LEED Zero. BD+C, ID+C, and O+M are the three main rating systems of LEED design and construction, and it is often one of these systems that libraries will choose if they undertake the construction or renovation of a certified green building.

Each of the three main LEED rating systems outlines a different type of green building or architecture. BD+C parameters are used when the project involves new construction or incorporates a major renovation (U.S. Green Building Council, n.d.-e). ID+C certification standards regulate interior design and construction projects and while ID+C projects often encompass the whole interior of a building and under specific circumstances a well-defined section of a building’s interior can be LEED certified without the rest of the building receiving certification (U.S. Green Building Council, n.d.-f, n.d.-m). O+M rating systems, unlike BD+C and ID+C, give existing buildings that do not have the option to update their interior or the budget to undergo construction the ability to green certify their operations and maintenance systems (U.S. Green Building Council, n.d.-d).

According to the U.S. Green Building Council (n.d.-h) on LEED's main website, to certify a building or interior under LEED the group applying for certification must meet specific prerequisites and then earn credits which will produce points during the certification process. Furthermore, the requirements for prerequisites and the requirements to earn credits change with each rating system (U.S. Green Building Council, 2014). However, the main categories that dictate each rating systems' prerequisites, or through which credits can be earned, are the same across all certification types. These categories are as follows: Integrative Process, Location and Transportation, Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and resources, Indoor environmental quality, Innovation, and Regional priority (U.S. Green Building Council, n.d.-g). The level of certification a building receives is determined by the number of points a project accrues during the certification process. There are currently four ranks available: Certified earning 40-49 points, Silver 50-59 points, Gold 60-79 points, and Platinum earning 80+ points with a building able to receive a maximum of 110 points in total (U.S. Green Building Council, n.d.-h).

LEED is not a free certification program and as such has multiple costs attached. These costs depend on the type of project, the size of the project, and the time and personnel required to oversee a green standard certification. LEED monetary costs start with the registration fees and continue with certification fees, with the option to recertify later (U.S. Green Building Council, n.d.-c). Because the cost of certification changes based on the size of the project and which rating system is used, the specifics of LEED fees can be viewed in a table which can be found on the LEED Certification Fees website (U.S. Green Building Council, n.d.-c). Once certification of a LEED building is completed projects have the option to complete recertification every three years (Holmes, 2018). Recertification of a LEED building also goes through a review process that has associated fees, though at a lower cost than the ones required for the initial certification of a LEED building (U.S. Green Building Council, n.d.-c). Though the initial costs of registering a LEED project are comparatively small in comparison to the costs of a new construction or major renovations, the costs of recertification can also add more to the project over time.

Beyond the monetary costs of LEED, there are also those costs associated with time and manpower. The LEED certification process while relatively straightforward is also complex. The steps required to complete certification are easy to understand. You meet the requirements, earn enough points, fill out paperwork, and pay for the third-party certification. But the overall time and education required to fully complete LEED certification are costly as even the guides and basic reading material can be dense and difficult to understand. While the majority of the components and processes of LEED are understandably locked behind accounts or a paywall, there is freely available information to study before starting the LEED process. This information, such as the rating system PDFs, can be found on the U.S. Green Building Council (n.d.-g) LEED main webpage and provides an overview of what goals each LEED rating system requires regarding their prerequisites and credits. However, even these general overview documents contain hundreds of pages of information. The general descriptions are often difficult to understand without a vocabulary list or specific training and the information is extremely detailed. The U.S. Green Building Council does offer LEED education classes, professional certification in LEED methodology, and a dedicated LEED coach to help projects navigate the LEED certification process (U.S. Green Building Council, n.d.-b, n.d.-j).

Serious consideration should be given on whether or not to build a green library through a certification process like LEED before it is undertaken. Building libraries to a certified green standard is a vital part of not only keeping libraries relevant but also supporting the longevity of the community and the world. However, building or updating to green standards can be difficult to achieve without guidance

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or training. While enrolling in certification programs like LEED will give project managers access to resources and education that could make building green both easier and more efficient, going through a certification process like LEED also adds extra time, money, and resources that might not otherwise be required.

OTHER GREEN CERTIFICATIONS AND STANDARDS

Apart from the LEED certification, there are many other programs that promote green building and design in the United States or internationally. Though LEED is probably the most well-known green building rating system there are a number of other green certification programs available for libraries to choose from and these systems have a range of costs and requirements. The Environmental Protection Agency (EPA) lists six green building or environmental standards on its website that can be used to promote green standards across the U.S. (Environmental Protection Agency, 2017).

These certification programs are not the only ones available within the United States. In the article “Green Building Standards and Certification Systems,” written for the Whole Building Design Guide, a program of the National Institute of Building Sciences, Vierra (2016) discusses both green product standards and green building certifications. Vierra’s list of building certification programs lists some of the most respected and used certification systems in the United States and Internationally. These systems are LEED, Green Globes, Living Building Challenge, Zero Energy Building (NZEB), Passive House Institute US, SITES, and WELL Building Standard (Vierra, 2016; International Living Future Institute, n.d.). The EPA’s list also includes Green Globes, LEED, and Living Building Challenge (Environmental Protection Agency, 2017).

These certifications, as mentioned above, are the most recognizable or appreciated worldwide. They are only a handful of the programs that exist worldwide and each program has specific criteria and goals for green buildings. While this lack of uniformity across certification programs can be frustrating it also means that libraries, and other building projects, can research which certification program is best for their needs. The aspects of green building, sustainability, and wellness that form the certification process changes based on the program, as does the pricing associated with each. These differences give libraries more options during budget restrictions. For example, both LEED and the International Living Future Institute offer net-zero energy certification programs which could help libraries move toward a greener building without having to undergo either major renovations or construct a new building (U.S. Green Building Council, n.d.-1, International Living Future Institute, n.d.).

SHIFTING TOWARD WELLNESS

Green architecture, green standards, and certification programs are fantastic ways to show the community that libraries are invested in environmental health, and paid certification programs often provide guidance and support through a complex process. Though these programs add costs to a project, the results of achieving green certification also help to defray the operational costs of the building over its lifetime. However, since many libraries cannot afford to have their buildings certified through a program such as LEED, it might be time to shift the focus from going green and being green certified to instead develop goals of wellness within libraries. Wellness, in this context, should come to encompass a more

holistic approach to library development by including the physical and mental wellness of patrons and employees as well as green design and environmental protection.

Wellness has taken on a variety of meanings over the last decade as people embrace a more holistic approach to overall health and well-being. The National Center for Complementary and Integrative Health (NCCIH) website states that “Wellness has several dimensions, including emotional well-being (coping effectively with life and creating satisfying relationships) and physical well-being (recognizing the need for physical activity, healthy foods, and sleep)” (National Center for Complementary and Integrative Health [NCCIH], 2018, para. 1). The NCCIH has sponsored research that studied people who used complementary and alternative medicine (CAM) to support their general wellness and the results suggest “that people who use complementary approaches for wellness tend to have better overall health, higher rates of physical activity, and lower rates of obesity than those who use complementary approaches to help manage a health problem” (NCCIH, 2018, para. 2). While the NCCIH does recommend that further research be undertaken into the long-term effects of CAM use, it appears that initial research into this field suggests that promoting improved overall wellness in people does improve their physical health (NCCIH, 2016, 2018).

With budget restrictions a real concern in many academic and public libraries, library organizations have to develop creative solutions to promote health and wellness. The definition of wellness is so broad that the ways in which libraries can improve the well-being of their employees and patrons are plentiful. The National Institute of Health lists five different areas in which to improve one’s overall wellness: your surroundings, your feelings, your body, your relationships, and your disease defence (National Institute of Health, 2018). As a library, improving a person’s disease defence, or their relationships is not a task that libraries can reasonably undertake. Conversely, improving the library surroundings and providing support for mental and physical health are important goals for libraries. Often, programs that promote the improvement of one of these aspects will improve them all.

Improving a library’s surroundings is frequently accomplished through physical changes to the building in the form of renovations or with new construction. This chapter has already extensively discussed green certification programs and, if affordable, building green is a great option for a library. However, small changes to construction projects can also lead to vast improvements in employee and patron wellness without the cost of official green standard certification. When a new library was built in 1998 in Fort Collins, Colorado the Fort Collins Utilities promoted the integration of daylight as the main source of light in the library through design assistance that “provides energy expertise and helps pay extra costs for daylighting specialists or HVAC consultants” (Rensselaer Polytechnic Institute, 2004, p. 3). The Daylight Dividends Case Study conducted by the Lighting Research Center at Rensselaer Polytechnic Institute (2004) found that the daylight design simultaneously reduced the overall maintenance cost of the building through savings in lighting costs while also delighting patrons who liked the use of daylighting, or the use of natural light, in the library overall.

Other libraries have followed the example of early daylighting adopters and used natural lighting to help decrease energy costs or improve the library surroundings. The Bronx Library Center in New York designed a combined floor plan for the top two levels of its library. The implementation of this design opened up the floors to a large amount of natural light through the use of both clerestory, and eastern and southern facing windows, which improved the natural light and reflected it to floors below (Weeks, 2006).

In a study conducted on the relationship between daylight in the workspace and the overall health of office workers, researchers found an initial correlation between exposure to daylight and access to windows and an increase in quality of sleep and overall health (Boubekri, Cheung, Reid, Wang, Zee, 2014).

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Consequently, one of the easiest ways to improve the quality of the library surroundings is to increase the natural light in the building. However, new construction or major renovations do not have to occur to increase the natural light in a library. In 2018, Western Kentucky University proceeded with a project to replace the windows in Raymond Cravens Library. This project was not undertaken with the intent of improving the natural light in the library, but because the windows were old and needed replacement for the continued functionality of the building. During the design and implementation of this project, instead of just replacing the windows with a window of similar size and shape, larger floor-to-ceiling windows were installed. The larger windows allow in much more light than before and also increases patron and employee views of the trees and skyline outside. Improving a workspace without some type of construction can be difficult, but using smaller construction projects that are needed to keep a building functional, such as new windows, can be extremely beneficial to the physical and mental wellness of library staff and patrons when used to improve the buildings biophilic design.

When construction is neither affordable nor required, improvements to library spaces can be made outside of traditional building structures. While some libraries are bringing nature inside libraries, others are taking the library out into nature and the community. In her article "Great Outdoor Spaces," Rodgers (2017) describes the Nature Explorium, an outdoor learning environment designed by the Middle Country Public Library (MCPL) in Centereach and Selden, New York. The MCPL, along with the Long Island Collaborative for Kids, landscape architects, and the U.S. forest service created an outdoor library garden where patrons of all ages can explore and learn (Rodgers, 2017). Her article also highlights the creation of an outdoor pollinator garden and classroom through a collaboration between the Princeton Public Library in Princeton, IL and The U.S. Department of Agriculture Natural Resources Conservation Service (Rodgers, 2017). Libraries can create better environments for their patrons through collaboration with local organizations and government services by thinking outside of the brick and mortar buildings librarians are used to.

Changing a building's surroundings has been shown to help improve people's mental and physical health and their overall wellness, but there are also actions libraries can take to improve patrons and employees' wellbeing without construction or interior redesigns. In libraries, the introduction of office plants around the building to improve air quality and reduce stress has been occurring. The Betty & Gordon Moore Library and the University of Cambridge have brought plants onto several floors of their library since 2016 (Clarke, 2016). Even the addition of plants into a few key areas can change the overall feel of a room and help remove toxins from the air when the operations and maintenance systems cannot be improved. In other libraries, programs that support de-stressing initiatives and physical movement can play a large role in improving working conditions for employees and support students and patrons through difficult times. These programs are ones that many libraries already offer but are discussed here because of their effectiveness in improving the mental and physical health of the people libraries serve.

Since the early 2000's libraries, both academic and public, have been developing new programs to help adults, kids, and teens deal with stress and improve wellness. The variety of these programs is impressive with each library tailoring their offerings to the desires of their communities. On campuses, many academic libraries offer extended library hours right before and during finals week. In "Supporting Student Wellness: "De-Stressing" Initiatives at Memorial University Libraries," Rose, Godfrey, and Rose (2016) discussed how their branch libraries offered both extended library hours and free coffee and snacks, such as popcorn, throughout finals. As part of their de-stressing initiatives Memorial University Libraries also offered yoga in the library, de-stressing stations (e.g. colouring books, stress balls, or small toys), and pet therapy (Rose, Godfrey, and Rose, 2016). When a survey was conducted at

Memorial University Libraries to see how students felt about these initiatives the researchers found that overall the students felt that the extended library hours, free snacks, and pet therapy were more helpful in reducing stress, and were liked more than the offered yoga classes or de-stressing stations (Rose, Godfrey, and Rose, 2016).

Extended hours and free snacks to students are easy and effective measures that academic libraries can take to help their student population during an extremely stressful time, but programs such as yoga or de-stressing stations do not need to be limited to exam periods. Ohio State University has, as of March 2018, opened a wellness room at their 18th Avenue Library (Jaggars, 2018). According to Vice Provost Damon Jaggars' (2018) post on the Ohio University Libraries website, the Wellness Room will be open to all faculty, staff, and students 24 hours a day, seven days a week for wellness activities including yoga, meditation, or quiet contemplation. Rooms or areas like the Wellness Room at OSU have been growing in popularity. The Moffitt Library at UC Berkley introduced a wellness room after its remodel in 2016, while Duke University Libraries has two wellness spaces within the Perkins Library (Kelly, 2016, Duke University Libraries, n.d.). The College Library at the University of Wisconsin-Madison has also created a Reflection Space on one of the floors of their library (College Library University of Wisconsin-Madison, n.d.). Each of these areas, whether they are a single room or a specific area within the library, is dedicated to the promotion of wellness and mindfulness in students instead of being allocated as study areas. The development of wellness rooms, meditation areas, and reflection spaces show how aware libraries and the community are becoming of how stress affects everyone and the multitudinous ways in which libraries can support community health.

Yoga, relaxation spaces and de-stressing stations are not limited to academic libraries either. In "Y is for yoga: Libraries embrace the practice to ease stress and promote literacy," Barack (2015) shows just how widespread yoga has become throughout the public library system as she highlights yoga instruction and programs offered in multiple states including Oklahoma, Wisconsin, and New York. In her article Barack (2015) discusses how public and school libraries are using yoga in conjunction with story time to help young children learn how to deal with stress and cope with unfamiliar emotions. Public libraries, more so than academic ones, are already well on the road to supporting wellness through their consistently evolving programs and workshops that cater to the needs of their communities.

CONCLUSION

Going green is a trend that libraries have been pursuing for decades. With the development of green standard certification programs, libraries now have guidelines to help them along their path to being green. However, the official green certification has extra costs associated that add to the already considerable costs that can accompany green projects. The extra costs associated with green certification are not unreasonable, but they can be restrictive when libraries are on a tight budget. By shifting attention from green standards and certification to promoting wellness, libraries can promote the physical and mental health of their students, employees, and communities without breaking the bank.

Wellness in libraries can be accomplished through a variety of means. Building a green certified library will promote wellness in patrons and employees, but when money is tight using a small project that has to be completed to forward green goals, such as increasing the natural light in a building, also promotes wellness. Outside of new construction, libraries can also shift their perception of where their library exists and bring themselves and their patrons into nature to learn in new and different ways. The

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designation or creation of spaces for meditation and relaxation to improve the mental and physical health of library communities not only facilitates wellness but can improve student study habits and employee work ethic. Libraries and librarians should broaden their focus from the creation of green libraries to the development of wellness within libraries through the integration of green standards and wellness initiatives and programs.

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KEY TERMS AND DEFINITIONS

Biophilic Design: A concept used during building to increase people's connections with the natural environment both in homes and in office spaces. This is accomplished through the use of direct nature, indirect nature, and space and place conditions within the building design.

Clerestory: An exterior wall of a room or a building that rises above adjacent buildings or rooftops and has windows to let in natural light and or fresh air.

Daylighting: The use of daylight, through the placement of windows, skylights, and reflective surfaces to provide sufficient internal lighting.

Going Green: The steps taken to reduce an organizations or persons environmental impact. This includes any steps from conserving energy to reducing carbon emissions, or even recycling.

Green Architecture: Building ideology that promotes energy conservation, the use of reusable and safe building materials, and placing a building in regard to the sites environmental impact.

LEED: Acronym for Leadership in Energy and Environmental Design. It is a building certification program managed by the U.S. Green Building Council that focuses on improving environmental and human health through the creation of better buildings.

Well-Being: Experiencing an overall state of happiness and good health.

Chapter 3

Semantic Web–Linked Data and Libraries

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ABSTRACT

The present society is considered an information society. A society where the creation, distribution, use, integration, and manipulation of digital information have become the most significant activity in all aspects. Information is producing from every sector of any society, which has resulted in an information explosion. Modern technologies are also having a huge impact. So managing this voluminous information is really a tough job. Again WWW has opened the door to connect anyone or anything within a fraction of a second. This study discussed the Semantic Web and linked data technologies and their effect and application to libraries for the handling of various types of resources.

INTRODUCTION

The modern world is the information-centric world. The central development of a society is based on how much information it has. This is no new concept. Since the ancient period, the upper-class people used to keep the information very secret to them only. But after developing new technologies, getting information is very easy job now. Presently people have become accustomed to digital information. In the beginning, digital resources are available through computers only. The WWW has opened the doors towards anything or to reach anybody with just a single click. The revolution brings new channels such as tabs, mobile apps as well as various new web technologies like; markup languages, programming languages, web servers, databases, web versions etc. are giving more opportunity to access more resources. Again, the interlinking between the similar concepts and presenting it through the AI (artificial intelligence) technique is making the web world more dynamic.

Libraries are becoming the information centres where resources are not limited inside the library only. These technologies have affected to overall housekeeping works in libraries, especially the procurement of document types has extended to electronic and digitised materials. Managing these materials is also

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becoming more challenging day by day. These technologies are the perfect solution to those challenges. MARC, ISBD, WebOPAC, Dublin Core, Union Catalogue, OAI-PMH etc. are the common technologies libraries are using for storing, managing, retrieval and disseminating the various resources to serve its users.

OBJECTIVES OF THE STUDY

The followings are the core objectives of this study to aware of

- The semantic web and linked data in brief.
- Why, when and how the web and linked data became the semantic web and linked open data.
- Components of the semantic web and linked data; its framework, standards, languages etc.
- The architecture of the web of stack of the semantic web.
- The advantages and disadvantages of the semantic web and linked data.
- The application of semantic web and linked data in the LIS field.

COVERAGE OF THE STUDY

The semantic web and linked data technology are completely a part of the WWW which belongs to the computer science and communication engineering discipline. Library professionals got a huge benefit as the traditional libraries are moving towards digital environments. This study is limited to the concept, architecture, required standards, required languages, and some related concepts, advantages & disadvantages and applications of semantic web and linked data only in the field of library & information science and library professionals to impede the lengthiness and expansion.

LITERATURE REVIEW

A lot of studies were done on the semantic web, linked data and its application in libraries. Some of them are highlighted here. Bakshi and Karger (2005) illustrated the tools built into the Haystack information management from the semantic web. Horrocks (2008) stated the process of RDF and OWL as the standard format for sharing and integration of information and knowledge. The general introduction to some ontology languages and its role in the semantic web (Antoniou et al., 2005). Bizer et al. (2009) refer to the concepts and principles of linked data and situate these within the broader context of related technological developments. Bizer et al. (2008) outlined the technical context in which linked data is situated and the development in the past years through initiatives. The possibilities of representing the most prevalent form of MARC, MARC21 as RDF for the Semantic web (Styles & Ayers, n.d.). Macgregor (2009) illustrated the application of semantic web and related technology to discover a variety of e-resources.

Gonzales (2014) stated the possible framework that will connect the library resources to the web and make them accessible to the mass readers. Halla (2013) elaborated the linked data based cataloguing as well as to overcome the drawback of MARC-based cataloguing. Baker (2012) described the issues

around the Dublin Core and to ensure that library data meet traditional standards for quality consistency and interoperable to other data sources in the linked data environment. Yadagiri and Ramesh (2013) discussed the concept of the semantic web and its related components and its benefits to library functions for providing effective library services. Hallo et al. (2014) pointed out the process to publish library metadata on the web using linked data technologies. Schilling (2011) expressed the relation and future of the library metadata and linked data.

METHODOLOGY

Descriptive methods of research have been followed here. Starting with a concept followed by the objectives and the scope of the study were demarcated. A review of the related literature has been done then. A brief discussion, need for these technologies so far with a history of these concepts, technology requirement, standards, languages, syntax, semantics etc., the advantages and disadvantages, some related concepts and the application of these technologies in the field of LIS was discussed. The conclusion was drawn based on the cases studied here.

SEMANTIC WEB

Before getting in touch with the semantic web, it is required to know well about the web. The semantic web is the extension of the web. It is a space, where any information can be shared worldwide. The English scientist Tim Berners-Lee invented this in 1990 to share information all over the world. Initially, it is written in HTML and published text information only through the internet by providing a unique locator ID for retrieval. Later it also started sharing images, videos and other file formats with various hyperlinks for connecting and go through the related information. It works via a data transfer protocol like HTTP through which data were transmitted to the end-user. As technology grows, the web has been grown to the semantic web to provide better access and reuse to the resources. The semantic web is a technology that represents information about some data which is interlinked to some related concepts in respect to the data (Bakshi & Karger, 2005).

LINKED DATA

Linked data is a method, by which some data are interlinked to each other in the web for providing a better answer to the search queries through browsers. This technology builds with the help of web technologies. In the beginning, the web provides the document search. One can retrieve the documents on the web according to the person's query. But after developing the linking technology, users can retrieve related data from the query instead of documents and with the search results, some interlinks also appeared by which users can look over some related concepts to their area of interests (Campbell, Lorna & MacNeill, 2010).

Figure 1. Web of document
(Adapted from. [Sabou, 2016])

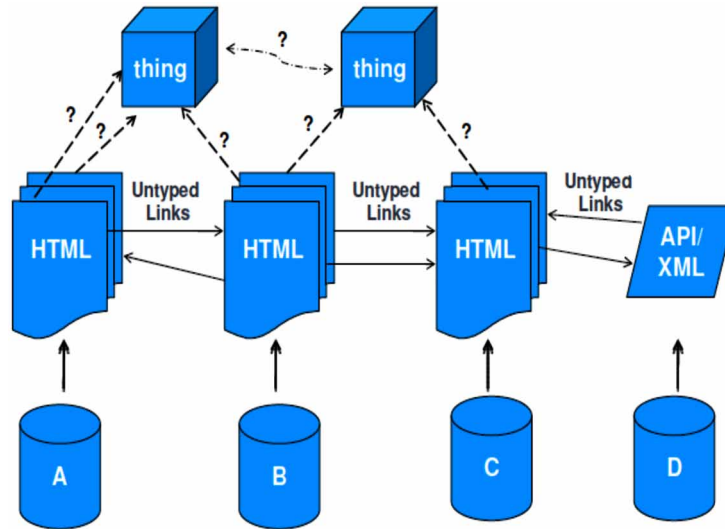
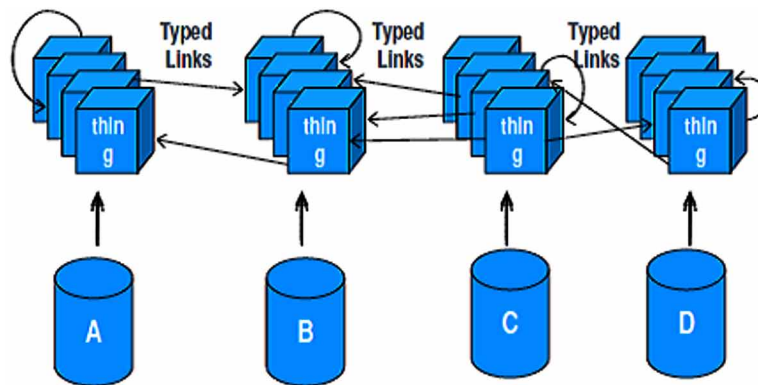


Figure 2. Web of data
(Adapted from. [Sabou, 2016])



NEED FOR THESE TECHNOLOGIES

HTML facilitates the hyperlink method of connecting other pages on the web, it is necessary to develop a method through which users can retrieve the relevant data/information instead of relevant documents. According to the user's demand, the concept of 'web of documents' and the 'web of data' came out. The web of document method is the result of the traditional web search which can retrieve related documents from a particular search query. But the web of data is the result of modern hyperlink data structure method which can retrieve the particular data/ information with some hyperlinks to some other data/ information related to the query.

As figure 1&2 show the differences, the web of document can access a particular content through two or more context. The context(s) are connected to some other context(s) so, it might possible that some irrelevant documents may retrieve. But in the web of data, the contents are connected to the related contents. So users can have a look at the related contents only when they want to, without any irrelevant interrupt.

BACKGROUND OF SEMANTIC WEB AND LINKED DATA

In 1990 the WWW was developed by Tim Berners-Lee, for sharing resources through the Internet (Berners-Lee, Handler& Lassila, 2001). The semantic network model was formed in far back in the 1960s by one scientist Allan M. Collins, one linguist M. Ross Quillian and one psychologist Elizabeth F. Loftus to represent the relationships between concepts. After four decades, Tim Berners-Lee applied this concept to the modern Internet and coined the term World Wide Web where interlinks between the related concepts through metadata has built up to create, upload and share of resources.

The concept of linked data came in 2006 by Tim Berners-Lee as to interlink data between different sources. The term linked data is also coined by Lee. Later on, the web of data concept came in 2007 from the linked open data project, supported by the W3C working group for aiming to make available and interlink the datasets on the web under an open license.

THE SEMANTIC WEB TECHNOLOGY

The semantic web is the collaborative movement by which structured and semi-structured data are converted into a structured web data. In the beginning, the internet is used to hyperlink the documents in academic and industry both for interconnect more and more pages for accessing from multiple points. The user interaction in websites through content management system expands the web into a dynamic level. It works through some standards to organise and make the semantic web possible.

- **Components of the SemanticWeb:** The followings are the components (Yadagiri & Ramesh, 2013) of the semantic web, by applying these the goals of the semantic web will be achieved-
 - **World Wide Web Consortium-** the W3C is the organisation of maintaining the standards for the web founded by Tim Berners-Lee after 1994 at the MIT lab in support with the European Commission and DARPA. It is the open web platform for interacting with the users through any device. It enables the users to create data stores on the web, build vocabularies and write rules for handling data.
 - **Resource Description Framework-** the RDF is a graph-shaped metadata data model belongs from the W3C family and is designed on the base of the entity-relationship concept. This is a descriptive model of information applied to describe the web resources to express the subject-predicate-object concept. It came to light in 2004 under the recommendation of W3C.

- **Resource Description Framework Schema-** RDFS is a language that used to describe the vocabulary in the RDF graph. It is also used to define the resource type or classes through some properties. It is a type of ontology definition language. This language was first released in 2004 by W3C recommendations.
- **Simple Knowledge Organisation System-** SKOS is a data model which represents the knowledge organisation system like classification scheme, subject heading list, thesauri or any other type of structured controlled vocabulary in a machine-readable format. This model type is defined in ontology language and expressed and encoded through RDF syntax. It is supported by W3C recommendations and was first appeared during 2004-05.
- **Standard Protocol and RDF Query Language-** it is a graph matching or semantic query language that used to retrieve and manipulate data stored in RDF structure on the web. The W3C recognised as a standard language and the key technology for the semantic web in 2008.
- **Web Ontology Language-** OWL is a standard for encoding and exchanging ontologies and is designed to support the semantic web. OWL came to light in 2004 by margins of DAML and OIL. It is built upon RDF standard and is the concept of providing information in explicit meaning for better understanding and process of information on the web.
- **Notation3-** N3 is a non-XML serialisation of RDF model developed by Tim Berners-Lee in 2008. It is more compact than RDF notation.
- **N-triples-** N-triples is a format for RDF graphs for storing and transmitting data in a line-based plain text serialisation format. It is the subset of Turtle and developed by Dave Beckett under W3C.
- **Turtle-** it is an RDF model format for presenting data with a SPARQL syntax. It is the subset of N3 and superset of N-triples and developed by Dave Beckett under W3C.
- **Semantic Web Stack:** The semantic web stack illustrates the layered architecture of the semantic web. The stack was created by Lee (figure 3). It is based on the hierarchy of languages and each language exploiting the features and extending the capabilities of the layers.

The modern web stack (figure 4) layer unstained with OWL and attention has turned towards the rules layer and language.

- **Advantages of the SemanticWeb:** The followings are some advantages of the semantic web-
 - It would understand users need and interest and organise every type of file format.
 - Search engines will ask questions about the user's query.
 - It wants feedback about users to search results and can calculate users past, present and potential future interest.
 - Users can publish classified ads for any products and the web will index it in their database.
 - If users publish any data, the web will integrate the data with their existing data.
 - Users can merge different data sources and create a new database without touching the original database.
 - Even in shopping and marketplace users can search any product with any specification in anywhere in the web.

Figure 3. Lee's web stack
(Adapted from [Horrocks, 2008])

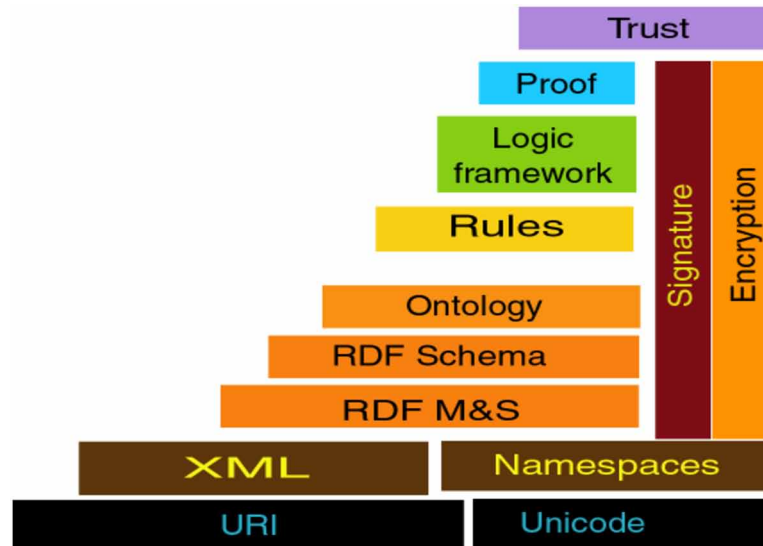
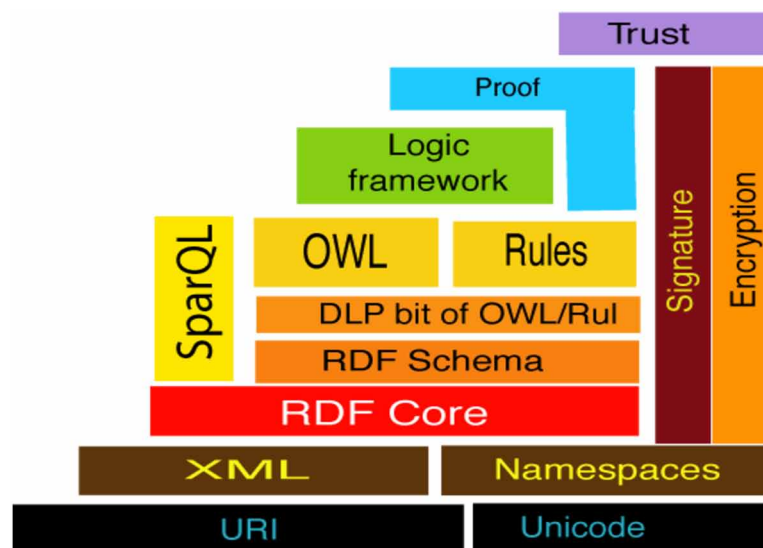


Figure 4. Modern web stack
(Adapted from [Horrocks, 2008])



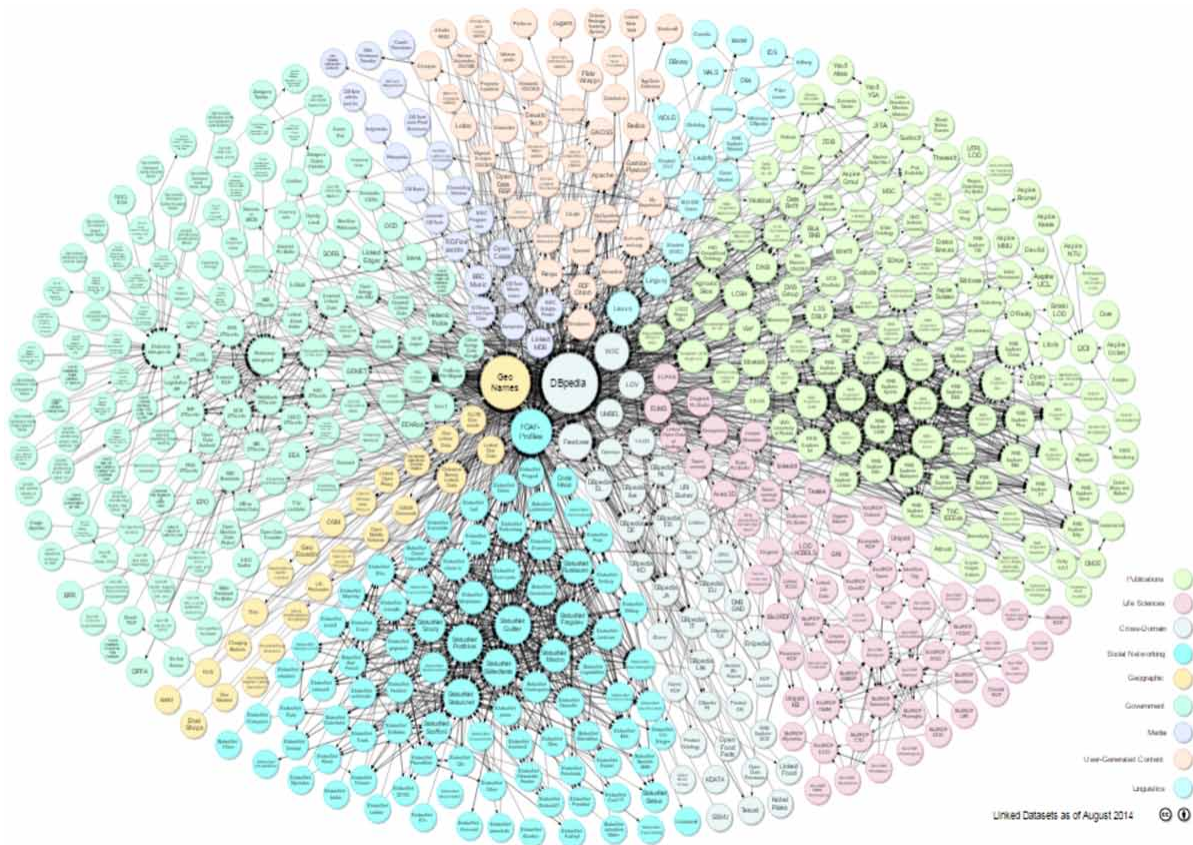
- **Disadvantages of the SemanticWeb:** The followings are some disadvantages of the semantic web-
 - The WWW and the semantic web are not compatible with each other. The WWW is written in HTML and the semantic web is written in RDF.
 - The semantic web tools don't generally support the large-scale application and is vary from application to application.
 - The common ontologies are not easy to describe.

THE LINKED DATA TECHNOLOGY

To make the semantic web a reality, voluminous data is to be presented in a manageable format to make available it. It is also needed to connect the related data. This interconnects of the data structure is called Linked Data. These links represent information through a web browser, after indexing the documents by the search engines and according to the search queries. In the conventional hyperlinks, the relationship of two documents wasn't able to describe an individual entity of the documents. As a limitation of the HTML, the global information system has evolved from the links of documents to the links of data.

- **Components of the Linked Data:** Berners-Lee has figured out four components (Coyle, 2012) of linked data, they are-
 - **Uniform Resource Identifier-** the URI is used to identify a document on the web, came into use in 1990. The uniform describes the unique identity of any resources on the web. The resource describes the various types of resources and the identifier distinguishes what to identify from a container. The syntax and semantics of URI are derived from the WWW concept which is designed to layout in Functional Recommendations for Uniform Resource Locator and Functional Requirments for Uniform Resource Names.
 - **Hypertext Transfer Protocol-** it is a TCP/IP-based application-level protocol used to deliver data on the web founded in 1990. It is a standardised method to communicate with each other through the computer system. It specifies and construct the search query from the end-user to the servers and returned according to the demand of the user. It is also can be used to the extension of its request methods, error codes and headers.
 - **Standards and Control Vocabulary-**it is the process of finding information using some standards of indexing the matter on the web using some control vocabularies as index terms and standards for running the web technologies like RDF, SPARQL, SKOS, OWL, N3, N-triples, Turtle etc.
 - **Include Link-**the links are made to other resources from one document for interlinking the same types of concepts and for discovering and use most of the related materials. This is the reuse of information value added by the web.
 - **Linked Open Data-** LOD is the latest addition to the components in linked data. LOD is a data which is available as a whole under open license and users can read, download, print or use it in any circumstances. Berners-Lee, the inventor of LOD specified it as the 5th component of linked data. The LOD Project started in 2007, aiming to identify datasets which

Figure 5. DBpedia datasets up to August 2014
(Adopted from. [<http://lod-cloud.net>])



are available in open license and to republish the data in the RDF framework. From then the datasets has grown to huge amount RDF triples and links (figure 5).

- **Advantages of the Linked Data:** The followings are some of the advantages of linked data-
 - It is sharable, extensible and easily reusable according to need.
 - It supports multilingual functionality for data and user services.
 - Getting information with a variety of related links is available quickly.
 - Publishing and promoting information or products is just got easier.
 - It supports the retrieval and remixing the data to consistent access to all metadata providers.
 - No longer to input data in a manual format, it identifies the fields and input automatically.

- **Disadvantages of Linked Data:** Several challenges may have to face both the users as well as developers while using linked data, these are-
 - Required regular update due to the information revolution as a huge amount of information is generating and changing regularly. Failed to which the links may not work properly.
 - Sometimes it may difficult to understand the concept. People may get confused about URL/ URI, open-world assumption, HTTP, syntax etc.
 - Keep the license agreement in mind and the terms of use of the materials at the time of reuse or publish it.

SOME SIMILAR CONCEPTS RELATED TO SEMANTIC WEB & LINKED DATA

To make understand about the semantic web and linked data some closely related concepts needed to know about (Yadagiri & Ramesh, 2013), these are-

- **Hypertext Markup Language-** HTML is a rigid markup language which is used for displaying contents on the web through the browsers. Any materials or contents are written in a document editor in between the angle tags (<>), will be displayed in the browser. HTML first appeared in 1990 from the SGML as a standard stated by W3C.
- **eXtensible Markup Language-**XML is the extensible form of HTML. It provides fundamental structure and syntax for the contents of the web materials. It also has the capabilities of simplified data storage and sharing mechanism and was developed in 2009.
- **Microformats-**it processes the data of markup in the web page within HTML tagging. It may be written in a natural language or formatted displays of product information.
- **Web Ontology-** ontology describes the identity of anything in general terms. Web ontology is the structural framework for representing knowledge within a specific domain on the web. It uses machine-readable semantics to communicate between human and machine.
- **A Friend of a Friend-** it is an application initiated by RDF in 2000 for connecting people of the same interest level or group through links. It provides a rich vocabulary to describe the personal relationship. In another way, it may call the social semantic web within a network.

APPLICATION OF SEMANTIC WEB AND LINKED DATA IN LIBRARIES

Nowadays libraries are turning mainly, one is in the form of an automated library system and the second one is in the form of a digital library system due to the various applications of emerging technologies. In the automated system, library operations are set automatically through ILM software. The most important part of an ILMS is managing the library records or the databases. To manage this database or metadata especially in the form of a catalogue, a library uses various schemes from the early period. After the 1960s when different MARC formats were started using tags to describe the metadata of the documents, the storage and retrieval of information got easier and much faster. The syntax may fix here but the semantics of the tags vary from item to item and represent the full bibliographic details of any documents.

As time passes, the web becomes semantic. The MARC tags were also becoming backdated. Though at present, almost every library uses MARC formats as standard for describing the metadata but in modern society, with new technologies it's becoming difficult to describe everything through MARC due to the rising of various file formats. Sometimes MARC failed to express the digital content details as local variation changes the consistency (Halla, 2013). It can't specify the relationship between entities or the hierarchical relationship of entities as it is a document-centric format for description.

So, as a drawback of MARC families, a new concept came alternatively i.e. FRBR then RDA and BIBFRAME (Gonzales, 2014). This technology changes the presentation architecture of data. FRBR is the entity-relationship model which represents the core relationship and navigates the hierarchical relationship of entities and provides also links to other materials. RDA is the guideline to formulate the bibliographic data. The BIBFRAME is the new data model concept replaced to MARC. It is designed to describe bibliographic information using linked data to integrate with the wider web of data. So far the web becomes semantic by representing data from HTML to XML; likewise, libraries represent the resource elements through Dublin Core metadata schema. The modern web OPAC not only retrieves the particular metadata but also retrieve the related data by the help of DC elements. Various web-based services like documentation, bibliographic, reference, referral etc. were given very easily.

Again the digital library architecture is not limited to the metadata only. It is an archive which provides the document itself for use and reuse of the resource(s). The linked open data facilitates full access to the resource(s) so far. Consortia are the best and popular example for open data. Import-export of data is another great example. OAI-PMH facilitates to handle the data migration for both LMS and digital archive. It is needed to establish ontologies for describing the specific objects. It also should be interoperable for easy access constantly and coherently. SEKT project has guided that a digital interface should redirect to other archives for accessing different type of resources for the same purpose (Sure, & Studer, 2005). It can be understood better with some of the worldwide case studies of the application of these technologies.

1. Case Study: 1

- a. **The OCLC-** OCLC is using linked data for several years and for several purposes. The first example is WorldCat service. It is a global cooperative catalogue service, which collects bibliographic details from libraries, incorporates into their database, and shares publically. The different objects that represent the different entities like the author, subject, work, place, publisher etc. are presented through standard ontologies and linked through other/ similar data in the database.

The Dewey service is another example. It provides the full bibliographic details of the document. The search entities are ISBN, title, author and subject heading. The links are mainly created by the author and the subject headings and recorded as virtual authority links, which also retrieve the other/ similar works.

Virtual International Authority File (VIAF) is the authority file deals with the various library authority files and combines and linked together for a single interface. It mainly deals with 'see' and 'see also' records and directed to the original records.

The Faceted Application of Subject Terminology (FAST) is another example. It is derived from Library of Congress Subject Headings (LCSH) and used both in WorldCat and Dewey services of OCLC. It uses very rich vocabulary for creating headings to control and maintain the uniformity/ standard and headings are interlinked to each other (OCLC, n. d.).

- b. **The LC-** Likewise the OCLC datasets, LC (Library of Congress) has also several datasets. The LC subject headings used by the co-operative libraries around the United States for sharing and linking up their database to others. The authority file (Name Authority File) provides several authoritative data of several entities like the place, person, title etc. Names are maintained through controlled forms. The LC classification scheme is also adopted for used in other libraries and most widely used classification in the world. The MARC relator codes through vocabularies and serves the identifier (The Library of Congress, n. d.).
- c. **The Wikipedia-** A tremendous example of both semantic web and linked data is Wikipedia. It is the largest and most popular in general reference work on the internet. It consists of more than 40 million articles in more than 250 different languages (as on Feb 2014) and almost all articles are editable and usable in any manner. The inter-links between the articles make it more dynamic and one of the top ten most usable website in the world (Wikipedia, 2017).

2. **Case Study: 2**

- a. **The NDL, India-** The National Digital Library under the Ministry of Human Resource Development, Govt. of India is an excellent example. It is the national archive in a single interface full of interlinks to the various repository sites in India. NDL harvest the meta-data from those sites and create the links, and by clicking on those links it redirected to the particular sites/ resource(s) (Rahaman, Jana & Roy, 2017). They have also followed certain vocabularies for indexing and search-retrieval.
- b. **The West Bengal Public Library Network-** It is a library network of West Bengal state in India which contains full of resource(s)/ interlinks to all types of user and necessary for the public for fully open. It provides links to various types of libraries in Web Bengal, library circulars, the library acts, digital rare books, the library catalogue, community information services etc. (The West Bengal Public Library Network, n. d.).

3. **Case Study: 3**

- a. **The Library Services-** In the present day, libraries are providing various types of new services. Web-based services are one of the important of them (Rahaman, Jana & Roy, 2017). Through the second and third generation of web (web 2.0 and 3.0) libraries are providing services like- Union catalogue (which represents a combined interface for retrieving resources from two or more libraries), Resource sharing/ Interlibrary loan (a loan facility of resources by a patron from other libraries if it is not available in the present library or vice versa), Discovery services (a single interface of retrieving any resources acquired by the library holding in any medium), Blogs (it is a service for providing the latest updates about the library with both side interaction), RSS (a feed for tracking of new contents from any site), Social sharing (by sharing options one can share/recommend resources to individual/ group/ organisation), Tagging (tag a term in a search result for using later), Creating list (a list of reading materials for use in future both for staff and user and also can be shared with others), Useful links to other resources/ organisation

(may be open/ closed), Ratings (it is a method of like or dislike any resource(s) and can also be used as a review for the same) etc.

These services are using various standards for storing-retrieving, fetching-harvesting, indexing, folksonomy, interlinks for making those resources usable worldwide. The semantics and linking technologies are used not only to retrieve the required resources but the similar resources also related to the searched item.

CONCLUSION

The goals of a library and these technologies are almost the same, to store and manage information in a well-structured meaning and provide it to the mass, through quick retrieval mechanics and relevant as fast as possible. These technologies are not limited to online but offline also. Library in-house operation tools are also providing search history facilities. Discovery tools are providing search facilities from all content holders over a single interface. Just like union catalogue online bibliographies, thesaurus, encyclopaedias are also using web ontologies. Now the web 2.0 technologies are used in and as library 2.0 which facilitates regular updated and evaluated multidimensional library services by using the same mechanism. It focuses on the user need and not limited to one-way service but also provide a facility for feedback and interaction. The next generation of web and library 3.0 is nearby and based on the concept of man-machine interaction and open protocols.

Library professionals come in handy to semantic web and linked data to provide effective library services. As the professionals stand between the user and information as a gatekeeper, they should bring them together. The implementation of library portals through semantic web and interlinks with various resources will fulfil the vision of the libraries. The semantic library portal should have automated interaction with a search engine combined with web ontologies, and the content is tagged with information. The adoption and implementation of technologies will enable ontology-facilitated sharing and reuse of learning resources. Such a portal will allow the library to provide the best services.

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KEY TERMS AND DEFINITIONS

HTTP: Hypertext Transfer Protocol is an application based protocol for transforming of information through WWW. Through protocol can interchange information by text or media or can hyperlink to other resources/webpages.

Linked Data: It is an interlink technology between two or more documents of related thoughts. Now the links become an open license for most use of thought contents.

MARC: Machine Readable Cataloguing (MARC) is an online version of the traditional one. It is presented in the form of the Online Public Access Catalogue (OPAC) from a single library or a group of libraries (union catalogue). The records are presented through particular tags in a standardised format and can be exported/ imported through metadata harvesting say OAI-PMH.

Markup Language: It is the process of defining and presenting contents through the web in a syntactically distinguishable format. Hypertext Markup Language (HTML) is the first and basic markup language then eXtensible Markup Language (XML) came into existence as extended version.

OWL: Web Ontology Language is a mechanism to process the content of web information. It provides more machine interpretability than XML, RDF and RDF Schema by facilitating additional vocabulary with the existing semantics.

RDF: Resource Description Framework is a standard data model for the exchange of data over the internet. Basically, it is a method of describing or modelling the concept of data. A set of classes having certain properties to provide basic elements to describe those data is known as RDF Schema. The set of classes are called as vocabulary or ontology in the web language.

SKOS: Simple Knowledge Organisation System is standard to support and use of organising knowledge in a systematic frame like thesauri, classification scheme, subject heading system, taxonomies, etc.

URI: Uniform Resource Identifier predefined set of syntax rules which identifies a particular resource in the web. It also maintained extensibility through a separately defined hierarchical naming schema.

W3C: The World Wide Web Consortium is a web standard community to lead the web to its full potential and to run and maintain the web from a-z through standards.

World Wide Web: The World Wide Web or the web is a network of space where contents are available and accessible from any web-enabled device written in a particular language. The web is now transmitted to semantic web from document centric to data centric.

Chapter 4

Overcoming the Google Handicap: How to Incorporate Information Literacy Skills on a Junior College Library Website

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ABSTRACT

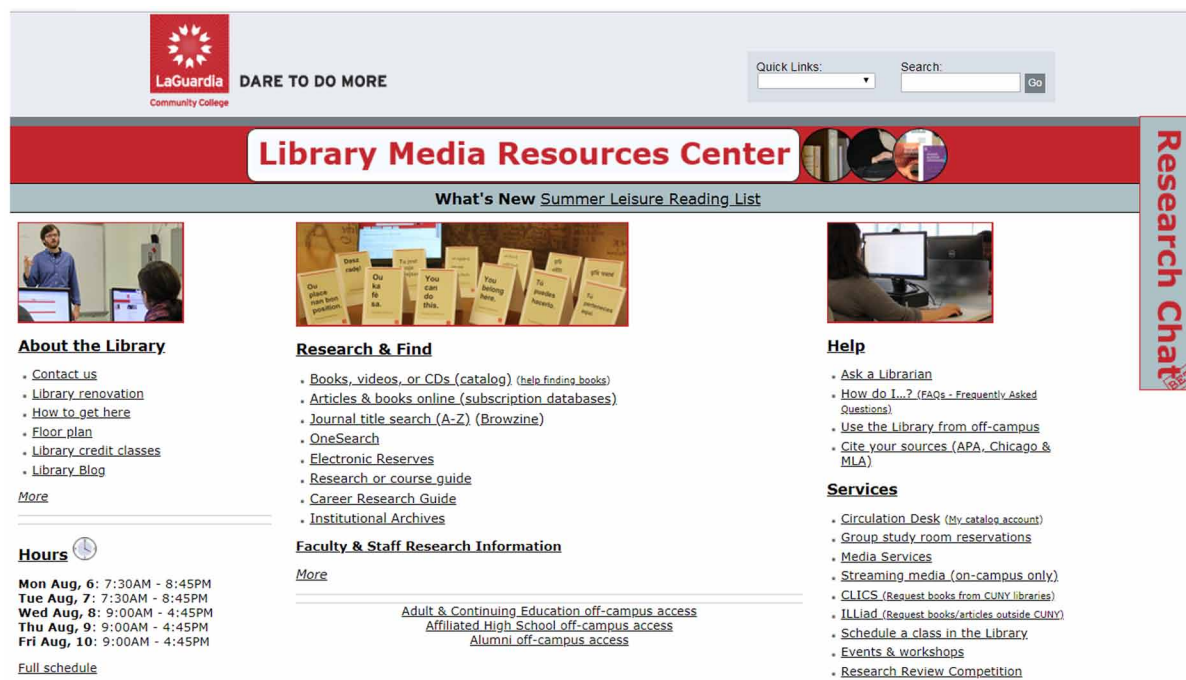
This chapter illustrates how the author upgraded the library website at an urban junior college, evaluating the efficacy of the single search box and how to support information literacy. As a framework, the author used the United States Department of Energy's Root Cause Analysis Guidance Document, which illustrates root cause analysis, a process to uncover, analyze, and resolve issues or problems of user behavior relating to technology. A usability test of the library's website using student subjects supplied data for data collection. Events and causal factor analysis identified the causes of problems observed in the usability test and corrective actions required to mitigate them. Results determined what design strategies promote information literacy on a library website and if the single search box is the best fit for an urban junior college.

INTRODUCTION

Google Search is arguably the most popular resource to search the World Wide Web (Statista, n.d.). It requires no research experience. A user enters words into a single search box and receives seemingly good results in a split second (Koonz, 2016, p. 120). Recent trends position a single search box in the center of an academic library's home page. Discovery tool services such as Primo, EBSCO Discovery Service, Summon, and WorldCat Local, allow students to search all available information in a library using the familiar single search box. More importantly, the Google-like tool supports a search for research articles across multiple databases rather than require students to select a database from a subject or alphabetical

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Figure 1. The former Library Web site utilized the ExpressionEngine content management system (LaGuardia Community College, 2018)



list (Fawley & Krysak, 2012, p. 207). While several college libraries within the City University of New York had employed Primo's single search box on their Web sites by 2017, LaGuardia Community College had not. LaGuardia is an associate degree-granting junior college within New York City. The Library's Web Services unit decided it was time to both review existing literature and assess the eight-year-old Web site to consider a potential upgrade. It was also time to determine if the search box approach was the best choice for a junior college. Figure 1 is the Web site's home page at the time of the review.

Studies of implementing discovery tools on library Web sites are primarily restricted to senior colleges and universities. Very little research is at the junior college level. However, researchers at Moraine Valley Community College, an associate degree-granting institution in the United States, determined that a single search box alone on a home page was not sufficient at the junior college level (Swanson & Green, 2011, p.227). They concluded that junior college students "were not well-positioned to make choices on an academic library Web site" (Swanson, Hayes, Kolan, Hand, & Miller, 2016, p. 359) and were not prepared for college. Junior colleges in the United States refer many students to one or more levels of remediation or developmental education to help them adjust to college-level work (Bailey, Jeong, & Cho, 2010, p. 255). Researchers at Moraine Valley emphasized that a key part of student learning at the junior college is building a context for research because students are new to college and college-level research. Students' ability to select tools and interpret results will be limited when they do not have guidance in how research tools operate (Swanson et al., 2016, p. 366). Therefore, a search box in the center of a library Web site without any instruction in how to use it or in what it searches is unsatisfactory.

Traditionally, information literacy has been the goal of library instruction given to college and university students. Librarians introduce critical thinking and decision-making strategies to find and utilize information in general instruction sessions or in sessions given in conjunction with a discipline-specific assignment (Poirier & Hocker, 1993, p. 234). Students learn how to access, retrieve, and evaluate an information source's currency, relevance, authority, accuracy, and purpose (Blakeslee, 2004, p. 6). Undoubtedly, a majority of students use Google to search for information. Unfortunately, Google does not verify or assess results in any given search. It is up to the user to evaluate the quality of the information. This can prove difficult for the college or university student who is not information literate. While they may be engaged in social media and active in online activities, youth need opportunities to develop the skills and knowledge to engage with technology effectively and meaningfully (Boyd, 2014, pp. 176–177, 184–186). Do junior college students have the ability to evaluate the results of a Google or discovery tool search?

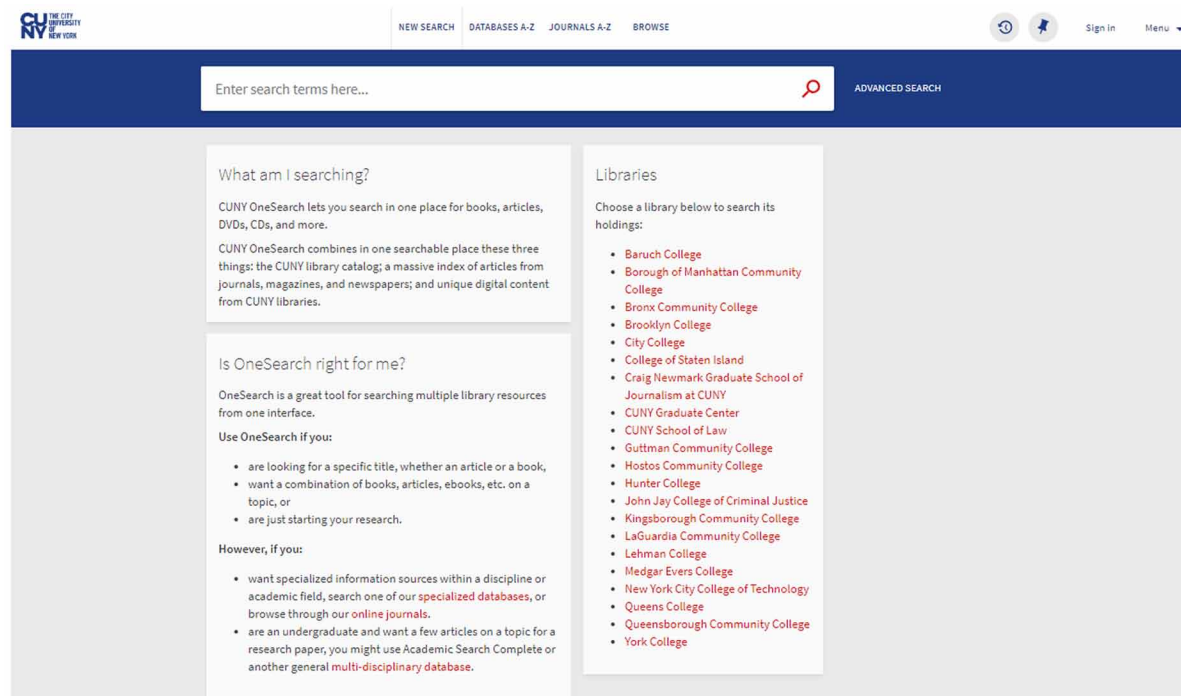
Fagan (2011) suggested that discovery tools support some information literacy outcomes and fail to support others in their critique of whether discovery tools influence the process of becoming information literate (p. 177). While limiters in a discovery tool allow students to modify search results, they do not provide boundaries for research that are available in a subject-specific database. In addition, discovery tools do not differentiate between primary and secondary sources, or popular and scholarly articles, in the same way as a subject-specific database. Thus, a student will not identify the value and differences of resources, nor their purpose or audience (pp. 172–173). Fagan concluded that students develop critical thinking skills by using a Web site without a discovery tool since they may need to revise and refine their research question (p. 173).

A Web site without a discovery tool seemed suitable for LaGuardia Library as it best supports information literacy. However, pressure mounted to introduce a single search box given that most junior college libraries within the City University of New York already followed suit. Figure 2 displays the home page of the University's central library. What strategies incorporate information literacy into Web design if the Library Web site features a discovery tool? This chapter illustrates how the author upgraded the LaGuardia Library Web site by evaluating the efficacy of the single search box and how to support information literacy. As a framework, the author used the United States Department of Energy's *Root Cause Analysis Guidance Document*. The Document illustrates root cause analysis. It is a five-phase process to uncover, analyze, and resolve issues or problems of user behavior relating to technology: (Sobel, 2017, pp. 316–318):

1. Data collection
2. Assessment
3. Corrective actions
4. Inform
5. Follow-up

A usability test of the Library's Web site using student subjects supplied data for data collection. Test questions focused on student inquiries at the Library's reference desk and information literacy topics typically covered in a library instruction session. The Framework for Information Literacy for Higher Education, a set of six interconnected core concepts compiled by the Association of College and Research Libraries (2019), served as a guide for information literacy standards. Events and Causal Factor Analysis in the assessment phase identified the causes of problems observed in the usability test and corrective

Figure 2. The City University of New York employs Primo's discovery tool service, OneSearch (The City University of New York, 2019)



actions required to mitigate them. Results will determine what design strategies promote information literacy on a library Web site and if the single search box is the best fit for an urban junior college.

BACKGROUND

Usability Testing

The author employed a usability study to collect data for the first phase of root cause analysis. Usability testing is a common means of Web site analysis. It is the best approach to analyze a Web site. A usability test, or usability study, determines what is working and what is not on a Web site. Castonguay (2008), in a previous study at LaGuardia Community College, argued that usability testing provides data and direction for the improvement of any library's Web presence, a library's "primary communicative and educational link with the outside world" (p. 448). Usability tests can be simple or comprehensive. Some studies require professional consultants. However, elaborate tests can be a waste of resources. Enis (2017) suggests best results come from testing no more than five users (p. 25). If a small sample runs into the same problems navigating a Web site, so will a large sample size.

A common testing approach is first-click testing. An examiner asks a user to answer a question using a Web site and observes the user's actions. First-click testing reveals design flaws since users typically find what they are looking for if their first mouse click is correct (Enis, 2017, p. 25). On the other hand, Palmquist (2001) recommends a quantitative approach by observing the time needed to answer a question,

the average time spent on a Web page, and the number of pages visited answering a question (pp. 123, 129, 131). King (2003) suggests that administrators first determine what to test and then create specific, rather than open-ended, test questions (pp. 12–14). Letnikova (2008) proposed a list of standardized questions focusing on the library catalog search, the times the library is open, electronic journals, reference help, and any changes to the Web site the study participant may suggest (pp. 396–397).

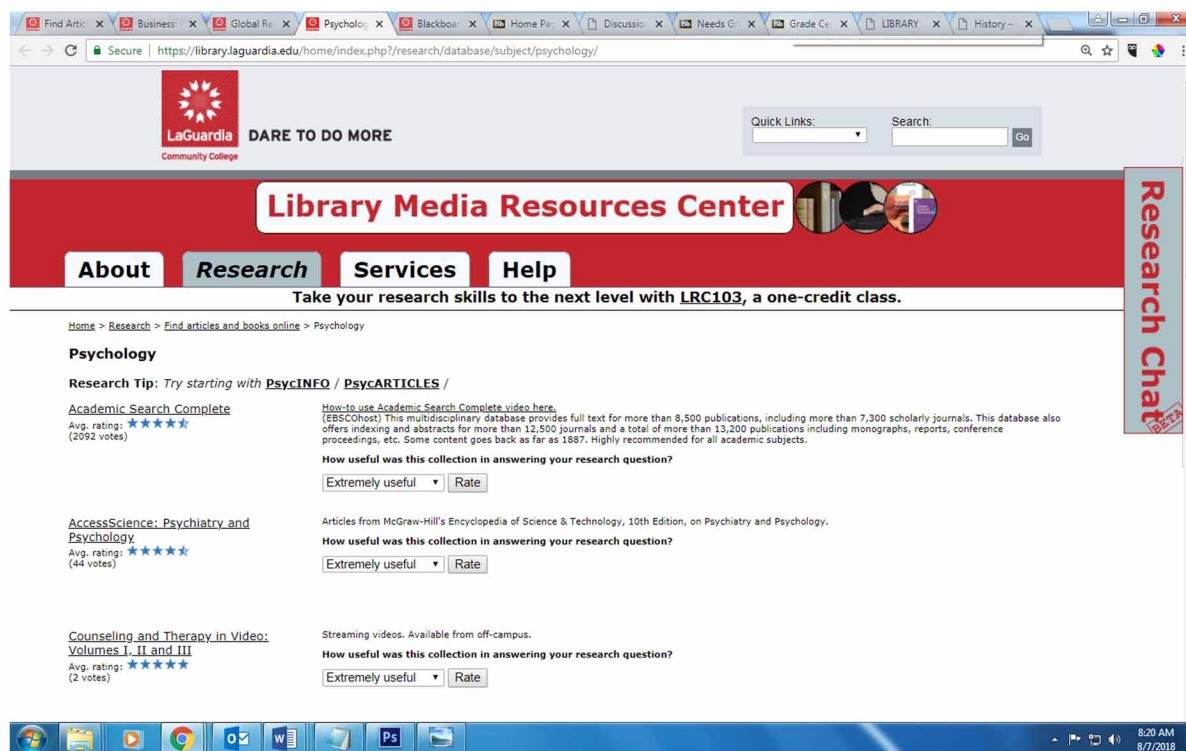
Many usability studies of library Web sites advocate Web design practices to insure users find information in an efficient and timely manner. Florida International University Libraries suggest replacing library-specific terminology with words students can identify and shortening lengthy text. For example, researchers proposed shortening “alphabetical list of all electronic resources” to “A-Z databases” and “other forms” to “forms” (Hammill, 2003, n.p.). Lemieux and Powelson (2014) recommend keeping important content above the fold of the screen so the user will not have to scroll to the bottom of the Web page (p. 53). A Web site usability study at Auraria Library, which serves the University of Colorado Denver, the Metropolitan State College of Denver, and the Community College of Denver, advances a more user-centered home page by using first-person pronouns to refer to the user. For example, the first person “my library account” replaces “your library account” (McHale, 2008, p. 162). Another consideration in Web site design is student discipline and its influence in the use of library Web site resources. Kim (2001) found that arts and science students in four universities in the United States utilized the library’s Web site more than business students did since the latter used commercial Web sites in their research (p. 16). Kim also put forth that Web developers could customize services for different disciplines by understanding user preferences (p. 9). Figure 3 illustrates how LaGuardia’s Library customized resources.

Discovery Tools on Library Web Sites

Some scholars advocate discovery tools and others reject it. Williams, Bonnell, and Stoffel (2009) argue that discovery tools “should be placed front and center on the library Web site, where they can best be located by users and used in tandem with library catalogs and subscription databases” (p. 137). Bartlakowski (2015) suggests that by using the familiar single search box, discovery tools can break new ground in Web site design and provide an opportunity to rethink outdated practices (p. 643). On the contrary, Koonz (2016) argues that students may not know what a search box searches nor understand search strategies to use it successfully (p. 120). Duke and Asher (2012) add that students lack an understanding of discovery tools and expect the single search box to deliver results using simple keywords rather than Boolean logic (p. 72).

Fagan (2011) submitted that librarians and library Web sites may need to compensate for discovery tools’ “inadequacies and capitalize on new opportunities” (p. 177). Results of a Texas Tech University study called for unambiguous text on library Web sites since users did not understand terminology related to discovery tools (Perrin, Clark, De-Leon, & Edgar, 2014, pp. 57, 62, 65). Likewise, a test at Linfield College revealed that students struggled with the discovery tool, navigated search results too quickly, and missed potential cues to guide them (Valentine & West, 2016, pp. 184–185). Another study at the University of Houston Libraries reported that students were unfamiliar with discovery tool functionality and ignored tools such as facets to narrow a search list (Brett, Lierman, & Turner, 2016, pp. 19–20). Researchers at North Carolina State University advise that what a search box searches must be transparent to students or instruction must be available (Lown, Sierra, & Boyer, 2013, p. 237). Hanrath and Kottman (2015) suggest future testing and design should focus on how to integrate discovery tools with other library services (p. 4). The success rate of students answering common library tasks in a usability test

Figure 3. Subject- or discipline-specific Web pages on the former site suggested resources and then provided an alphabetical list, often with Academic Search Complete as the first entry (LaGuardia Community College, 2018)



of a discovery tool at University of Kansas Libraries was only eighty percent suggesting that discovery tools alone do not go give an overview of the library's resources (p. 17).

Usability studies of discovery tools at the junior college level are few. Swanson and Green (2011) in a study at Moraine Valley Community College observed that students unknowingly used whatever search box was readily available and were unaware of the differences between databases, library catalogs, and other search tools (p. 227). They concluded that a guided gateway to resources was a more effective access point to library resources than a single search box (pp. 222). A subsequent study tested a new Research Tools Web page, which acted as a guide for students to databases and deemphasized the all-in-one search box (Swanson et al., 2016, pp. 365). Results determined that the prototype, with limited choices available to select, gave students better guidance over the existing page and the multitude of choices to narrow a search in a discovery tool. Swanson et al. (2016) concluded that the more options offered on a page the less successful students were at recognizing the resources that they needed (p. 366). They also argued that a key part of student learning is building a context for information resources and providing a frame for what the library offers not possible in the discovery tool approach.

Incorporating Information Literacy Into Web Site Design

Fagan (2011) compared a Web site featuring a single search box against a Web site without one using the Information Literacy Competency Standards for Higher Education as a guide. The Association of College and Research Libraries (2000) established the Standards as “a framework for assessing the information literate individual” (p. 4). Fagan (2011) concluded that library Web sites without discovery tools best support accessing information effectively and efficiently if a student has no prior library instruction (p. 173). However, students must be willing to visit and engage with the Web site. They must utilize guides and tutorials when available. Fagan also asserted that users might underestimate the time and planning required retrieving external information. Similarly, Fawley and Krysak (2012) believe that discovery tools should serve as a precursor to subject-specific databases. They recommend that Web sites incorporate research guides to direct students to specialized information rather than having students browse a long list of results in a discovery tool search (pp. 210–212).

Current literature discussing the incorporation of information literacy into Web site design is primarily restricted to four-year schools. Researchers discovered that 84.2% of university library Web sites in the United Kingdom offered information literacy training. However, only 52.6% offered online tutorial training for one or two aspects of information literacy, primarily information seeking and citing (Ellis, Johnson, & Rowley, 2017, p. 53). The researchers concluded that libraries should be proactive promoting information literacy by taking into account the current use of mobile devices for research (p. 65).

In Brazil, Gomes and Dumont (2018) analyzed library Web sites at the Universidade Federal de Alagoas and the Universidade Federal de Minas Gerais. They determined that both Web sites had two functions, informational and referential, with a greater focus on face-to-face interaction over virtual (p. 535). The researchers also noted that the Web sites did not use terms such as orientation, instruction, and training with the intent to foster information literacy skills. They outlined five methods to integrate information literacy (pp. 529–533):

1. Extend discovery tools so students recognize the value of information sources and the resources to search for them
2. Demonstrate how to use information resources with videos
3. Use social media to build knowledge creation
4. Create online tutorials
5. Promote tutorials for self-learning

Researchers at Stony Brook University in the United States conducted a usability test on the effectiveness of the University library Web site’s home page following the implementation of discovery tools. They concluded that an information literate Web design was essential for effective online research. They proposed three methods to enhance the user experience (Chase, Trapasso, & Tolliver, 2016, p. 39):

1. Build information literacy principles into Web site design and development
2. Use online learning objects to reinforce research skills, habits, and practices
3. Incorporate examples of successful discovery tool searches

ROOT CAUSE ANALYSIS

A Usability Study as Data Collection

An article written by Karen Sobel prompted the decision to use the *Root Cause Analysis Guidance Document*. The article illustrated how to resolve a library problem using root cause analysis. Root cause analysis is a method to “trace a problem back to its initial causes so that organizations in charge of the process can prevent the event from happening again or mitigate a current situation” (Sobel, 2017, p. 312). The author modified the five-phase process in the *Root Cause Analysis Guidance Document* in this study to evaluate the functionality of the Library’s Web site as a means to uncover and resolve issues or problems. The main issue or problem at hand was that the eight-year-old Web site did not have up-to-date features such as an image slideshow for promotional purposes or a drop-down menu. The Web site also did not have the Primo search box on the home page like its sister colleges. Root cause analysis could determine the effectiveness in the present design. It could also establish the efficacy of discovery tools at the junior college level and expose how to support information literacy in Web design.

The author decided to use the Framework for Information Literacy for Higher Education as a guide for what skills support students becoming information literate. In 2016, the Board of Directors of the Association of College and Research Libraries (2015) rescinded the Information Literacy Competency Standards for Higher Education in 2016, “which means they are no longer in force.” The Framework is a set of six interconnected core concepts also developed by the Association of College and Research Libraries (2019):

1. Authority is constructed and contextual
2. Information creation as a process
3. Information has value
4. Research as inquiry
5. Scholarship as conversation
6. Searching as strategic exploration

Librarians may collaborate with other institutional partners and apply the Framework’s concepts to help students build information literacy skills. The Framework outlines knowledge practices for each concept that demonstrate “ways in which learners can increase their understanding of these information literacy concepts” (p. 2). Similarly, the Framework delineates dispositions, which “describe ways in which to address the affective, attitudinal, or valuing dimension of learning” (p. 2). For example, a person who is information literate in the research as inquiry concept recognizes that “research is iterative and depends upon asking increasingly complex or new questions whose answers in turn develop additional questions or lines of inquiry in any field” (p. 7). A learner should be able to “synthesize ideas gathered from multiple sources” (p. 7) as a knowledge practice to develop information literate abilities. The learner should also be able to “seek multiple perspectives during information gathering and assessment” (p. 7) as a disposition.

A usability study of the Web site administered in March 2017 provided data for the first phase. The author, as test administrator, posted an announcement on the Library’s Web site and social media outlets to publicize the study. The announcement linked to a form asking for students’ email addresses as a point of contact. A poster was also set up at the Library’s entrance with the author’s email address. Subjects

Figure 4. The list of questions given to each student in the usability study



needed to be LaGuardia Community College students and each received a free data-storage device as a gift for participation in the study. The author read aloud an introductory script in each test designed to put the student at ease. It explained the purpose of the test and reassured students that the study was testing the Web site not them. Reading the script verbatim was important so that each participant received the same information. Next, the author provided a desktop computer and then read ten individual questions aloud. The author also supplied a printout of the questions, presented in figure 4, in the event students wanted to read questions. The author observed student progress answering questions using the Library's Web site as a first-click testing approach. Students could pass on a question if they either could not locate the answer or found the question too difficult. It was important that the author was impartial and did not help the student when they needed assistance navigating the Web site.

Questions focused on student inquiries at the Library's reference desk and information literacy topics typically introduced in library instruction classes. Two questions in the study related to subscription databases. Finding a list of databases in their discipline on a Web page in question four supports the Framework for Information Literacy for Higher Education's concept that authority is constructed and contextual. A database list helps students "understand that many disciplines have acknowledged authorities in the sense of well-known scholars and publications" (Association of College and Research Libraries, 2019, p. 4). By finding an article on gun control using a research database in question five students learn that searching is a strategic exploration as they "match information needs and search strategies to appropriate search tools" (p. 9). Two other questions in the study pertained to finding and borrowing books from the Library's collection. Students discover that research requires inquiry as they "use various research methods, based on need, circumstance, and type of inquiry" (p. 7) to locate and borrow books using the library catalog search. Two additional questions focused on access to research

help. Finding a research guide highlighting intellectual property in question two could help students understand that information has value and that “intellectual property is a legal and social construct that varies by culture” (p. 6). By finding research help available at the Library’s reference desk in question ten a student in need of citation assistance could learn how to “give credit to the original ideas of others through proper attribution and citation” (p. 6). Question nine asked students if they could borrow books from other libraries, both within the university and worldwide. Here, students learn that information is a process and “understand that different methods of information dissemination with different purposes are available for their use” (p. 5). The remaining three questions pertained to services specific to LaGuardia often asked at the Library’s reference desk. These services and resources aid students in research.

The author recorded student success answering questions on a worksheet divided into four categories. In the first category, similar to a Likert-type scale, a bipolar range of one (“with much difficulty”) through five (“with little difficulty”) graded overall progress, designated numerically as excellent (5), very good (4), good (3), fair (2), and poor (1) (Lavrakas, 2008, p. 427). The author encouraged students to think aloud in order to anticipate how students navigated the Web site. The second category recorded the number of mouse clicks needed to reach an answer. Students had the opportunity to give verbal suggestions for Web site improvement in the third category. The final category was a written observation made by the author.

Events and Causal Factor Analysis

The author used a brief form of Events and Causal Factor Analysis to assess results of the usability tests. Analysis identified problems students had answering questions. Specifically, it pinpointed where the Web site failed to promote information literacy and what were the causes and conditions that led to it. The author adapted the Design Problem Worksheet available in the *Root Cause Analysis Guidance Document* to illustrate the cause or causes of challenges (U.S. Department of Energy [DOE], 1992, p. B-5). A direct cause directly shaped the event. A contributing cause is a “cause that contributed to an occurrence but, by itself, would not have caused the occurrence” (p. 3). The root cause is the source of the problem. If corrected, it would prevent the event from happening again. When completed, the worksheet in figure 5 outlined each cause of Web site failure and corrective action to prevent recurrence. Figure 6 is an example of a completed worksheet.

Following analysis, the author created a cause and effects diagram as a visual display of the causal factor chain. The chain is a sequence of events where “a specific action creates a condition that contributes to or results in an event” (DOE, 1992, p. 3). The implementer designates some conditions as either the direct, contributing, or root cause of the event. The diagram in figure 7 documents conditions and causes that led to an event where the Web site failed to promote information literacy. Evidence from the usability study will provide a supporting claim for each condition. A cause will identify the condition that was responsible for the event. The diagram will also provide a corrective action to prevent recurrence. However, unlike the analysis here, “Events and Causal Factor Analysis is used for multi-faceted problems or long, complex causal factor chains” (p. 9). Here, the analysis is linear and elementary in design.

Overcoming the Google Handicap

Figure 5. The modified Design Problem Worksheet assigns either a root, contributing, or direct cause to a challenge students faced in the usability study

Design Problem Worksheet

Why was "Design" a Cause?

Rate each subcategory cause:

D = Direct Cause
C = Contributing Cause
R = Root Cause

Design Problem Subcategories	Cause
A = Outdated Content Management System and Ineffective Design Strategy	
B = Inadequate or Defective Software	
C = Inadequate or Defective Design	
D = Poorly Written Text or Description	
E = No Text or Description of Site Search Functionality	
F = Inefficient Guidance and Instruction	
G = No Designated Area to Promote Resources and Services	
H = Ineffective Web site Menu System	

Cause Descriptions:

Recommended Corrective Actions:

Figure 6. The completed worksheet is for the subcategory inadequate or defective design, identified as a contributing cause with a C

Design Problem Worksheet

Why was "Design" a Cause?

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Design Problem Subcategories	Cause
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C = Inadequate or Defective Design	C
D = Poorly Written Text or Description	
E = No Text or Description of Site Search Functionality	
F = Inefficient Guidance and Instruction	
G = No Designated Area to Promote Resources and Services	
H = Ineffective Web site Menu System	

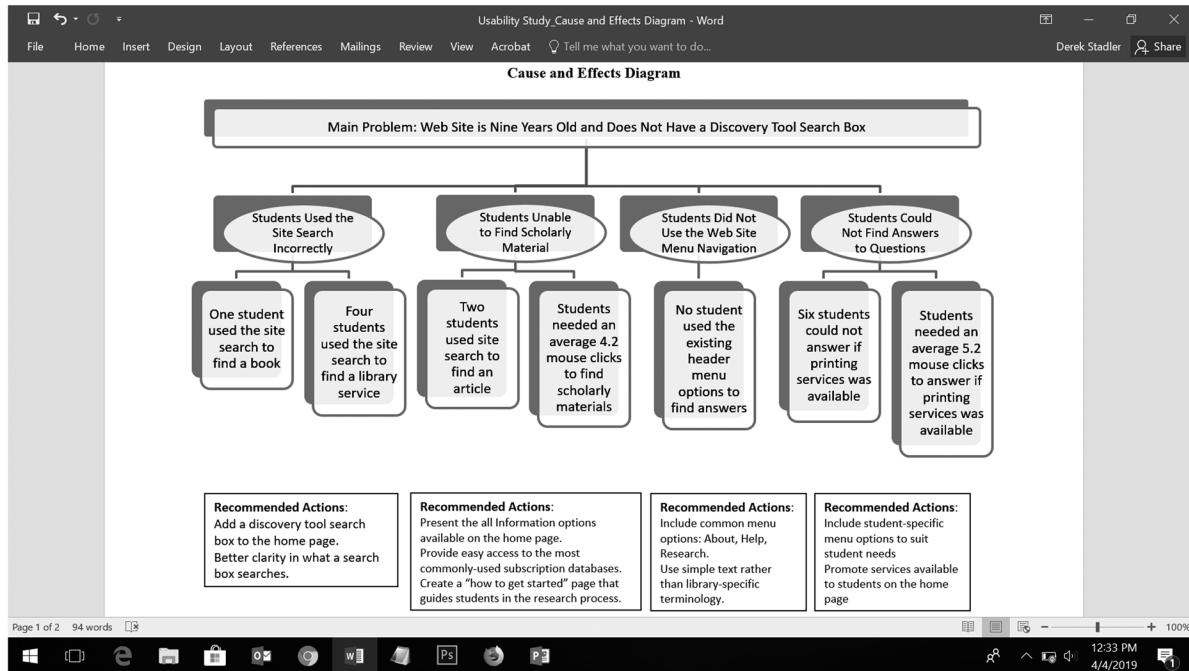
Cause Descriptions:

C=Inadequate or Defective Design. The existing Web site failed to promote resources and services to students.

Recommended Corrective Actions:

The Web site needs to guide students to appropriate resources and services through an improved site layout.

Figure 7. The causal factor chain of the Web site problem outlines each event of failure with evidence and a suggested action to correct it. Events are indicated within an oval shape and squares indicate the evidence. Below are suggested corrective actions.



SOLUTIONS AND RECOMMENDATIONS

Identifying Challenges

Ten students enlisted in the study. Tests were approximately thirty to forty-five minutes in length. Students had little difficulty locating the library catalog search to find a book in the first question. They scored between a four and a five, or very good. A hyperlink to the catalog search labeled as "books, videos, or CDs (catalog)" was under a Research & Find heading on the home page listing all available research options. Similarly, students had no major issues finding a research guide on the home page in question two. A hyperlink to all research guides marked as "research or course guide" was available under the Research & Find heading. Finding a list of databases in question four was also clear to students, with an average two mouse clicks needed to reach the answer. Students could easily locate a subject list of databases once they found the "articles & books online (subscription databases)" hyperlink under the Research & Find heading.

Six of the ten students used the search box located in the upper-right corner of each Web page to find answers to at least one question. Some students used it multiple times. This search box served as a site search for the LaGuardia Library Web site and the LaGuardia Community College Web site. While half of the students found success using the site search to answer questions regarding library services, the other half tried unsuccessfully using it to find resources such books and articles.

Overcoming the Google Handicap

Another challenge was that students were unable to locate academic material in an efficient and timely manner. Students scored a 3.6 (good) and executed over four mouse clicks when asked to find a research article in question five. Although students scored an average of 4.6 (very good) when asked to find a list of databases on a subject, most of the subject-specific resources had hyperlinks arranged alphabetically with EBSCO's Academic Search Complete as the first choice and no direction to what may be the best option.

Students demonstrated low scores in several service questions. They scored 2.4 (fair) attempting to find out if they could print a class paper in the Library in question seven. They also scored a 3.2 (good) when asked if they could borrow material from other libraries, either university-wide or globally, in question nine. Students did not find information for both parts of the question using the Web site. Students scored a 3.7 (good) trying to find all available options to contact a librarian for research help in question ten. No student could find all five options. The low score revealed that the Web site was unclear to students.

A final observation was that no student utilized the Web site menu navigation. The menu system featured a header menu with three options (About, Help, Research, and Services) each leading to a surrogate Web page with a list of resources and services. However, no student used this menu.

Design Problem Worksheet

The author created a unique Design Problem Worksheet for each cause of student challenges. The unique worksheet did not have a matrix to list a subcategory cause like the *Root Cause Analysis Guidance Document* (DOE, 1992, p. B-1). It simply indicated if the cause was root, direct, or contributing.

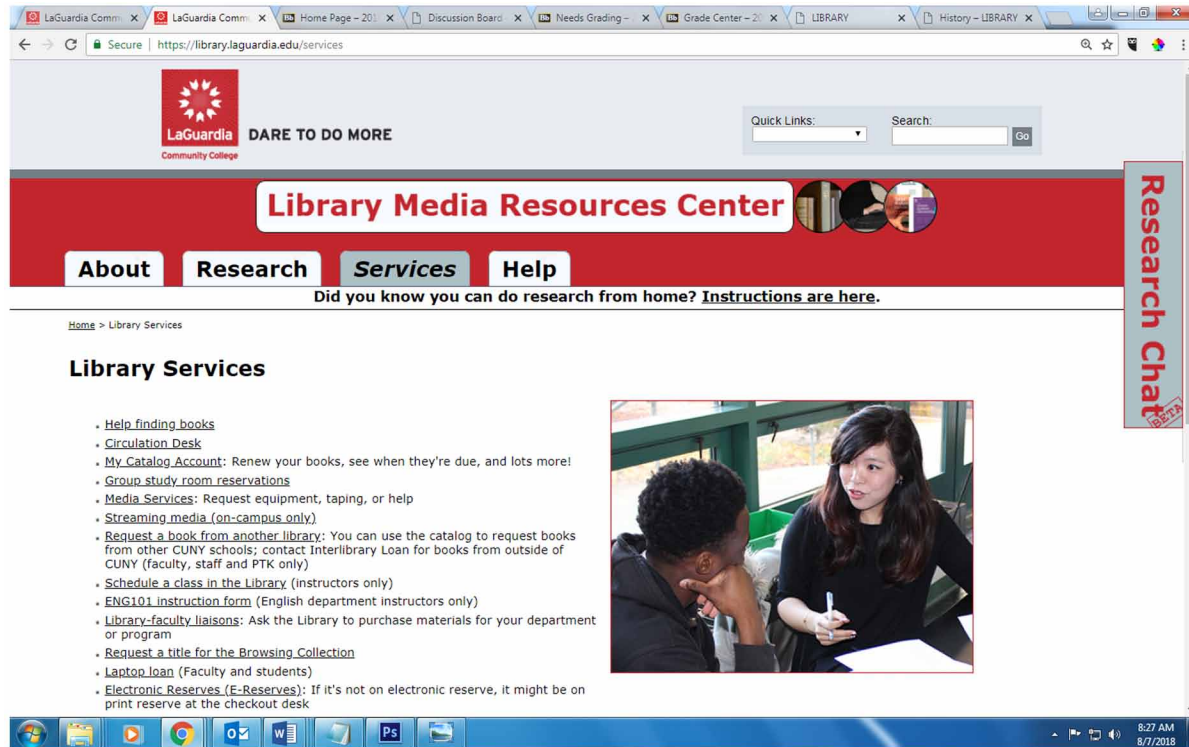
Not surprisingly, the root cause of all challenges was an outdated content management system and an inefficient design strategy to incorporate information literacy skills. There were three contributing causes. First, the existing content management system was inadequate or defective. It did not provide the student with a modern drop-down menu system available in modern Web sites. Second, inadequate or defective design inhibited the student from finding information and allowed the student to use information improperly. Lastly, poorly written text or description thwarted a student from finding or interpreting information on the Web site.

There were several direct causes. The direct cause of students using the site search incorrectly was that no text or description advised what it searched. Students unknowingly used the site search to find articles or books. They thought the site search was either a discovery tool or a tool to search all resources and services. More specifically, the Web site failed the Framework for Information Literacy for Higher Education's research as inquiry concept. Students were unable to "use various research methods, based on need, circumstance, and type of inquiry" (Association of College and Research Libraries, 2019, p. 7). The contributing cause of this was inadequate or defective design. The Web site failed to promote resources effectively.

The direct cause of students not finding academic material in an efficient and timely manner was lack of guidance or instruction. The Web site failed to show that searching is a strategic exploration. Students did not "match information needs and search strategies to appropriate search tools" (Association of College and Research Libraries, 2019, p. 9). The contributing cause of this was inadequate or defective design. The Web site did not effectively support searching for academic material.

The direct cause of student inability to answer service questions correctly was that the Web site featured no area to promote resources and services that foster information literacy skills, such as a header slider with alternating images and text common in a modern Web site. Here, the Web site failed to show

Figure 8. Each Web page, like this Library Resources page, had a menu choice of About, Research, Services, and Help. However, the menu was missing from the home page of the site.



information as a process. Students did not “understand that different methods of information dissemination with different purposes are available for their use” (Association of College and Research Libraries, 2019, p. 5). The contributing cause of this was inadequate or defective software. The existing content management system did not support modern Web design tools.

The direct cause of student failure to use the existing menu was its location atop all site pages except for the home page as noted in figure 8. Missing from the site was a header menu with drop-down options on the home page and subsequent Web pages. Here, the Web site failed to show research as inquiry by not organizing information in meaningful ways (Association of College and Research Libraries, 2019, p. 7). The contributing cause of the event was inadequate or defective software that did not support a modern drop-down menu.

Cause and Effects Diagram

The cause and effects diagram highlights each causal factor chain that led to an event observed in the usability study. It suggests corrective actions to prevent recurrence. For example, students using the site search incorrectly was the result of inadequate or defective Web site design. No text or description informed students what the box searched so students used it improperly. Evidence given in the diagram was that one student used the site search to find a book. Another used it to find an article. Corrective

actions to prevent recurrence of this event is a discovery tool search on the home page and better clarity in what the tool searches.

Corrective Actions

Results of Events and Causal Factor Analysis uncovered whether the LaGuardia Library Web site incorporated information literacy skills in design. It also determined the case for the single search box. The author surmised that information literacy skills needed to be better incorporated into Web site design and a discovery tool search on the home page was the best choice. The author not only based the latter according to the Web sites of other City University of New York schools but on the results of the usability study. No student selected the OneSearch hyperlink under the Research & Find heading which led to the Primo discovery tool. Unfortunately, several students used the site search incorrectly and though it was a means to search for academic resources.

Corrective actions in phase three of root cause analysis could prevent recurrence of an event. As defined, corrective actions must prevent recurrence, be feasible, and meet the objectives of the organization without introducing new risks (DOE, 1992, pp. 14–15). The author concluded that a new, modern content management system was necessary. Modern content management systems such as WordPress can promote both resources and services in more innovative ways. A prototype for a new Web site using WordPress sought to support information literacy skills in design using the Framework for Information Literacy for Higher Education as a guide. The following are design strategies advanced in the prototype based on Events and Causal Factor Analysis and the literature review.

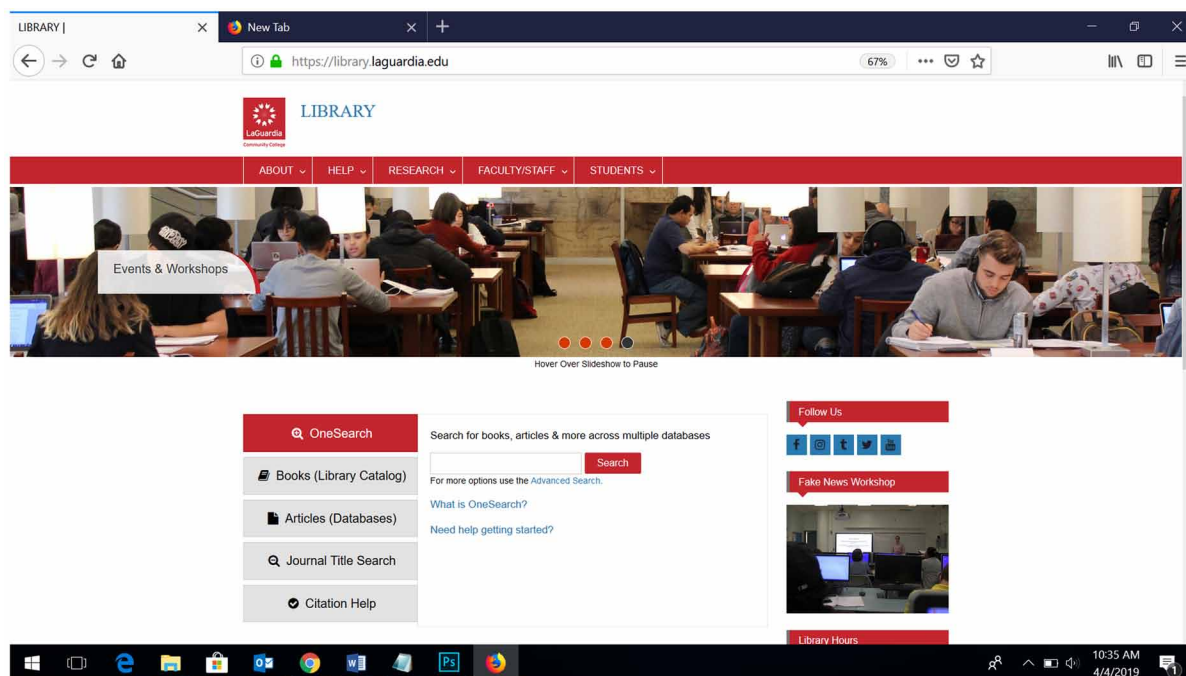
Single Search Box Approach

The global library cooperative OCLC (2005) reported that eighty-nine percent of college students started research using an online search engine. However, less than two percent of students started from a library Web site (p. 35). The single search box is necessary in junior college library Web site design considering OCLC statistics and the results of Events and Causal Factor Analysis. A library Web site should provide them with a tool that will direct them to academic resources since students look for a search box. Instruction in the use of the discovery tool and a description of what it searches needs to be at or near the tool. The author proposes that more than one search box should never be above the fold of the screen, for example, a discovery tool and a site search. Students may not “value the process of matching an information need with an appropriate product” (Association of College and Research Libraries, 2019, p. 5), the Framework’s concept of information creation as a process, if more than one search box is above the fold of the screen.

The prototype in figure 9 positioned the single search box front and center on the home page “in tandem with library catalogs and subscription databases” (p. 137). The discovery tool is the default choice in a box of tab options. A description outlines what the tool searches and a video tutorial of a successful search is available for further inquiry. Other tab choices include:

- A library catalog search
- Access to subscription databases
- A journal title search
- Citation help

Figure 9. The new LaGuardia Library Web site features the Primo discovery tool front and center on the home page



The design supports the concept of research as inquiry. It organizes information in meaningful ways and provides help for students in need (Association of College and Research Libraries, 2019, p. 7). It also allows more than one search box above the fold of the screen, accessible upon need.

Database Subject List Concurrent with Campus Departments

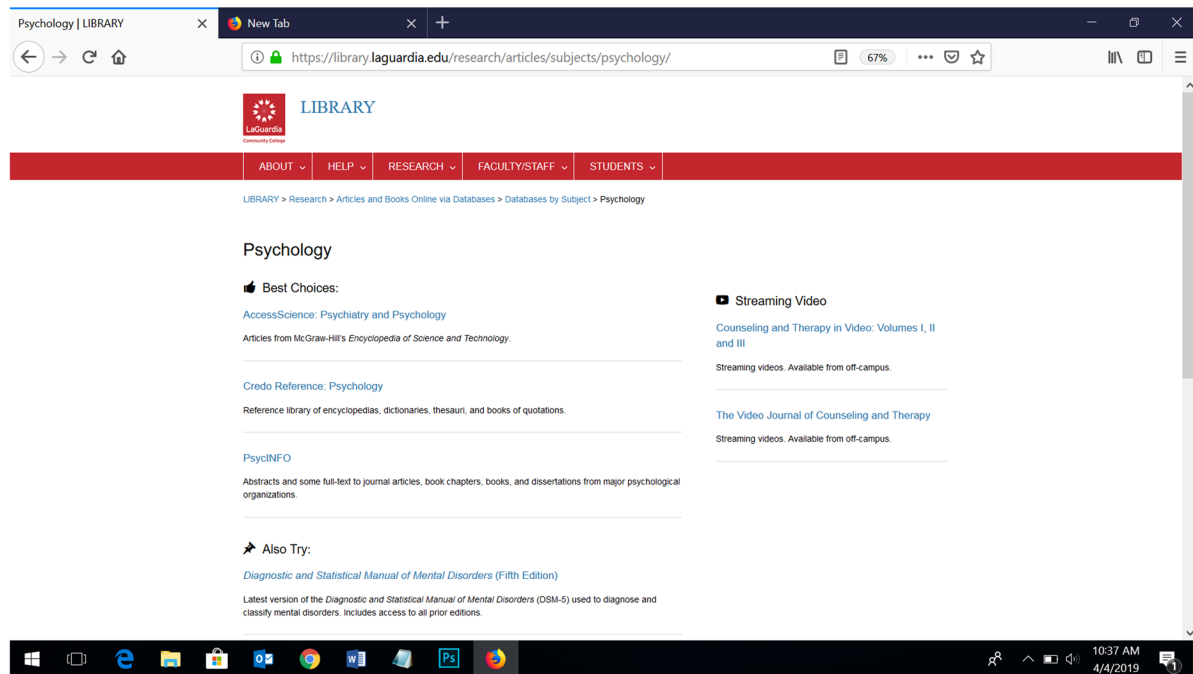
The Framework for Information Literacy for Higher Education advances that authority is constructed and contextual. The prototype arranged the subject list of subscription databases according to the name given to LaGuardia's campus departments. It makes students "understand that many disciplines have acknowledged authorities in the sense of well-known scholars and publications" (Association of College and Research Libraries, 2019, p. 4). The existing Web set aligned subjects with common or signature names. The new approach identifies with a student's major or focus in academic work and demonstrates to students that their discipline has acknowledged scholars and publications. For example, the Computer Science subject became Computer & Engineering Sciences.

Steer Students to Resource Needs

Swanson et al. (2016) concluded that limited choice of navigation on a Web site is ideal (p. 366). Web design should guide students to the resources that they need since students navigate Web sites quickly and make poor decisions. The existing Library Web site arranged databases alphabetically on subject-specific Web pages without any guidance to the best choice. Each subject-specific Web page on the prototype,

Overcoming the Google Handicap

Figure 10. The subject-specific Web pages now guide students to resources, with a best choices and an also try option



like page in figure 10, listed entries according to relevance in an effort to promote the concept of research as inquiry and “organize information in meaningful ways” (Association of College and Research Libraries, 2019, p. 7). A subject-expert librarian judged entries and placed them proportionately on the list, which divided into a “best choices” category and an “also try” category. In addition, the prototype featured a “Need Help Getting Started” Web page. It furnished a breakdown of available resources and allowed students to find scholarly material in an efficient and timely manner.

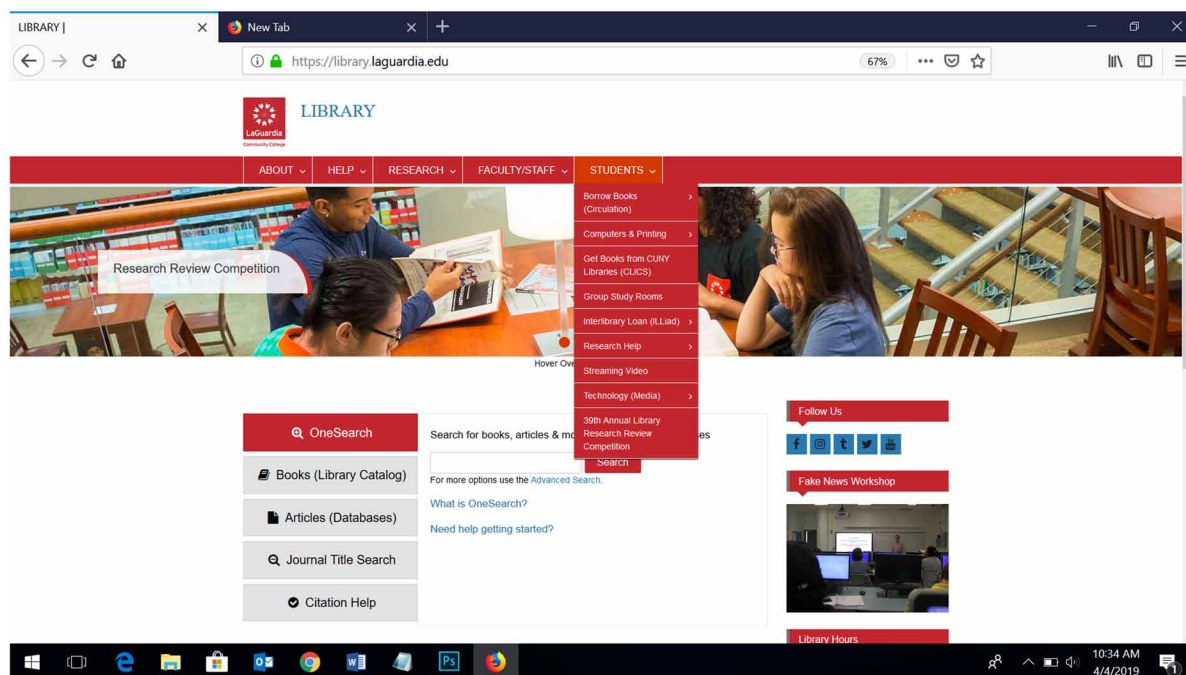
Simple Terminology over Library-Specific Terminology

Web site text and description should reflect words a junior college student can identify. The prototype displayed menu items short in text length to combat speedy navigation. The design reinforces the concept of creation as a process. It prepares students to “understand that different methods of information dissemination with different purposes are available for their use” (Association of College and Research Libraries, 2019, p. 5). For example, the prototype replaced the library-specific term ILLiad with “get books or get articles” outside of what is available from the College.

Access to Research Help

Students had difficulty discerning available ways to contact a librarian in the usability study. Here, the Web site failed the Framework’s concept of research as inquiry. Students could not “seek appropriate help when needed” (Association of College and Research Libraries, 2019, p. 7). The prototype clearly

Figure 11. The new menu features a drop-down specific to student research needs



indicated the multitude of options to contact a librarian not only on the home page but also on subsequent Web pages.

Organize Information using a Drop-Down Menu

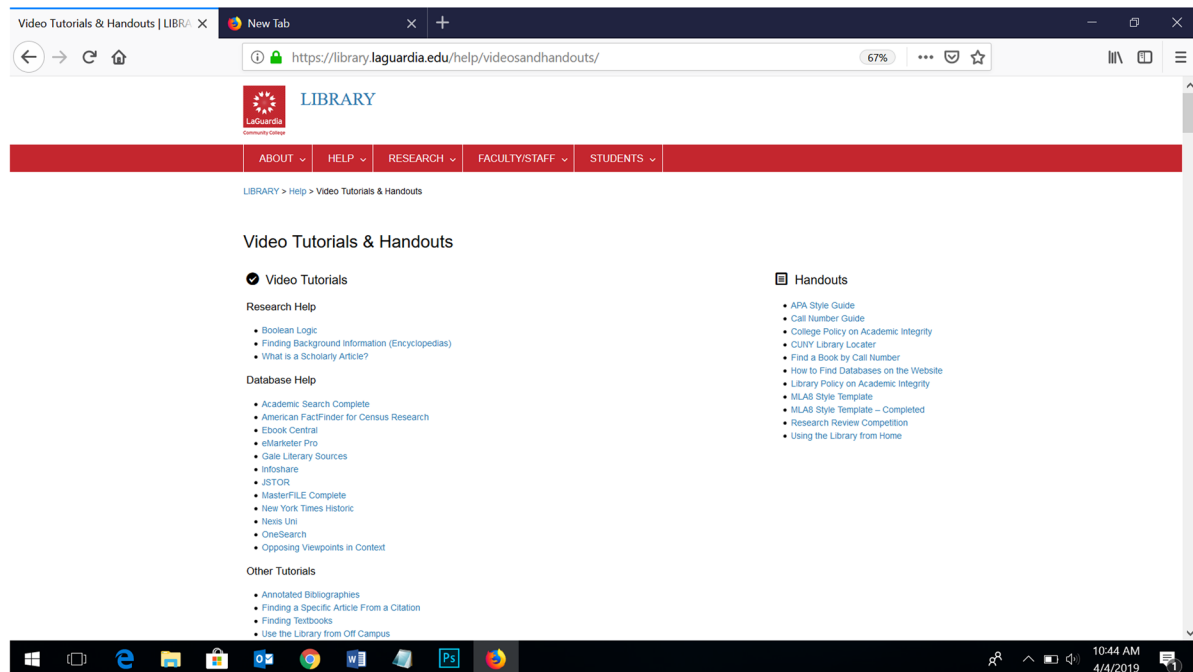
A Web site should align with the concept of research as inquiry. It should “organize information in meaningful ways” (Association of College and Research Libraries, 2019, p. 7). Modern drop-down menus support organizing information expressly to a user’s needs. The prototype had a drop-down menu unlike the existing Web site. The drop-down in figure 11 highlights services and resources available to students.

Promote Information Literacy Skills in Video Tutorials and Image Slideshows

It may be difficult to incorporate all knowledge practices and dispositions of the Framework for Information Literacy for Higher Education into Web design. However, both video tutorials and image slideshows available in modern Web sites provide a means to illustrate critical information literacy skills. For example, promoting a citation workshop in an image slideshow supports the Framework’s concept that information has value. Students may learn to “give credit to the original ideas of others through proper attribution and citation” and to “respect the original ideas of others” (Association of College and Research Libraries, 2019, p. 6). It also promotes the concept of searching as strategic exploration. Students turn to experts for guidance (9). Additionally, a video tutorial illustrating that information has different perspectives enables students to comprehend the concept of scholarship as conversation. Students “recognize that a

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Figure 12. The instruction available on the new Video Tutorials & Handouts Web page focuses on several information literacy concepts



given scholarly work may not represent the only - or even the majority - perspective on the issue” (p. 8). Figure 12 highlights the comprehensive collection of video tutorials available.

Promote Information Literacy Skills in Social Media

Gomes and Dumont (2018) recommended using social media to build knowledge creation (p. 532). Social media is an excellent place to illustrate information literacy skills. The author developed a plan that promotes the library’s services and resources through social media. Each unit in the Library supplied content for social media announcements. For example, social media posts alert students of upcoming citation workshops sponsored by the reference unit.

FUTURE RESEARCH DIRECTIONS

The author asked other units within the Library for feedback after creating the Web site prototype. Faculty and staff reviewed the new design and provided some suggestions. The author administered a scaled-down usability study of the prototype using four students for the follow-up phase of root cause analysis. The additional study undertaken in July 2018 investigated the effectiveness of corrective actions prior to the launch of the new Web site. The original occurrence of an event should be re-evaluated to determine why corrective actions were ineffective if a problem recurs in the follow-up phase (DOE, 1992, p. 16).

Students generally scored better in the second study. All students used the OneSearch search box in the first question and successfully found a book. However, two of the four students in the study used OneSearch to locate a research guide in the second question. Students search whatever search box is available (Swanson & Green, 2011, p. 222). Unfortunately, the discovery tool did not find the guide since it was not within a subscription database or the library catalog. Students may have thought prematurely to use OneSearch when considering the sequence of questions. The students' actions echoes a concern that single search boxes must indicate what they search. Fortunately, all students in the second study used the single search box to locate an article in question five. They used limiters available in OneSearch to narrow down their search.

The *Root Cause Analysis Guidance Document* provided a means to uncover and solve problems with LaGuardia Library's Web site. Periodic usability testing of the Web site can confirm that corrective actions remain effective and that the site promotes information literacy. The cause or causes of potential problems need to be determined and steps taken to correct them if they do arise.

The *Root Cause Analysis Guidance Document* holds potential to solve any library problem. Future research can focus on resolving other issues such as problems related to a library's instruction program. Undoubtedly, determining root cause will help librarians prepare improved instruction sessions that guide students to academic materials. Moreover, root cause analysis can uncover issues of user behavior relating to technology. Duke and Asher (2012) found that students lack an understanding of discovery tools (p. 72). Research should concentrate on improving the functionality and usability of discovery tools. Root cause analysis can operate as a measure to uncover and resolve problems.

CONCLUSION

Google's single search box transformed how researchers retrieve information. The young researcher now looks for the single box to search for information. They may be unaware of what it searches or whether search results are current, authoritative, relevant, or accurate. Indeed, the single search box is a handicap to the junior researcher since it does not provide the necessary tools to analyze and assess results. Information literacy skills help the junior researcher build critical thinking and decision-making strategies to find and utilize information.

Still, libraries need to rethink outdated practices. They need to incorporate a Google-like search box on Web sites. The results of this study promote the use of the single search box and discovery tools on junior college library Web sites. About 45% of junior college students at the City University of New York are first-generation students and unfamiliar with college-level research (Bonet & Walters, 2016, p. 224). A Web site with a discovery tool leads students to academic research in an efficient and timely manner using an approach students can identify. However, students must know the scope of the search. Web designers must pay careful attention integrating information literacy into Web design. Resources and services must be available to students and Web design must best suit students' navigation habits. Guiding students to the resources they need is the best approach.

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KEY TERMS AND DEFINITIONS

Discovery Tools: An online resource that searches multiple databases in order to present all available material in a library.

Information Literacy: The ability to determine the type of information needed for a given task as well as the ability to locate and evaluate the appropriateness of a piece of information for a given task.

Junior College: A college where students can earn an associate of arts or related degree.

Root Cause Analysis: A technique to search for the root, or source, of a problem.

Single Search Box: An online tool where a user enters words in one location in order to search a Web site or a database of information.

Usability Testing: A method to determine the functionality of a Web site in order to establish the need for change in design and format.

WordPress: A popular open source content management system that powers most of the Web sites on the World Wide Web.

Chapter 5

Role of Library Professionals in Content Development: A Study With Reference to e-PG Pathshala (A Gateway to PG Courses)

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ABSTRACT

The overall goal of any country is to create high quality, curriculum-based interactive content for all subjects and host them on a platform for the benefit of universities, colleges, and the worldwide academic community in open access. The Government of India has initiated several projects for the e-content development. One of important project is e-PG Pathshala, which is a gateway to PG courses. The bigger challenge to develop this is content creation. So, library professionals made a vital role during the phase of e-content development. This chapter focused on e-PG Pathshala project and how library professionals helped to develop the content. e-PG Pathshala has 15 courses, which comprises of 387 e-modules developed in four quadrants. The INFLIBNET Centre is an anchor institute for the courses of library and information science.

INTRODUCTION

The content in digital format while addressing the requirement of students and teachers, should also act as a catalyst to cultivate the ability in an aspirant to learn, unlearn, relearn and acquire newer abilities. As such, high-quality curriculum-based content should address the requirement of a diverse group of stakeholders for tasks such as:

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1. Complementing the traditional class-room learning of the students. Students could access and use the digital content outside the class-rooms in a self-paced manner. It would also help address the issues of quality and teacher shortage.
2. Supplemental usage of digital content by the teachers in the ICT enabled smart class rooms and/or labs while teaching.
3. Professional self-development by teachers using the digital content to upgrade their own knowledge and for capacity building for new pedagogy.
4. organize and present course material to enable students to learn at their own pace.

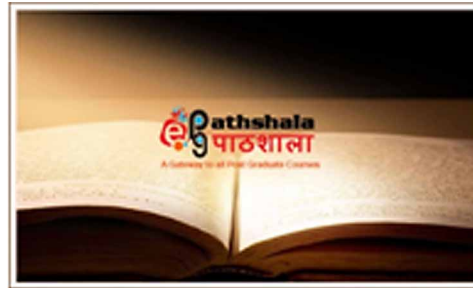
Effective mechanisms, policies and processes need to be set up to ensure success of initiative. The critical factors which need to be addressed are:

1. Defining the standards, templates, content creation methodologies and frameworks; for content creation.
2. Design of frame work to evaluate content, its quality, accuracy, scope, correctness and interactivity and conformity to standards and specifications.
3. Deployment of the digital content using national academic cloud, ICT infrastructure and LMS.
4. Accreditation of the e-education content. There is a need for common curricular structure.
5. Digital preservation methodologies including periodic migration of content from one format to another, from one platform to another and from old hardware to new.

LITERATURE REVIEW

Diverse studies were conducted by different authors on various issues on e-PG Pathshala in the library and information science domain as well as in other disciplines in which Bansode (2019) stated that e-PG Pathshala is a one of the prominent initiative of Ministry of Human Resources Development (MHRD) managed and maintained by INFLIBNET Centre which offering large numbers of PG courses pertaining to the different subjects in variety of formats. Maharaj (2018) argued regarding the roles of e-PG Pathshala in promoting the e-learning among the users. This study also presented the usage statistics of e-PG Pathshala initiative in different angles. Waghmode (2014) mapped the roles of information and library network (INFLIBNET) in developing and spreading higher education in India by providing details of different activities governed through INFLIBNET centre including e-PG Pathshala. Saha and Mukhopadhyay (2016) through webometric analysis mapped the ranking of Open Educational Resources (OER) provider in India. This study included various initiatives taking place in Open Educational Resources (OER) sphere in Indian context including e-PG Pathshala. Sonkar and Srivastava (2017) analysed the use of Open Courseware by PG Students of Babasaheb Bhimrao Ambedkar University, Lucknow particularly E-PG Pathshal context. This paper further examined the satisfaction and perception of users towards E-PG Pathshal project and also pointed out the barriers encountered during the access of e-contents. Jeyapragash et al. (2017) elaborated the e-PG Pathshala initiative in detailed and assessed the contents modules of the e-PG Pathshala. This study further discovered that the total 15416 modules contributed in six major subjects in which social science contributed 5917 modules in majority but medical and health sciences contained only 483 modules. This study also advice the medical and health science experts that they should initiate to contribute more e-content modules for their targeted users. Walia and Manju

*Figure 1. e-PG Pathshala
(INFLIBNET, n.d.)*



(2018) pointed out the different initiatives taking place in open educational resources sphere including e-PG Pathshala. This study further discussed the various roles played by open educational resources in reforming the higher education system. Gurav and Patil (2019) described the concept of e-learning in detailed and also argued regarding like other open access learning initiatives, e-PG Pathshala how play pivotal role in promoting e-learning among the users. Boricha and Gohil (2019) discussed the transformation of the education digital mode and also briefly described e-learning initiatives available in Indian inclusion with e-PG pathshala. Santosh and Panda (2016) raised the different issues connected with open educational resources (OER) in distance education setting and also highlighted variant open initiatives available in Indian scenario inclusion with e-PG Pathshala project. Deval (2018) highlighted the different open educational resources developed at the national level in India including e-PG Pathshala project in detailed which provided facilities to continuously learning to the massive audiences. As such, so study was found on role of library professionals in content development on e-PG Pathshala project.

E-PG PATHSHALA

e-PG Pathshala, an MHRD initiative under its National Mission on Education through ICT (NME-ICT), executed by the UGC and completed with huge volume of content along with its quality. The content and its quality are the key component of education system, high quality, curriculum-based, interactive e-content in 71 subjects across all disciplines of social sciences, arts, fine arts and humanities, natural & mathematical sciences, linguistics and languages developed by the subject experts (professor, associate professor, assistant professor or equivalent) working in universities (central, state, deemed) and other R & D institutes across the country. Every subject has a team of principal investigator, paper coordinators, content writers, content reviewers and multimedia team. A dedicated portal (<http://epgp.inflibnet.ac.in/>), to host the content, is available in open access. The INFLIBNET Centre has executed this program in terms of technical infrastructure and its development along with administrative role (fund-disbursement). The Centre has also act the role of anchor institute for Sociology, Food Technology, Political Science, Women Studies, Human Rights & Duties and Library Science. E-PG Pathshala banner is showing in figure 1.

Figure 2. Website of e-PG Pathshala
(INFILBNET, n.d.)

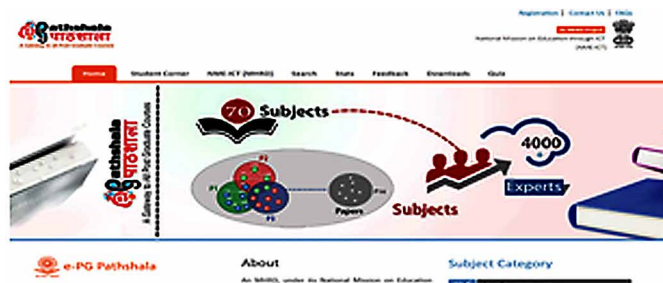


Figure 3. Volume work and teamwork flow in e-PG Pathshala

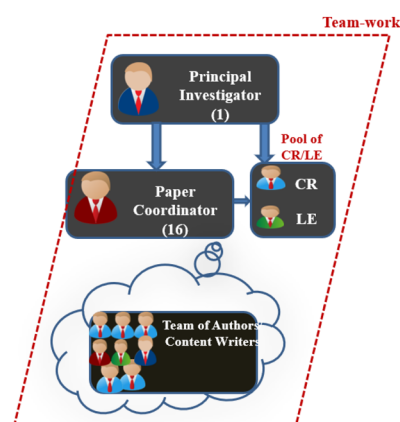
Developing e-content in 70 subjects

1 Subject = 16 Paper*
1 Paper = 30-35 Module (20 Hr lecture)
Total module = 16 X 35 = 560

Four Quadrant approach

Each Module comprises of
a) e-text = textual material
b) Self-learning = audio / video component
c) Self assessment = Questions
d) Learn More = further reference material

* 4 core paper of each semester (2Yr course)



The Outcomes of e-PG Pathshala

The outcomes of e-PG pathshala are depicting in figure 2.

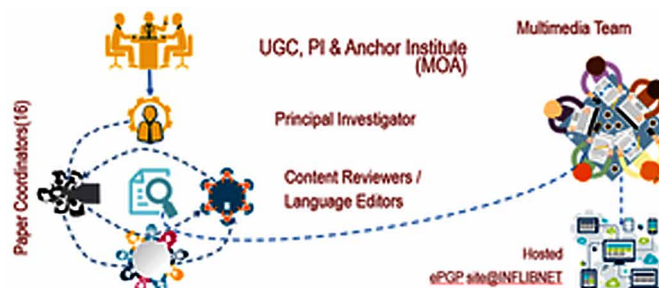
- Develop e-content in 70 subject areas at PG level drawing expertise from subject experts in colleges and universities.
- 15 courses on Library and Information Science.
- 23900+ e-modules for PG courses.
- All modules are in four quadrant (e-Text, video, self-assessment, learn more).
- Make e-content available to students and peers using different delivery modes to impart formal and informal education and for supplementing and complementing the process of teaching and learning in higher education.
- Promote usage of e-content amongst students and peers.

Role of Library Professionals in Content Development

Figure 4. Four quadrant of e-PG Pathshala



Figure 5. Pictorial representation of methodology



Volume of Work and Teamwork

Figure 3 shows that each subject consists of different core papers. A Each paper comprises of 35-40 modules covering 40 hours teaching duration. Each module consists of four quadrants which is being done by academic team and multimedia team of each subject.

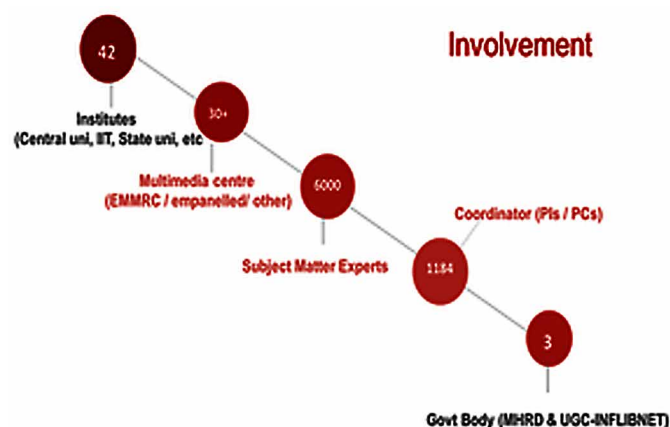
Pictorial view at ePG Pathshala of four quadrant is shown in figure 4.

Methodology to Develop the Content in each Subject

The UGC has constituted a Standing Committee for e-PG Pathshala on e-content creation to monitor and coordinate the activity of content creation in a most effective and efficient manner. The Standing Committee identified one subject expert, called Principal Investigator (PI) for each subject. PI is completely responsible for e-content development of assigned subject. UGC/INFLIBNET prepared platform for hosting all e-contents, interfaces for different requirement (e-Pathshala Management System, online PI application) along with disbursement of funds to PI's institute. Standing Committee constituted Monitoring Cell at UGC to monitor the work progress made by each PIs.

A gist pictorial representation of methodology is mentioned in figure 5.

Figure 6. Involvement of professionals in e-PG Pathshala



Involvement of the Professionals across the Country

There are several institutes, multimedia team, subject matter experts are participated in this national initiative which depicted by figure 6.

ROLE OF LIBRARY PROFESSIONAL TO EXECUTE THE E-PG PATHSHALA PROJECT

Challenges

There are several challenges came in the initial period of the projects. Few main challenges areas follow:

1. Guidelines for entire execution process & authors (content creator): There were huge requirement of different stakeholder of content creators such as paper coordinator, content writer, reviewer, editor, multimedia team, etc. An involvement of 100+ person required for a subject. It was really challenging job for UGC. Moreover, project has financial implication apart from technical requirements.

Therefore, UGC constituted a Standing Committee for overall execution of project. Under the guidance of Committee, guidelines for execution of project as well as guidelines for content writers were created. The library profession played vital role in the preparation of guidelines.

2. Identification of subject and subject experts: The identification of 70 subjects was also challenging task. However, 77 subjects were identified but the content production has been done only for 70 subjects. Accordingly, identification of 70 principle investigator was tough task. It was achieved by nominations and online application.
3. Management & Monitoring System: The management and monitoring of current progress of project in terms of technical as well as financial was challenging job. It was resolved through online system prepared by INFLIBNET Centre.

Role of Library Professionals in Content Development

Figure 7. Roles of library professionals in e-PG Pathshala



4. Metadata enrichment: While submission of content by content writers, it was observed that all content didn't have keywords as well as metadata of each module / content. It was very much necessary to search interface so that learners can get relevant search result. There were also several modules are inter-disciplinary where metadata enrichment was mandatory.
5. Repository & hosting: Such a big repository comprised of more than 23,000 e-modules in four quadrants was really challenging in terms of size, seamless access, search engine, etc

Efforts of Library Professionals in e-PG Pathshala

The library professional played vital role in every phase of the content creation especially initial phase of the content development. Four major area where their roles were very important is mentioned in figure 7.

1. **Identification of Subjects and Subject Experts:** The library experts helped to the Committee during the process of identification subject and its experts. The efforts made as shown in Table 1.
2. **Authoring e-Modules:** A detailed guidelines were prepared for entire execution process along with guidelines for content writers. To authoring e-modules the efforts shown in Table 2 made.
3. **Content Repository and Hosting:** The INFLIBNET Centre created repository to host the content. Details are as follow:
 - a. Open Source Learning Management Repository
 - b. Initially, A tutor was customized to host e-PG Pathshala content. Later, own developed platform were used to host the content.
 - c. Contents were organized using 6 major subject categories of Web of Science.
 - d. E-PGP Management System to manage administrative activities of project.

Table 1.

Subject identification: Identified subjects that are offered in multiple number of universities • Web sites of universities • University Handbook • Web of Science – Most Productive Research Areas	Subject Expert Identification: • Vidwan – Expert Database of INFLIBNET • Web of Science – Most Productive Subjects • Most-cited Indian authors

Table 2.

e-Text • Personal / Module Details • Objectives • Learning Outcomes • Structure: Intro ... • Illus., Graphics and Pictures • Style, Spacing, Numbering, Font-type, size, etc. • References • Plagiarism Check • IPR Issues: Permissions, etc.	Self-Learning • Template for ppt • Multimedia, animation, simulation, virtual lab. • Empanelment of multimedia vendors • Story board for animation
Self-Assessment • 10 – 15 Questions • Multiple Choice Questions • True & False Statements • Correct Sequencing • Fill-in the blanks • 4 to 5 Subjective Questions	Learn More • Did You Know? • Interesting Facts • Time Line • Glossary • Web Links • Points to Ponder, etc

- e. Storage server deployed for storage of all modules.
4. **Metadata Enrichment:** One of the major efforts of library professional is metadata enrichment. It was a big task to create the different metadata filed as per standards and create the same for all e-modules. The metadata were created for every module.
 - a. Content organized in the Repository in six major subject categories using Web of Science Subject Categories.
 - b. Library of Congress Subject Headings (LCSH) (RDA-complaint) Plugged into LMS for assigning subject headings.
 - c. Additional keywords were provided by the Library staff at INFLIBNET to each module.

CONCLUSION

e-PG Pathshala is one of the largest repository for PG content developed in four quadrant. The impact of this project shows that lakhs of users are learning content from portal and 6000+ subject experts involved. As an outcome of this study presenting the several key points such as library professionals can play vital role to execute any e-content / e-Learning project, Government of India has taken good initiative in the era of e-Learning, the capacity building for the teachers of colleges / universities are being created, one department of any Institute can start the content creation for respective subjects for UG/PG courses on the practise of e-PG Pathshala using Learning Management System.

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Section 2

Open Access Resources in Library and Information Science

Chapter 6

Alignment of OER Platforms With SDGs: An Exploratory Study

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ABSTRACT

Given that India is a fast-developing country, education can play a transformative role in societal change in the country. However, disparities continue to persist in access to education, provisioning of quality education. This has been reiterated and manifested even in recently declared SDGs with specific reference to SDG 4. SDG 4 recognizes the need for inclusive education to drive the change. This chapter highlights the role and importance of OERs in transforming the education and making it more inclusive. More importantly, OERs can play a significant role in bridging the digital divide in the country by imparting access to education to both haves and have-nots. The chapter in this context focuses on comprehending the challenges, prospects, and finest practices connected with Indian Open Educational Resources (OER) initiatives. This chapter will also address some of the relevant queries or questions such as, ‘Why do Indian universities, colleges, and school educators adopt—or are reluctant to adopt—OER?’

INTRODUCTION

India is a very diverse, multi-linguistic and multi-ethnic country in the world. The development of information and communication technology (ICT) is a boon for Indians and has been connecting the digital divide in the country. ICT has enhanced Indian skill sets and productivity as best human resources in

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the world. With the introduction of emerging ICT enabled technologies such as block chains, Artificial Intelligence (AI) have revolutionized the use of such technologies in the education world too. Some of these technologies have found their places in education sector, which could significantly contribute in improvising the quality of education in the country by enhancing the access to educational resources among haves and have-nots in the society. There is an escalation in Open Educational Resources (OER) and open access movement because of two reasons; first, *reach of internet availability* and second, *its nature of digital content*, which can be shared.

The Agenda 2030 formulated by United Nation highlighted seventeen (17) Sustainable Development Goals (SDGs) which focuses and support for developed and developing countries in integration their plans and policies to make sustainable and prosperous world to the future generation. Through SDGs 17 guarantee to assist in improvement of poverty, mitigate economic inequality, protect this beautiful planet and to make peace and prosperity among people in the world by 2030. Lane (2017) which study presented an outline how open education address the gap to help the SDGs and SDG 4. The study revealed that how potentials OER and its activities help at all education level for instances local, regional and national level to achieve SDGs and SDG 4. The ambition for open education to contribute to the SDGs is clear from this and other gatherings but the means to make it happen are not as clear, and many have claimed that little has happened since the SDGs were launched in 2015.

Given this brief background, the chapter aims at carrying out an objective assessment of the existing OER initiatives at national and international level. While doing so, the exploratory chapter has carried out an extensive review of existing OER platforms, both at national and international levels. In order to carry out the assessment, data have been collated from various websites of OER platforms. The chapter is organized sequentially following areas:

- It will introduce the concept and lays down the objectives and methodologies in brief with sustainable development goals special focus on SDGs 4 and also tried to align with OER concept.
- The next introduction sub-section will a brief overview on Open Educational Resources (OERs) history and its development indicators for instance with select OERs legacy which initiatives have taken place by national and international institutions and organizations level in table below.
- The study in sub-section of introduction highlighted SDGs 4 with its associated target with IFLA Global Vision and how it will be aligning with OERs concept.
- The study also elaborated on Open Educational Resources and HEI scenario in India and how OERs rich content effort helping India education system.
- The study also highlighted in detailed manner about various OER platforms and initiatives being operational at the national level and explained how its needed more to be done in order to address the challenges those exist in the OERs system.
- The study also attempted to carry out an assessment OER initiatives by international institutions and organizations and also stressed that how much content is rich these OER initiatives and platforms at globally.
- The study also emphasized on its associated challenges with the existing OER systems and opportunities that could be helpful to eradicate digital divide and educational haves and have-nots in the society.

Alignment of OER Platforms With SDGs

Table 1.

Country	Date	OER Development	reference
United Kingdom and Germany	January 1999	Video sequences published for free use The University of Tübingen (Germany) and The Open University (UK)	COL (2019)
USA	2001	The Massachusetts Institute of Technology (MIT) Open Initiative	COL (2019)
France	July 2002	<i>UNESCO forum on Impact of Open Courseware on Higher Education in Developing countries</i> in 2002 and this platform coined the term OER first time	COL (2019).
USA	September 2002	MIT released 32 courses with open licenses	COL (2019)
France	January 2005	Giving knowledge for free: The emergence of OER reports by OECD	COL (2019)
India	2007	National Knowledge Commission (NKC) stressed on importance of OER	M.S. Vijay Kumar (2009)
South Africa	January 2008	Cape Town Open Education Declaration emphasizes that the government and publishers of the world should publish educational materials free on internet	COL (2019)
USA	August 2009	Free digital textbook initiative by Governor of California	COL (2019)
USA	September 2010	Stanford University started first MOOC (Massive Open Online Course) based free courses in	COL (2019)
Bangladesh	April 2011	Full set of digital textbooks for grades one to 12 launched by Bangladesh	COL (2019)
France	June 2012	In the first congress Paris Open Education Resources Declaration launched	COL (2019)
Antigua and Barbuda - West Indies	2013	Antigua and Barbuda had adopted their OER policies	COL (2019)
India	2014	National Mission on Education through ICT adopted open license policy for all its content releasing as OER	COL (2019)
France	September 2017	UNESCO organized 2 nd Open Educational Resources (OER) congress at Slovenia, Ljubljana 18-20 th	COL (2019)

Select OER Legacy

These above initiative (Table) clearly depicts the fact that there is need to give thrust to OER and it need to be recognized as major instruments to meet the current challenges in education sector.

SDG 4 and OER

Open Educational Resources (OERs) has the potential to minimize the existing inequality in the education space, hence can contribute to the bridging of digital divide in the country. The SDG 4 which stands for *quality education opportunity for all* and its associated targets are key factors which highlights 1) complete equitable & free education for girls and boys 2) stressed on all women & men must get their vocational and quality university education 3) to create better option of vocational skill, employment,

job & entrepreneurship for youth and adults 4) disparities should be eliminated at all level in the society special in educational world 5) everyone must get their skill and knowledge to indorse sustainable development through education (UN, 2015).

The IFLA in its global vision report 2018 mention that 1) Information and knowledge should be provide equal and free access 2) focus on inclusion to all without thinking their communities 3) highlights to adopt and innovate digital content with update technology 4) report focus on advocacy and collaboration among library and it leadership 5) library must take proactive approach and innovation open for all so that to create world repositories, better preservation system and organized knowledge in library for future generation 6) stressed on engagement of youth professionals to lead (IFLA, 2018).

The Development and Access to Information (DA2I) report 2019 is stressed how library could play pivotal role to *greener, fairer and better-informed* United Nation Agenda 2030 to make awareness among people about SDGs. The report also focused on needed to work *from the global to the local* and helped policy makers to understand environmental issues round climate change. The emphasized on *a call to action* to work with library to advance hard work to attain the Agenda 2030 (DA21, 2019).

Hence, IFLA global and DA21 report highlights that library can play an important role in meeting the larger agenda SDGs and SDG 4 by Agenda 2030. Library and library professionals can create and play significant role to helping to generate OERs at all level study from individual to inspirational & organizational. Library professionals can be game changer to promote awareness of OERs to all level from national to International, global to local without facing any barriers because existence of library around the world. Library could also paly key role to make environmental issues understanding to policy make and global citizen through open educational resources. The OERs can address the gap of SDGs and SDG 4 to contribute in eradicating poverty, arresting economic inequality, which would eventually enhance the peace and prosperity of people in the world by 2030.

OER AND INDIAN HIGHER EDUCATION SYSTEM

India's Higher Education Scenario

Education is playing big role to transform the country into knowledge-based society and also by enhancing the socio-economic condition and environment. The true learning process always imparts human beings to think, and act rationally for betterment of its country and society at large. Indian education system has long history in the regards to sharing and contributing continuously to their knowledge, beliefs, values and skills on nationally and globally. Modern advanced education system of India is grounded on the British period largely and facing several challenges like quality education, teacher's standard, infrastructure condition, facilities of state of art technology for institution and universities etc. (Agarwal, 2009). The improvement of academic excellence of Indian higher education, National Knowledge Commission also addresses these issues in its report through three ways such as expansion, excellence and inclusion (NKC, 2007). There are 47 Central Universities, Institutes of National Importance/Others 96, State Universities, 364, Institutions deemed to be universities, 123 & State private universities, 262 & if see in percentage frame, Central Universities 5%, Institutes of National Importance/Others 11%, State Universities 41%, Institutions Deemed to be Universities, 14% and State Private Universities 29%. The objective through expansion NKC focused on creation of more universities, preached for financial diversification and higher education regulation system and in the last it mentioned for better reform,

needed more central universities further in India. Through objective of excellence NKC emphasized for reform of prevailing universities, promotion of quality education and streamline to undergraduate colleges/institutions. The name inclusion itself explain that presence and ensure quality education access for all deserving fellow in the societies and through positive action and approaches.

Bansal, Chabra and Joshi (2013) states in their study that there are various problems associated with Indian education system currently such as insufficient availability of quality teacher, quality of basic infrastructure, poor condition of libraries at colleges and universities level, quality of educational materials, money involvement in education and still quality education is unapproachable for remotely located people specially for rural India.

There are huge challenges in front of advanced education system in India specially areas of quality content educational resources materials (Bansal, 2013). The cost of quality educational materials is very high, and it is very far to reach from remotely and disadvantageous sections of society. Therefore, the development to information and communication technology (ICT), has become imperative to fill the gap of digital divide in the society.

OER and Higher Education of India

As SDGs 4 is important key to attaining other SDGs specially through innovation of online education with updated technology which became very easy to reach out to the people previously they were unapproachable for it. National Knowledge Commission (NKC) states which also mentioned above in introduction part that the development of excellence open access (OA) and OERs with good connectivity of internet through proper dissemination system which is way to our true accomplishment in this regard. Dutta, (2016) in his study states that the quality open educational resources and OA can improve the hitches of educational materials to a very large degree and would also change teaching and learning standard. He also highlighted in the study that through various innovative programmes by government of India like National Programme on Technology Enhanced Learning (NPTEL), e-Pg Pathshala, NMEICT etc. have been tried out to provide and motivate toward development & dissemination of educational materials for Indian advanced education.

Presently, there are various OER platforms of Indian initiative which provide educators and learners specially on higher education to sharing and retrieving their educational resources his or her interested and needed. These are going to explaining herewith briefly which will help learner to understand relevancy and importance of open access and OERs in higher education. Shodhgana is one of major platform where PhD theses deposited by research student in India for open access. NPTEL is baby of 7 Indian institute to technology which is based on engineering and core science online courses and it has also web and video format courses. These all course are providing from March 2014 onward and successful candidates are giving certificates of IITs & IISc. Project OSCAR is an OER platform where animations repository available for open source courseware and it's also stated as learning objects (LOs) in the field of science & technology for purpose of learning and teaching perceptions. e-PG Pathashla is an open educational resources platform which has initiated by MHRD and NME-CT where e-content available at Postgraduate level in 70 subjects. Study Webs of Active-Learning for Young Aspiring Minds (SWAYAM) is based on three principles of education that is access, equity and quality and it is providing educational resources materials to all for teaching and learning purpose include those who have remote location and the most deprived from it. Virtual Labs is an initiative as OER where providing remote access labs facility specially for the various subjects of science and engineering field. It is consortium of twelve par-

ticipating institutions and IIT Delhi is coordinator of this consortium. Spoken Tutorial is an OER where learners can learn free and open source software and it is developed by IIT Bombay which is an initiative of National Mission on Education through ICT and MHRD, Government of India. It has ninety-eight courses in fifty-one software series and in thirty-two languages including some foreign languages. The foreign languages are Thai, Spanish, Portuguese, Persian, Nepali, English and USA English. There are various MOOC based OER initiated like NPTEL, IITBombayX, IIMBx, SWAYAM, agMOOCs, and NAARM MOOCs. NAARM MOOCs and agMOOCs, are cater in the field of agriculture sector where it is helping to develop human resource and capacity building through MOOCs based online programs.

The next section further elaborates in detailed manner about various OER platforms and initiatives being operational at the national level.

EXISTING PLATFORMS OF OER AT NATIONAL LEVEL

Open educational resources (OER) is one of the greatest revolutions in this regard in digital era which is kind of educational materials supporting in teaching and learning process in education system like book, journals etc. The important part of OER is that those who staying very far location and remotely, they can access their quality educational material for their teaching and learning purpose. Some open access initiative highlighted national level OER in India as below. Though the history of OER revolution in the country has been elucidated in the introduction section, it becomes imperative to offer a detailed account of various OER platforms and initiatives in the country. Tracing the history of OER in India, India's OER policy could be linked to the open licensing policy of India adopted by The National Mission on Education through ICT (NMEICT) under Ministry of Human Resource Development, Government of India in 2014. In this section, a detailed mapping of all the existing OER platforms and initiatives are carried out.

- **National Digital Library of India (NDL):** The basic objective of NDL to create a 24x 7 enabled integrated National Digital Library platform for all kind of learners in India. It has planned to build up as a national knowledge asset which available through single window facility to disseminate existing content and create new digital content for the end user. It has various kind learning resources full-text to access like Book; Thesis; Audio Lecture; Article; Manuscript; Video Lecture; Question Paper; Web Course; Annual Report; Solution Data Set; Report; Technical Report; Manual; Album; Monograph; Technical Manual; Law Judgement on subject Computer Science, Information and General works, Philosophy & Psychology, Religion Social Sciences, Language, Natural Science and Mathematics, Technology, The arts; fine & decorative arts, Literature rhetoric, History and geography. NDL is available with four languages like Hindi, Bangla, Gujarati & English with app bases access. NDL is also available with featured sources such as NPTEL, NCERT etc.
- **Shodhganga:** It is a repository of Indian electronic theses and dissertations (ETDs) which is Open access facility of Indian ETDs for the world-wide academic community and to help in floating the standard and research quality in India. ETDs of Shodhganga is accessible full-text of all institutions and universities in India. It has approximately 205216 full text theses and synopses of 5050 which are contributing by 355 Universities and Institutions in India. Shodhganga is covering subject on science, social science, humanities and language etc. It has strong linkages of all

institutions and universities through memorandum of understanding (MOU) approximately 405 universities signed MOU with Shodhganga, INFLIBNET Centre.

- **Shodhgangotri:** Shodhgangotri is initiated by INFLIBNET to compliments ShodhGanga to covering electronic version of approved Indian research proposals and synopses from different universities and institution in India. It is a repository of Indian research in progress, research proposal, synopses and covering subject domain such as science, social science, humanities and language etc.
- **EPrints@IISc:** It is repository of research output which is created by Indian Institute of Science (IISc), Bengaluru research community which is accessible for anybody from anywhere, but submission is limited to the research community of IISc, Bengaluru. It is also helping and encouraging other institutions and universities to create their own open archive for author self-achieving methods based on EPrints open archive software which is from eprints.org. There is various kind work included in this archive as such Book (39),Book Chapter (98),Conference Proceedings (1859),Conference Paper (4760),Conference Poster (63),Departmental Technical Report (61),Journal Article (38435),Editorials/Short Communications (1637),Patent (26),Preprint (218),Teaching Resource (4),Other (2),Conference or Workshop Item (1) etc. The subject covered of the repository are Administration (3); Biological Sciences (7843); Chemical Sciences (11680); Earth and Environmental Sciences (429); Electrical Sciences (6864); Information Sciences (1212); Mechanical Sciences (11482); Physical & Mathematical Sciences (8538); Other Centres/ Units/UG Programme (615); Others (1699).
- **National Programme on Technology Enhanced Learning (NPTEL):** NPTEL is open online courses on engineering, computer science, core science etc. which has initiated by IITs (Kanpur, Roorkee, Delhi, Madras, Guwahati, Mumbai and Kharagpur) with IISc, Bengaluru. It has created on web and video format courses which based on education policy viz. access, equity and quality with availability concept anyone, anytime and anywhere (AAA) to all. It is providing certificate for its video, web and workshop online courses. It has vast subject cover such as Aerospace Engineering, Agriculture, Architecture, Atmospheric Science, Automobile Engineering, Basic courses(Sem 1 and 2), Biotechnology, Chemical Engineering, Chemistry and Biochemistry, Civil Engineering, Computer Science and Engineering, Electrical Engineering, Electronics & Communication Engineering, Engineering Design, Environmental Science, General, Humanities and Social Sciences, Management, Mathematics, Mechanical Engineering, Metallurgy and Material Science, Mining Engineering, Multidisciplinary, Nanotechnology, Ocean Engineering, Physics and Textile Engineering etc. It has strongly connectivity and linkages with SWAYAM, National Digital Library of India.
- **Project Open Source Courseware Animations Repository (OSCAR):** The project OSCAR was hypothesized by Prof Sridhar Iyer at IIT Bombay to OSCAR for learning and teaching in science & technology with better classroom environment facility for distance and independent learning education which is an OER platform where animations repository accessible for open source courseware and it's also stated as learning objects (LOs) in the field of science technology for the purpose of learning and teaching perceptions. It has learning resources, learning objects (Los), animations, videos and 3D models on various subjects Biology, Biochemistry, Bioscience and Engineering, Chemistry, Computer Science, Chemical, Electrical, Civil, Mechanical and Metallurgical Engineering, Earth Science, Electronics, Environmental Science, Physics

- **SHAKSHAT:** It is basically concept of one stop education portal like Pedagogy Project, Consortium for Educational Communication, NPTEL, Spoken Tutorial, Talk to Teacher, Amrita Virtual Interactive e-Learning World, e-Yantra, Free and Open Source Software for Education which has initiated by MHRD, Government of India under NME-ICT to provide quality education solution to faculties, scholars, professionals, students and life-long learners.
- **Open Government Data (OGD) Platform India:** It is a government portal where open data available for public use which publish datasets, tools, documents, applications and services of different ministries and departments of government of India. It is joint initiative of US government and Indian government. It is based on four modules - Content Management System (CMS), Communities, Data Management System (DMS) and Visitor Relationship Management (VRM).
- **Agropedia:** Agropedia is an initiative of Indian Council of Agricultural Research (ICAR) under National Agricultural Innovation Project (NAIP) with help of IIT Kanpur, ICRISAT, UAS Raichur, IIIM-C and ZPD-IV to map the information gaps in Indian agriculture sector and to provide support to create agriculture portals and knowledge repository for agricultural scientist and farmers. It has various components like knowledge models, agroforum, agroblog, agrowiki voice messages, voice POP, agrowiki, forum, unverified posts on subjects Atmospheric Science, Crops, Forestry, Plant Production, Plant Protection, Animal Husbandry, Agricultural Engineering, Social Sciences, Postharvest Management, Soil Science and Microbiology etc. It is available on other languages and its knowledge models are based on learning objects (LO). It is a download POP app which is very much helpful to reach end user easily.
- **eGyanKosh:** eGyanKosh is created by ODL (Open and Distance Learning) educational institutions in India as a National Digital Repository which is providing online access of IGNOU Courses. It has video programmes through a Youtube channel standard for eGyanKosh. It has learning resource like video lectures which are cover more than 380 subjects on abortion-moral and ethical aspects, acculturation, act (Philosophy), aesthetics etc. App based access available with name IGNOU e-content which can be downloadable from google play.
- **e-PG Pathshala:** e-PG Pathshala is an open educational resources platform which has initiated by MHRD and NME-CT where e-content and e-textbook for PG courses in 70 subjects which has developed curriculum-based, high quality, interactive e-content for PG level in all disciplines. It is being conceptualized by MHRD through NMEICT project and implemented by UGC which are learning resources 22000 e-text, 22000 plus video, 5000 plus expert, Quiz 30000 and 723 papers, Self-Assessment, Self-Learning. It is 70 subjects covering with e-content distribution are Adult Education (189),Analytical Chemistry/Instrumentation (222),Anthropology (538),Architecture (159),Biochemistry (249),Biophysics (430),Biotechnology (261),Botany (114),Buddhist Studies (28), Business Economics (454) Chemistry (552) Chinese (26),Commerce (462),Comparative Study of Religions (69),Computer Science (581),Criminology (466) Earth Sciences (27),Economics (537),Education (51),Electronic Science (115),English (556),Environmental Sciences (188),Food and Nutrition (561),Food Technology (206),Forensic Science (556),Geography (332),Geology (135),Hindi (590),Home Science (495),Hotel & Tourism Management (630),Human Resource Management (599),Human Rights and Duties (361),Indian Culture (523),Information Technology (286),Japanese (338),Jyotish- ganit (560),Law (461),Library and Information Science (377),Linguistics (485), M Planning (0) Management (590),Material Science (414),Mathematics (567),Media and communication studies (376),Performing Arts(Dance/Drama/Theatre) (559),Pharmaceutical Science (211),Philosophy (144),Physical Education, Sports and Health

Education (36), Physics (256), Political Science (201), Population Studies (356), Psychology (596), Public Administration (100), Risk / Disaster Management (16), Russian Studies (435), Sanskrit (Acharya in Vyakrana) (533), Sanskrit (M.A) (634), Social Medicine and Community Health (90), Social Work Education (424), Sociology (430), Spanish (560), Statistics (549), Urdu (304), Visual Arts (487), Women Studies/Gender Studies (138), Zoology (172). It has linkage with Study Webs of Active-Learning for Young Aspiring Minds (SWAYAM) which is providing e-PGPath-shala hosts the content for PG students through MOOCs.

- **Study Webs of Active-Learning for Young Aspiring Minds (SWAYAM):** SWAYAM is started by MHRD with concept of switch to smart education and learn anytime, anywhere with no age bar, without any boundary's limitation with concept of equal opportunities to all for provide quality educational resources materials for teaching and learning. SWAYAM is based on three principles of education that are access, equity and quality therefore, it is providing learning path include those who have remote location and the most deprived from it. It is also fulfilling the gaps information have and have- nots and digital divide in the society specially who have remained untouched by the digital insurgency. It has various kind programmers for lifelong learners such as School (179), Undergraduate (1075), Certificate (137), Diploma (41), D.EL. ED course, Postgraduate (703) and Annual Refresher programme in Teaching (ARPIT). The prestigious universities and institutions of India offering quality educational resources to pupils at PG to school level. The categories of courses on Humanities, Engineering, Mathematics, Arts and Recreation, General, Science, Commerce, Education, Language, Law, Library and Information Science, and Open Design School. It has language adaptability in English and Hindi and strong linkage and connectivity with other institutions. It is App based access which can be downloadable Google play, Windows store and Apple App store.
- **Virtual Labs:** It is an initiative as OER by MHRD, under the guidance of NME-ICT where virtual labs are providing remote access facility specially for the various subjects of science and engineering field like Electronics & Communications, Computer Science & Engineering, Electrical Engineering, Mechanical Engineering, Chemical Engineering, Biotechnology and Biomedical Engineering, Civil Engineering, Physical Sciences, Chemical Sciences etc. It is consortium of twelve participating institutions and IIT Delhi is coordinator of this consortium which is providing learning tools.
- **Spoken tutorial:** It is an OER where learners can learn free and open source software and developed by IIT Bombay which is an initiative of National Mission on Education through ICT and MHRD, Government of India. It has ninety-eight courses in fifty-one software series and in thirty-two languages including some foreign languages. The foreign languages are Thai, Spanish, Portuguese, Persian, Nepali, English and USA English.
- **IITBombayx (Partners):** It is free online course from IIT Bombay which is based on MOOCs and its courses are on three level introductory 1307, Intermediate 826 and Advanced 310. The various subjects domain like Architecture 36, Art & Culture 138, Biology & Life Sciences 180, Business & Management 500, Chemistry 54, Communication 111, Computer Science 646, Data Analysis & Statistics 236, Design 57, Economics & Finance 228, Education & Teacher Training 116, Electronics 65, Energy & Earth Sciences 51, Engineering 375, Environmental Studies 120, Ethics 17, Food & Nutrition 38, Health & Safety 123, History 142, Humanities 274, Language 44, Law 68, Literature 75, Math 130, Medicine 124, Music 25, Philosophy & Ethics 87, Physics 154, Science 240, Social Sciences 347. It is app based too and available at www.edx.org.

- **IIMBx:** It is MOOCs based courses which has initiated by IIM Bangalore faculty members covering programme related to advanced business management subjects. Online programme is based on philosophy provide quality educational resources solution to life-long learning including those who have constraint by location.
- **agMOOCs:** agMOOCs is online platform on agriculture field which enhance and provide knowledge and skill to organizations, professionals and students. It is MOOCs based course to access quality agriculture education.
- **NAARM MOOCs:** NAARM MOOCs is cater in the field of agriculture sector where it is helping to develop human resource and capacity building through MOOCs based online programs. It is an initiative of ICAR-National Academy of Agricultural Research Management (NAARM).

Assessment of various OER initiatives offers some interesting insights with respect to their goals, objectives, missions and vision. There is hardly any coordination between these OERs platforms except a few. It has been observed that while the availability quality educational materials on these platforms are very rich, however, there is a need to generate awareness among information seekers and to the end users about the availability of such resources. In this regard, only SWAYAM project trying to meet these gaps among OERs platforms as it has improved feature such as linkages with other OER platforms. For instance, it has established linkages with NPTEL, Sakshat etc. Second key findings that emerge from this section is that most of OERs platforms cater to science subjects and a few have resources on social sciences and humanities. The above comparative study also reveals that e-PG Pathshala and SWAYAM strongly support the master level courses by providing standard e-textbooks. SWAYAM has various advantages such as resources are based on MOOCs and language adaptability and App based access options. In order to understand what is happening globally, the next section of the chapter attempts to carry out an assessment OER initiatives of International institutions and organisations. Various key features such as aim, learning objectives, kind of resources, availability of educational materials, their mission and vision of the initiatives have been assessed to better understand those platforms and draw lessons for India.

MAPPING OF INTERNATIONAL OER INITIATIVES

The concept behind birth of Open Educational resource (OER) is, to expand the access of HEI materials irrespective of social, political and economic constraints faced by the user. To make this equal provision and opportunity to all, quality equation is key force to address this issue. As SDGs fourth goal with associated targets focus to provide quality education opportunity to all that would be through online quality education, innovation, with updated technology which will be easy to extend those billions of people lives specially those people were unapproachable and remotely located. There are many initiatives take place around the world in this regard. The major global effort towards this was in first congress in 2012 at The Paris Open Education Resources Declaration. The year 2017 as “The Year of Open” by the international open education community declared. In this year UNESCO also organized 2nd Open Educational Resources (OER) congress at Slovenia, Ljubljana 18-20th September 2017. Some international OER initiatives highlighted as below.

Alignment of OER Platforms With SDGs

- **The Open Education Research Hub (OER Hub):** It is located at the Open University (OU), UK which was funded by Hewlett Foundation. The basic objective of OER Hub is supporting to OER researcher in various areas such as to yield resources, conducting research and capacity building in domain of OER research. It is conducting research in Open education field including Open Pedagogy, Open Educational Resources, Open Access, Open Textbooks, Open Educational Practices and Open Scholarship etc. It has available all projects, case studies, publications and kind of services they are providing to end users.
- **OER Impact Map:** It is platform where anyone can understand in the spectrum of open education in the world. It is showing global impact of open educational resources (OER) so that the people can better understand the impact of OER through maps, evidence from various kind of data, hypotheses etc.
- **OpenLearn:** The Open University, UK is providing free learning to everyone on this platform and it has approximately 1000 courses on various subject domain including Education & Development, Health, Sports & Psychology, Languages, History & The Arts, Money & Business, Science, Mathematics & Technology, Nature & Environment and Society, Politics & Law. These courses are offered in three level Introductory, Intermediate and Advanced with mention number of hours required for courses. It is providing opportunity to enhancing working related skills those in jobs looking for it specially field of project planning, digital field, communication, money and finance, leadership and management, and career related for those who have not able to do in full-time study. The uniqueness of OpenLearn is that The Open University providing programmes on TV, Radio and Online channels with partnership with BBC.
- **OERu:** It is not-for-profit an independent organization which is coordinated by the OER Foundation with concept to provide higher education to everyone in the world. It is two kind of online courses namely full course and micro course, in this full course, it has two courses respectively Critical Reasoning and Facilitating learning in practice. There are various programmes in micro course at OERu explicitly Managing my Money, Introduction to ecosystems, The Business of football, succeed with maths-Part 1& 2, English, with learning, First steps into higher education, Can renewable energy sources power the world, Succeed in the workplace, Introduction to cyber security, Forensic Psychology, Basic science: understanding experiments, Indigenous Australian histories, Indigenous Australians: The dreaming and relationships to country, Human rights and indigenous Australian peoples, Contemporary realities for indigenous Australians, Designing the transition to a living future, Strategic planning for success, Taking action and choosing priorities, The inspiring challenge of sustainable development, Introducing the voluntary sector, Managing my investments, Introduction to Regional Relations in the Asia-Pacific, World history in the early modern era, Imperialism and War, World War II to present, Thinking, learning and memory, Understanding Culture in Asia and the Pacific, Evolutionary psychology, consciousness and perception, Writing for business success, Introduction to management, Leading and the managing people, Planning and managing organizations, The process of writing, Writing for academic purposes, Making your arguments more credible, Revising and polishing your writing, Core foundations of successful marketing, Market research and customer insights, Launching products and generating market demand, Creating effective business presentations, Intercultural communication, teamwork, and leadership, Foundations of psychological science, Regional Economics in Asia and the Pacific, Digital literacies for online learning, Social Entrepreneurship in the Digital Age, Digital citizenship, Open education, copyright and open licensing in a digital world, Critical

media literacies and associated digital skills, The role of the project manager, Moons of our Solar System, Initiating a project, Planning a project, Executing and closing a project, Introduction to principles of microeconomics, Production and consumption, Market Structures, Tourism in Asia and the Pacific, Living life with dementia, Becoming an entrepreneur, Planning a business start-up, Financing a business start-up. These all world-class courses can be access independently from home with only internet connection which are available with recognized institutions.

- **UNESCO-COL OER Chairs:** This project is an initiated and hosted at Canada by Athabasca University to support open education for national and international community. The main concept to hosting this to make higher education accessible to all with philosophy of, at anytime from anywhere. It has various objectives to create OER network at international level includes worldwide association on OER initiative, providing training for developing countries on OER to become leader in the field of online education, disseminating OER research internationally, to creating and providing platform for OER researchers etc. It is providing information regarding OER Knowledge Cloud and its publication, Open Courseware and UNESCO OER Site to end users globally.
- **Directory of Open Access Journals (DOAJ):** It covers more than 13000 journals for open access with approximately 3,946,872 Article on various subject including Agriculture, Auxiliary sciences of history, Bibliography. Library science. Information resources, Education, Fine Arts, General Works, Geography. Anthropology. Recreation, History (General) and history of Europe, History America, Language and Literature, Law, Medicine, Military Science, Music and books on Music, Naval Science, Philosophy. Psychology. Religion, Political science, Science, Social Sciences, Technology. DOAJ was launched at Lund University in 2003 immediately after UNESCO adopted OER. The main objective of DOAJ is to enhance the perceptibility and effortlessness to practice open access systematic and academic resources. The main motto of DOAJ is to be the one-stop shop for users at large.
- **Directory of Open Educational Resources (DOER):** It is platform where anyone can get its open educational resources which has developed by universities and institutions from commonwealth countries. The nature of collections is including higher Education, MOOCs, Open Schooling, Teacher Education, Technical and Vocational Skills Development (TVSD) and it is keep updating continuously.
- **PLOS:** It is Public Library of Science (PLOS) which is a directory of open access journals. PLOS has approximately 2.15 lakh articles peer-reviewed available free to access to all without paying price. The basic concept to foundation of PLOS is spread communication of research specially science and medicine field to across the world. It is established by organization of advocacy, innovator and publisher as a nonprofit open access. It is publishing seven peer-reviewed journals to open access with titles PLOS Pathogens, PLOS Biology, PLOS Genetics, PLOS Medicine, PLOS ONE, PLOS Neglected Tropical Diseases and PLOS Computational Biology including some more content on PLOS Collections, PLOS Channels and PLOS Blogs. The content of PLOS is available freely to the end users in the world to remix, reuse and distribute with proper acknowledgement.
- **OER Commons:** It is public digital library which has started by ISKME in 2007 to provide high quality OERs for teaching and learning purpose in the world. It is providing best platform for collaborative work for learners and educators. It is providing open educational resources on vast subject arrange as such Arts and Humanities (8017), Business and Communication (1823), Applied Science (6816), Education (5309), Career and Technical Education (1492), History

(6698), Mathematics (6242), English Language Arts (2312), Life Science (9301), Physical Science (8877), Social Science (4368) and Law (221) to all learners of educational level like Pre, Middle and High school, College for Upper Division, Community College for Lower Division, Graduate for Professional and Adult Education. The types of open educational resources and materials are available with Case Study (925), Teaching/Learning Strategy (2944), Textbook (1532), Simulation (1189), Full Course (3472), Primary Source (4625), Data Set (1232), Homework/Assignment (1454), Lecture Notes (1439), Diagram/Illustration (6096), Lesson Plan (9673), Module (2806), Activity/Lab (11212), Interactive (2707), Lecture (6251), Reading (11197), Unit of Study (1535), Student Guide (262), Game (514), Lesson (1325), Assessment (2942) and Syllabus (1607). It is providing various services regarding open educational resources to global community.

- **Wikipedia:** It is encyclopedia where content available free to global community to producible and distributable which was started on January 2001 and hosted by Wikipedia foundation. It has various kind of content including Featured content, Overviews, Portals, Glossaries, Outlines, Categories, Indices, Wikipedia Books, Spoken articles and Lists on the topics of Reference, Geography, Current events, Health, History, Culture, Technology, Society, Philosophy, Nature, Religion, Mathematics, People. It is covering Indices, People, places and times to the global community. It is available on different international languages globally and hosting on other project such as Commons-Free media repository, MediaWiki-Wiki software development, Meta-Wiki-Wikimedia project coordination, Wikibooks-Free textbooks and manuals, Wikidata-Free knowledge base, Wikinews Free-content news, Wikiquote-Collection of quotations, Wikisource-Free-content library Wikispecies- Directory of species, Wikiversity- Free learning materials and activities Wikivoyage- Free travel guide, Wiktionary- Dictionary and thesaurus.
- **OpenStax:** It is an initiative of Houston, Texas based Rice University which is private research university and basic objective is provide free high-quality with peer-reviewed online textbooks to students and lifelong learners. It's also made available low-cost print version textbooks to students and other tools which is to be required for successful teaching in the classroom. The textbooks are available the subjects on Math, Social Science, Humanities, Science, Business, AP and content develop by professional expert in the respective subject field with process of a rigorous peer review and keep the scope of course. It has developed two technology which is very much relevant to learn mathematics and various tools of science homework with proper feedback system namely openstax TUTOR beta and openstax Rover
- **Siyavula:** It is South African based repository which has been supported by Shuttleworth Foundation and its main goal is published textbooks as open educational resources specially for school level at primary and high on themes of subject's physical, mathematics, technology and natural science. It has basic objective is provide high quality OERs on mathematics and science to teaching and learning for South Africa and global community. It is also providing online communicating resources to the learners.
- **MIT Open Courseware:** As mentioned in introduction section that Massachusetts Institute of Technology (MIT) USA takes an OER initiative in 2001 and launched 32 courses under open licenses in 2002. As of now, open educational resources materials of 2400 courses at MIT is a free for educators and learners of global community. It is covering the topics on Engineering, Energy, Health and Medicine, Business, Mathematics, Humanities, Social Science, Fine Arts, Science, Teaching and Education and Society under various department like School of Architecture and Planning (programmes- Architecture, Media Arts and Sciences and Urban Studies and Planning),

School of Engineering (programmes-Aeronautics and Astronautics, Biological Engineering, Chemical Engineering, Civil and Environmental Engineering, Electrical Engineering and Computer Science, Engineering Systems Division, Health Sciences and Technology, Institute for Data, Systems, and Society, Materials Science and Engineering, Mechanical Engineering, Nuclear Science and Engineering), School of Humanities, Arts, and Social Sciences(programmes-Anthropology, Comparative Media Studies/Writing, Economics, Global Studies and Languages, History, Linguistics and Philosophy, Literature, Music and Theater Arts, Political Science Science, Technology, and Society, Women's and Gender Studies), School of Science (programmes-Biology, Brain and Cognitive Sciences, Chemistry, Earth, Atmospheric, and Planetary Sciences, Mathematics, Physics), Sloan School of Management (Programme-Management) and Other Programs-Athletics, Physical Education, and Recreation, Concourse, Edgerton Center, Experimental Study Group Economics, Global Studies and Languages, History, Linguistics and Philosophy, Literature, Music and Theater Arts, Political Science, Science, Technology, and Society and Women's and Gender Studies. It is collections like online textbooks, new courses, OCW scholar courses, most visited courses, audio/video lectures, supplemental resources, MITx & Related OCW Courses and OCW Highlights for High School.

- **Michigan Open:** It is an initiative in the field medical science specially focuses on opioid epidemic to provide preventative method to care of acute pain. The aim of this open is reduce opioid acute care, remove new persistent opioid, reduce mismanagement distribution of opioid among communities through providing proper education, guidelines and encouraging safe disposal chances. It has two kinds of resources one is provider resources like Dental, Surgical and Prescribing Emergency Prescribing Recommendations and Evidence-Based Reasons to Change Opioid Prescribing Practices. The second resource name is patient Resource including Opioid Facts, Pain Management Techniques, Talking to Your Doctor about Pain Control, Opioid Facts Brochure for Dental Patients, Prescription Medication Disposal and Talking to Your Dentist about Pain Control Brochure.
- **JHSPH OpenCourseWare:** It is repository of open educational resources and materials on public health research and education which has established by the faculty members of John Hopkins Bloomberg school of public health (JHSPH) for 121 courses on various topics including Adolescent Health, Aging Behavior and Health, Biostatistics, Cancer, Chronic Diseases, Environment, General Public Health, Genetics, Global Health, Health Policy, HIV/AIDS, Infectious Disease, Injury Prevention, Malaria, Maternal and Child Health, Mental Health, Nutrition, Occupational and Worker Health, Population, Science, Presentations, Public Health Preparedness, Refugee Health. It has various kind of collections to fulfil courses successfully and that are case-based courses, courses from deceased JHSPH faculty, core courses for the Hopkins Master of Public Health (MPH), food, ethics, Golden Apple Faculty, Teaching Vaccine Economics Everywhere, Courses with audio and Public Health in Developing Countries. JHSPH OpenCourseWare is openly and freely available on the web for educators and learners of the global community.
- **SciELO:** It is online library on scientific literature which started in 1997 to provide access to the uses of Caribbean and Latin American. It is providing open access journal contents including case studies, editorials, research related communications, review articles, research articles etc. in the scientific titles. The main objective of the project to provide quality scientific and increase communication on open science.

Alignment of OER Platforms With SDGs

- **SIDALC:** It is initiated by 22 Latin America and Caribbean (LAC) countries to information access among members countries in the field of agriculture. It is providing more than 3 million reference resources materials including journals, books, magazines, reports and theses among members agricultural institutions, library and information centres. This alliance has approximately 2.40 lakh full-text information to access. It has libraries directory and specialized services for this information services alliance.
- **LILACS:** It is virtual library on health which is providing literature of Caribbean and the Latin America. The 32 Caribbean and the Latin America countries have membership of LILACS and the content including Journals (901), articles (722335), theses (43720), monographies (91646) and approximately 454079 full-texts. It is working and providing continuously to enhance access and discernibility of quality open educational resources and materials in this region.
- **Open Policy Network:** It is platform where anyone can get open policies and practices central place from 32 countries. Its support to create open policies for public funded resources so that it would increase impact of investment of public fund. The main objective to create space for open policy, investigate gaps of open policy, make understand the importance open policy, coordinate and bring compatible together individuals, communities and organizations to develop policies for global open platform. It has open educational resources and services including case studies, work plan, registries & tools, meeting detail, projects etc.
- **Open Education Policy Network:** It is network of open educational resources (OER) policies of European country which focus to create cooperation specially in Eastern Europe and central Europe to develop and implement OER policies in Europe. The objective of this initiative is to make conducive environment for open education and backing policy support for it. It has various kind of resources and publications regarding OER policies and available in three languages including English, Polish and Czech.
- **Curriki:** It is providing online high quality OERs for learning and teaching purpose in the USA and global community. The objective of Curriki initiative to meet the gaps of those who have availability of quality educational resources and those who do not have in global community on share basis among experts, educators and learners. It has collection on various subjects including Arts, Computer Science, Career & Tech Ed, Ed Tech, Engineering, Education, Media Literacy, Health, Language Arts, Science, Math, World Languages and Social Studies
- **MERLOT:** It is providing online teaching and learning materials to global community from way back 1997 when MERLOT project started by California State University center. MERLOT is supporting and providing content creation tool which is developed by international experts such as learners, educators and researchers. It has approximately 10 thousand collection of learning materials and exercises, bookmark etc. so that anyone can get to enhance their teaching skill with using this collection. It has twenty-two type of learning materials including Assessment Tool, Animation, Case Study, Assignment, Collection, Development Tool, ePortfolio, Drill and Practice, Learning Object Repository, Hybrid/Blended Course, Online Course Module, Open (Access) Journal – Article, Online Course, Open (Access) Textbook, Presentation, Reference Material, Quiz/Test, Social Networking Tool, Syllabus, Simulation, Workshop and Training Material, Tutorial etc.
- **The TEMOA Project:** The project “Tools for Energy Model Optimization and Analysis (TEMOA)” is framework on open source modelling which is leading analysis on energy system to the global community. The basic objective of this project to figure open source technology (OST) on energy economy, OSS tools can be used, model should be more tractable on ambiguity study,

to tried to achieve difficult examination because in the future main drive force topics on policies and technology placement will be energy security and climate change.

The study tried to bring various Open Educational resource (OER) initiative which is working for global community with an aim to provide equal opportunity to access quality educational resources and materials. This section tried to provide overall idea of OER initiatives globally, its various features and its benefit to the end users. Although, there are many more OERs initiatives in the world platform including Darakt-e Danesh Library (DDL) from Afghanistan, Faculty of education at the open university of Sri Lanka (OUSL, Four MOOCS at the university of Cape Town in South Africa OER4Schools (Hodgkinson-Williams and Arinto,2017),Bookboon (adware), Educational research, Commonwealth Computer Navigator's Certificate, Free and open-source software, Internet Archive, North Carolina Learning Object Repository, Project Gutenberg, Virginia Open Education Foundation, Open educational practices in Australia, Open educational resources in Canada, Writing Commons, Online credentials for learning, Question and Test Interoperability specification etc. As introduction section mentioned that in 2001 MIT USA takes an OER initiative and in 2002 launched its 32 courses under open licenses and it was landmark of openness courseware of university. Taking this initiatives into consideration, UNESCO created a forum "Impact of Open Courseware on Higher Education in Developing countries" in 2002. The MIT open courseware (OCW) support the various level courses by providing standard course materials. It has various advantages to understand what is happening globally in open educational resources and materials.

CHALLENGES

There are various challenges associated with the operation of OER systems. Some of these challenges are highlighted by the OECD study (2007) such as:

- *Technical Challenge:* There are poor conditions of broadband access, innovation of technology and interoperability metadata etc., hinder the use and access of OER platforms and rural broadband penetration in India is evolving.
- *Economic Challenges:* There is need of adequate finance to invest in the development of hardware, software, OERs and long run survival of OER projects continue to act as roadblocks for the development of OERs. The funding pattern in the library and allocation of fund to adopt OERs is substantive in India.
- *Social Challenges:* As emerge in the form of scarcity of skilled hand to use of technology, quality of open content, reluctance to share resources on public domain, conservative thinking about IPR etc. The awareness among the stakeholders in India is not up to the marks, it needs more awareness development programme to educate stakeholders in OERs.
- *Legal Challenges:* There are copyright issues, language diversity and others. The regulation framework to understand creative commons (CC), Open licenses, OERs etc. should in place in India so that end users find out appropriate source of OER and identify of OER with all open licenses to apply appropriately in their work. It will be easy of creator to share their work on public domain.

OPPORTUNITIES

Despite the recognition that education plays a pivotal role in societal transformation, quality education access continues to be a hindrance for citizen both globally as well as nationally. Most recent global declaration in this context is the SDG 4 with specific emphasis to promote quality education and remove existing disparities present in the world. OERs could come as handy to address the current challenges associated with the education sector and fulfil the overarching goals of SDG 4. It can be possible through more targeted focus on creation of newer and powerful OER platforms, strengthening the existing OER platforms, which should be supported by planners and policy makers.

OER initiative is providing and helping to integrate and include respective government development plans and policies so that its guarantees to assist in improvement of poverty, mitigate economic inequality, and make peace and prosperity to prevail among people in the world by 2030. It has the potential to save money and time of developing countries in the world by providing easier content for course development, providing platform where universe of knowledge can be shared, facilitating quality educational resources at all educational level. It is providing the opportunities for educators, learners and researchers to sharing capacity-building resources for addressing digital divide among world community. OER is providing platform where anyone can create, disseminate and share their quality work on public domain. It is facilitating and providing very big opportunities for world academic fraternity to use, include OER in course curriculum, to access and share OER knowledge and last not least building awareness about OER among the academic fraternity.

CONCLUSION

Open Educational Resources (OER) concept is web based that easy to interact with in the digital world. It is greatly acknowledged by world community specially in India where educators, learners and researchers can easily create, develop, share, use and disseminate quality educational resources and materials among even those information seekers staying very far location and remotely. The exploratory study shows despite of various challenges including social, economic, technical and legal associated with OER, it provides plenty of opportunities to address access to information for both haves and have-nots - especially for reaching the unreached. OERs also has the potential to fulfil SDGs fourth goal which clearly mentions “Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all” (United Nations, 2015). It is also providing guarantee to assist in improvement of poverty, mitigate economic inequality, protect this beautiful earth and make peace and prosperity through this mean of comprehensive quality education with unbiased nature for all with permanent learning prospects among people in the world by 2030.

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Chapter 7

Open Science and Its Impact on Libraries, Publishers, and Authors

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ABSTRACT

The open science movement enables the accessibility and reusability of research output across the globe. Researchers and other stakeholders in the research process can now easily collaborate to add to the body of knowledge. This chapter documents how open science is impacting the role of libraries, publishers, and authors in the digital era. A structured document analysis and web analysis were done to find out how authors, publishers, and librarians are affected by open science. It was found that librarians are taking advantage of open science to provide various information sources to patrons, the publishers are now charging article processing fees to make the journal articles open access upon publishing, and authors are now able to access many information sources during the research process and enjoy greater visibility of their research output. The author recommends the adoption of open science especially in the developing countries and the enactment of policies that support open science at national, regional, and international levels.

INTRODUCTION

It has been noted that the open science movement have been focusing on the improvement of the traditional research cycle (David 2008). Proponents of open science (David 2008, Molly 2011) felt that research should be open from the initial stages to enable researchers to get access to all the information sources they want in various formats without any restriction. They added that the research system is largely funded by the public but governed by private interests and as a result, it has some restrictions in terms of what authors and libraries can do during the research process and with the research output. The business model is regarded as primary while research and communication is secondary. This is coupled

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with other challenges in research institutions and institutions of higher learning where researchers and librarians have other responsibilities such as teaching, on top of publishing. It is against this background that a study was done to unpack how open science is impacting libraries, authors and publishers. The objective of this chapter is to define open science and look at the benefits and challenges that have been brought by open science among the authors, libraries and publishers.

OPEN SCIENCE INITIATIVES

There are various open science initiatives that have been taking place globally (Lasthiotakis, Kretz, Sá 2015). These were driven by various open science platforms such as the African Open Science Platform (AOSP), Open Science Policy Platform by the European Commission, China Open Science among others. In Europe, the European Open Science Cloud was created to support the archiving of data in research funded by public funds using the FAIR principles (Orion open science 2019). The Panton Principles were also written to promote open science in July 2009 in Cambridge. Vollmer states that the Amsterdam call for action on open science advocates for open access of scientific publications especially those funded by public funds (Vollmer 2016). Ahinon and Havemann (2018) pointed out that in Africa, the adoption of open science has been slow in various countries especially the French-speaking Sub-Saharan African countries. The African Open Science Platform is funded by the South African Department of Science and Technology while it is managed by Academy of Science of South Africa (ASSAF) and the direction is provided by CODATA (AOSP 2019).

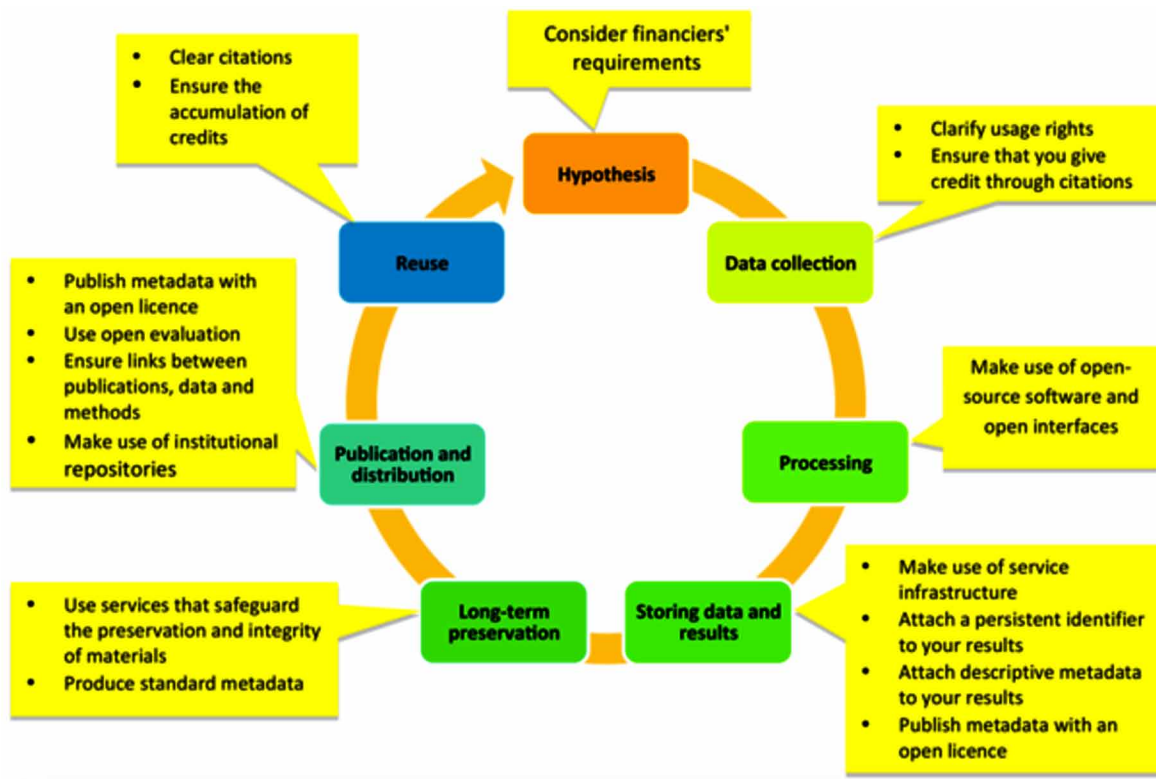
It has been pointed out that open science would develop if there is favourable infrastructure to acquire, curate and disseminate data and information and the availability of protocols, policies and procedures to support the research process as shown in figure 1.

The diagram shows that open science can only be achieved if it is promoted at every stage of the research process. Therefore, this calls for the development of inter-regional links, collaboration among various stakeholders, and exchange of ideas and good practices in order to achieve the objectives of open science. Most of the supporting policies are on open access and these include the AmeLICA, Coalition S, OA 2020, SciELO, Sao Paulo statement on OA 2018, Berlin declaration 2003, Bethesda statement 2003 and Budapest OA initiative 2002. Therefore, there is need to look at other facets of open science to ensure that there are enabling policies which would promote the adoption of open science in research institutions and publishers.

METHODOLOGY

A structured document analysis and web content analysis were done to find out how authors, publishers and librarians are affected by open science. The search words that were used to look for documents were open science AND libraries, open science AND authors, and open science AND publishers. The content from the retrieved information sources was analysed using content analysis and the data was presented thematically.

Figure 1. Open science at different stages of the research process



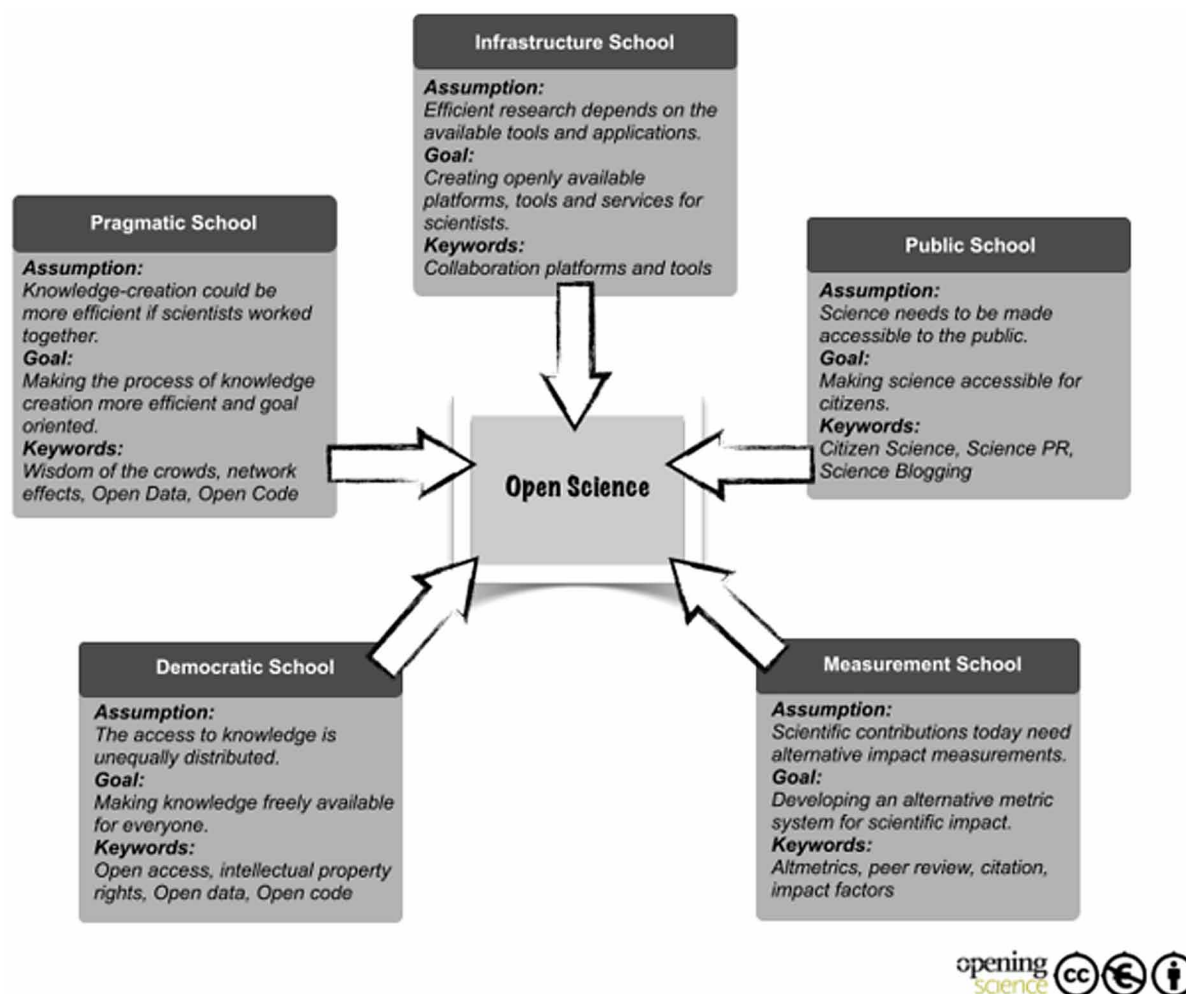
OPEN SCIENCE

The open science movement helps to improve the accessibility and reusability of research practices and outputs. It encompasses open access to publications, open research data and methods, open source, open educational resources, open evaluation and citizen science (Miedema, Mayer, Holmberg, and Leonelli 2018). Open science has been affecting how research is done and how knowledge is produced, shared, circulated, reused and preserved in all disciplines. This has improved the visibility of research output and accountability and transparency has greatly improved since research is now open to scrutiny and it is valued, funded and incentivised, and researchers are trained and rewarded. As a result, the open science movement has affected libraries, publishers, and authors alike.

Schools of Thought for Open Science

Fecher and Friesike (2014) put forward five schools of thought for open science which include the *infrastructure school* which is concerned with the technological architecture, the *public school* which is concerned with the accessibility of knowledge creation, the *measurement school* which is concerned with alternative impact measurement, the *democratic school* which is concerned with access to knowledge and the *pragmatic school* which is concerned with collaborative research. Figure 2 is a diagrammatic representation of these schools of thought.

Figure 2. Five schools of thought for open science



Advocates of the public school states that scientific publications should be accessible to everyone through the social web and web 2.0 technologies. The democratic school deals with the accessibility of knowledge mainly access to the research outputs. The proponents argue that the research outputs should be available for free and everyone should be afforded equal rights to access knowledge. Open science is regarded as a method which allows efficient dissemination of research and knowledge by the pragmatic school. The infrastructure school deals with the technical infrastructure that is needed to make research easier such as software tools and applications and networking facilities. This school regards open science as a technological challenge and focus on the technological requirements that are needed to do research. Scientific impact such as the impact factor is talked about in the measurement school. This affects funding and career development amongst researchers.

Key Dimensions of Open Science

The key dimension of open science as pointed out in the above paragraph are open access, open research data, open methods, open evaluation, open educational resources, and citizen science.

Open Access

This is free and unrestricted access to research output in the form of publications, data, reviews, and educational resources (OECD 2015). Open-access literature ‘is digital, online, free of charge, and free of most copyright and licensing restrictions’ (Suber 2012: 4). It has mostly been associated with journal publications but it applies to all types of research output. Open access enables wider circulation of materials which also increases the visibility of both the author and the research output. There are three major types of open access which are green, gold and platinum. Green open access is when authors self-archive their research output in an institutional repository or a personal website of the author’s accepted manuscript after peer-review before the publisher’s copy editing. Gold open access is when publishers ask for article processing fees (APC) from the author and the article would be available for free after publication and readers are not charged to access it. Platinum open access is when authors and readers are granted free access and the production of the publication is normally funded by subscriptions from institutions or a university.

Open Research Data

The unrestricted access to online data and the ability to reuse and distribute it after attribution is regarded as open data. The FAIR principle should apply to open data meaning it should be findable, accessible, interoperable and reusable. The deposited data should be reused without any restriction. Authors should be able to select an appropriate data repository and deposit datasets that should be citable. This data includes both digital and non-digital data such as organic materials in biobanks. However, there are ethical and legal issues that must be followed when using datasets and there must be clear legal frameworks and open institutional policies to have an impact. This means that the data should be “as open as possible and as closed as necessary” to ensure that confidential data is protected (Suber 2012).

Open Methods

The methods and sources that are used in research would be freely made available on the internet. The major practices of open science are scientific blogging and commenting. Researchers would make use of open annotation, open bibliographies, open notebook and reference management which can be used as collaborative dimensions of open science (David 2008). The open notebook science entails the online visibility of the recording of a research project just like a lab notebook whereby project plans, protocols as well as other workflows, experiments, raw data, interpretations, and memos are made accessible. The sources would be documented and made accessible including the research design, the problem being investigated and there is room for acknowledging failure during the research process. The use of open source software and hardware is also part of open methods.

Open Evaluation

It is stated that in an Open Evaluation environment, there are written peer reviews, bibliographies, numerical ratings, usage statistics, social web information and citations in combination with other usage or participatory elements from social media. In this process, the methods and databases for assessment would be open and freely accessible and this helps to improve the transparency of the process. Ross-Hellauer, Deppe and Schmidt, (2017) indicated that in open evaluation, it is possible to authenticate reviewer's identities which encourages the reviewers to do a thorough and honest review. A number of initiatives are being incorporated as a way of assessing impact such as the altmetrics movement which is developing indicators that compliment traditional measures to assess impact of research output. Post publication peer review is also being implemented by most open access platforms to evaluate the research output. There are a number of open citation initiatives being done by both publishers and authors to build an open and transparent database of citation metadata so as to be able to reproduce bibliometric analysis (Ross-Hellauer, Deppe and Schmidt 2017).

Open Educational Resources

These include textbooks and other teaching materials such as lectures, readings, problem sets, and interactive user forums that are freely available. Students can also take part in the crafting of open courses and there can be collaborative efforts with the archives, libraries, information centres and other memory institutions. In 2008, massive open online courses (MOOCs) were introduced and these have helped to complement traditional teaching since it is a way of mass education which is an interactive distance learning process.

Citizen Science

Eitzel et al (2017) regard citizen science as an expanding concept which includes the inclusion of social sciences and humanities in the open science movement. Citizens are now able to take part in research design, data gathering, analysis, dissemination of results and exploitation activities using collaborative technologies. Citizens can also fund research via crowd funding and participate in the evaluation of research results. Citizen science helps to ensure that there is responsible research and innovation as well as the democratisation of science. More people would be involved in the scientific process and there would be active engagement which helps to shape science and technology development.

CHALLENGES OF OPEN SCIENCE

In as much as there are benefits that are offered by open science, there are concerns and issues that should be dealt with. FOSTER (2019) indicated that there are socio-cultural, technological, political, organisational, and legal issues that should be ironed out. Socio-cultural challenges are linked to researchers who are not aware of the importance of opening up research. Some researchers are also regarded as reluctant to change the way they do their research processes especially archiving research data. Some researchers consider open science as a time consuming exercise that add to the already overloaded workload that they have. In some institutions, those who participate in open science activities are not recognised and

there is no rewarding system for them. Researchers from different disciplines have their own way of approaching the research process and this is another socio-cultural challenge. In order to deal with these socio-cultural challenges, there is need for a paradigm shift in research institutions, government bodies, libraries, funders and other stakeholders so that the vision, mission, policies, approach and practices are in favour of open science.

There are technological issues that need to be dealt with in open science especially the research e-infrastructure in developing countries. There has been some improvement in the information communication technologies but there are some loopholes that should be taken care of to promote a culture of openness. Political commitment should be demonstrated in promoting open science and this can be achieved by incorporating it into government agendas. The crafting of new policies goes hand in hand with the allocation of the needed resources for successful implementation. Policy development and strategic planning should be done from institutional, national, regional and international levels. Research institutions should ensure that there is a smooth transition to open science by providing the resources that are needed in developing and acquiring the necessary knowledge and skills. This means that a lot of investments should be done from the planning stage to have a functional ecosystem of open science. The development of a clear legislative framework at the international level would assist in dealing with the legal challenges that face open science.

FINDINGS

It was found out that librarians are taking advantage of open science to provide various information sources to patrons; the publishers are now charging article processing fees to make the journal articles open access upon publishing; and authors are now able to access many information sources during the research process and enjoy greater visibility of their research output. The impact of open science on authors, libraries, and publishers is presented in the next section.

Impact of Open Science on Libraries

A literature search on the impact of open science on libraries shows that open access has been topping the list. Libraries have been taking advantage of the services that are offered by the open science movement in order to offer a wide range of information services to its clientele. Most of the effects of open science have been experienced through open access where libraries had been participating in open access initiatives such as the development of institutional repositories and the promotion of the use of open access databases during information literacy trainings. Institutional repository were built to enhance the visibility of both authors and research institutions, as well as to improve the accessibility of the research output of the institution. Most journals allow authors to deposit their pre or post prints in institutional repositories. Most universities and research institutions have institutional repositories and most of them are registered at the Registry of Open Access Repositories (ROAR 2019). This has made it easier for users to search across repositories without necessarily visiting each repository. The four most important software that are used for creating and managing institutional repositories are Eprints by Southampton University, DSpace by MIT, CDSWare by CERN and FEDORA by Cornell and University of Virginia. The library has a major role to play in promoting open science by creating awareness among research-

ers and assisting authors to deposit their research output in the institutional repositories and other open access sites.

Impact of Open Science on Authors

Authors have been affected by open science as well and most of the researchers had been submitting their research articles to open access journals. They are also making use of open access sites that encourage the uploading of pre and post prints so as to increase the visibility of their papers. The authors had been affected by the issue of copyright and in some cases; they transfer their copyright to the publisher. Therefore, post print archiving would be essential after requesting for permission from the journal. This shows that authors should be aware of the archiving policies of the journals where they publish. They can also make use of the SHERPA Romeo site to check if pre and post print archiving is accepted. In the event that both pre and post print archiving is not allowed, the author can deposit the citation information such as the author, title, journal title, date of publication, pages, and the abstract on open access. The benefit of this is to reach a larger audience thereby increasing the impact and the citation count of the research output.

Open science helps authors in assessments at their institutions by improving the promotion criteria. There would be fair assessment of the author's research efforts and researchers can be incentivised to keep contributing to the body of knowledge. However, for this to be achieved, there is need to train authors on open science and offer support for research dissemination and data curation. Authors can also make use of other dissemination platforms such as social media like Facebook and Twitter, academic social networks such as Mendeley, Academia.edu, Research gate and SciLink, and other collaborative environments such as Github. There should be reliable open science infrastructures at institutional, national, regional and international levels. This would help to have activities and programmes that recognise open science activities to enhance the credibility and reputation of researchers which would lead to champions and role models in open science. The legal issues such as licencing, copyright and intellectual property rights would then be ironed out and be made clear through institutional, national, regional, and international policies to ensure that the rights of authors are protected.

Impact of Open Science on Publishers

Publishers were not left behind in the effects of the open science movement. They have adopted a number of strategies to allow them to survive in the open science era (Mizera 2013, Schopfel 2017, ENAGO 2018). Publishers are now taking part in open access publishing whereby some are charging article processing fees to authors in order to make the articles open access upon publication. Some publishers such as PeerJ charge once off membership fees and authors can publish for life in the journal databases. In some cases publishers request libraries and other institutions to pay a fee for their authors for example, the Open Library of Humanities and then scholars would publish at no further charges. Publishers view open access as a cost saving measure where there is no need for a physical copy. Open access have been regarded as a way of being more innovative among the publishers where collaboration is enhanced and return on investment improved (Schopfel 2017). Most publishers support green open access whereby authors are allowed to publish their works in institutional repositories. Authors are obliged to transfer their copyright to the publishers which restrict what authors can do with their published papers especially the post print versions. According to publishers, there are three versions which are the preprint which is

the original manuscript without any revisions, the post print which is the accepted manuscript with edits from peer reviewers and editors, and the version of record which is also known as the final version or the publisher's PDF with all peer reviewed edits and journal's formatting. Publishers allow the preprint to be shared anytime while the post prints are placed under an embargo ranging from six months to two years.

CONCLUSION AND RECOMMENDATIONS

It can be concluded that open science is affecting the way libraries, publishers and authors do their businesses. Libraries are more involved in the research process than before and they are partnering with researchers and other sections to develop policies that support open science. Libraries are now hosting open access repositories which archive research output that can be accessed for free and researchers are trained on how they can make use of open access repositories and other academic social networks to archive their research output. Libraries are also training researchers and students on how to access information using open access repositories and journal databases. Authors are taking advantage of what is offered by various open access models to increase their visibility which in turn improve the accessibility and impact of their research. Publishers are also adopting open science and most of them are offering publishing policies that support open access. Open research data has been supported both at institutional and publication models where journals are encouraging the deposit of research data by researchers when they are submitting the article for publishing. The charging of the article processing fees by some publishers also shows that they are supporting open science since this allows the articles to be available to researchers soon after publication.

The author recommends the adoption of open science especially in the developing countries and the enactment of policies that support open science at institutional, national, regional and international levels. Institutions can adopt policies for hiring, promotion, and tenure of researchers who adopt open science principles, for example, consideration of number of articles that are available in the institutional repository when they are looking at applications for tenure or promotion from researchers. Librarians can also be engaged in creating awareness and training researchers on the importance of open science so that authors are able to retain their copyright when they publish articles in order to archive their papers in open access repositories. Research institutions should be willing to pay the article processing fees that are charged by some open access journals through research grants so that the accessibility of such articles is improved. Institutions can also recognise members who edit open access journals as a way of promoting open science. Lecturers can also encourage their students to use open access materials and ensure that all the thesis and dissertations are archived in the open access repository. Institutions should adopt a policy of making journals that they host and publish open access. They can also publish proceedings of conferences that they organise as open access even if there are plans to publish them in a subscription based journal. Capacity building is also key to ensure that training programmes on open science are availed to create awareness on how it can benefit the various stakeholders.

FUTURE RESEARCH DIRECTIONS

An actual study can be carried out to determine how research institutions, publishers, libraries and researchers are promoting open science. This can be in the form of case studies looking at the policies and other open science initiatives. It has been observed that, the information sources documenting the impact of open science on research are mainly looking at open access. Other open science activities are not well documented. Therefore, studies can be done to look at the impact of open research data, citizen science, open methods, open evaluation and open educational resources in research.

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KEY TERMS AND DEFINITIONS

Article Processing Charge: A fee charged to the author, creator, or institution to cover the cost of an article, rather than charging the potential reader of the article. APCs may apply to both commercial and Open Access publications. APCs are sometimes charged to authors in order to cover the cost of publishing and disseminating an article in an Open Access scholarly journal.

GitHub: A web-based service that provides a source code repository that works exclusively with the Git command-line tool.

Gold Open Access: Making the final version of manuscript freely available immediately upon publication by the publisher.

Green Open Access: Making a version of the manuscript freely available in a repository.

Institutional Repository: An online database designed to collect the intellectual output of a particular institution or university, including digital collections such as electronic theses and dissertations (ETDs), pre-prints, or faculty scholarship, and presents associated metadata regarding these items.

Intellectual Property Rights (IPR): The rights given to the owners of intellectual property. IPR is protected either automatically (e.g., copyright, design rights) or by registering or applying for it (e.g., trademarks, patents). Protecting your intellectual property makes it easier to take legal action against anyone who steals or copies it. IPR can be legally sold, assigned or licenced by the creator to other parties, or joint-owned.

Open Access: Making peer reviewed scholarly manuscripts freely available via the Internet, permitting any user to read, download, copy, distribute, print, search, or link to the full text of these articles, crawl them for indexing, pass them as data to software, or use them for any lawful purpose, without financial, legal or technical barriers other than those inseparable from gaining access to the internet itself. The only constraint on reproduction and distribution, and the only role for copyright in this domain, should

be to give authors control over the integrity of their work and the right to be properly acknowledged and cited. May also refer to theses, books, book chapters, monographs and other content.

Open Data: Making data freely available on the public internet permitting any user to download, copy, analyse, re-process, pass them to software or use them for any other purpose without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself.

Open Educational Resources (OER): High quality, openly licensed, online educational materials for sharing, use, and reuse. They act as a mechanism for instructional innovation as networks of teachers and learners share best practices.

Open Science: Is the practice of science in such a way that others can collaborate and contribute, where research data, lab notes and other research processes are freely available, under terms that enable reuse, redistribution and reproduction of the research, and its underlying data and methods.

Publisher: A company whose purpose is to make the outputs of research publicly available.

Scholarly Communication: The creation, transformation, dissemination, and preservation of knowledge related to teaching, research, and scholarly endeavours; the process of academics, scholars and researchers sharing and publishing their research findings so that they are available to the wider academic community. The creation, transformation, dissemination, and preservation of knowledge related to teaching, research, and scholarly endeavours; the process of academics, scholars and researchers sharing and publishing their research findings so that they are available to the wider academic community.

Chapter 8

The Technology Shift for MOOC-Based Libraries: The Need of Libraries for MOOCs

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ABSTRACT

Massive open online courses (MOOCs) have evolved in past decade and become one of the prominent parts of the higher education system. The MOOCs provided a promising platform to aspirants who wanted to study further to either enhance their educational status or learn new technologies. With the evolution of MOOC, many platforms started to offer such courses, and many of them are not free as these courses need to register with some nominal fee. The role and need of libraries come at this point for MOOC courses as the courses are bundled with corresponding study material. The print library needs to assist e-library so that it may be compatible with the MOOCs and corresponding resources. The technological shift from print to e-library has a great impact on e-learning followed by MOOCs; however, the issue of MOOC libraries and resources is yet to be resolved to ensure the availability to all the users. The chapter deals with the need of library for MOOCs, its structure and technology shift from print library to e-library, along with the differentiation between e-learning and MOOCs.

INTRODUCTION

The term MOOC, since its beginning, was very attractive to the learners especially who were unable to study on a regular basis in the educational institutes due to various reasons including age factor, job continuation and timing issues. The basic idea of MOOC is very simple which states education for all through open platform and thus most of the free courses of MOOC, as the name suggests, became the

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primary choice for the students who could not join any regular course. In case of free courses, the study material is also free, however for the paid courses the study material is provided only after the registration. In this way the MOOC study material can be divided into two categories, viz. free and paid. Since library is the backbone of education, the need of library for MOOCs is a vibrant issue associated with MOOCs. As a consequence, the migration of print format to e-format has changed the education system in a drastic way which, as a matter of fact, is very helpful to MOOC system. It is obvious that for online courses, the library must also be online and hence the print library needs to complement the e-library. The issue of compatibility of e-library and print library has already been resolved to a greater extent by the use of e-books and online resources adopted by the libraries; however a large part of print library is still not available in e-format.

It is an important fact that MOOC is not mere e-learning and hence it is mandatory to differentiate the two terms not only for the basic terminology but also for the technological aspects. Consequently the need of library and resources for both e-learning platforms and MOOCs are to be well distinguished. The objectives of proposed chapter are to discuss the need of library for MOOCs and technology shift from print library to e-library along with the differentiation between e-learning and MOOCs. The chapter will also deal with the challenges associated with MOOC based library management. A survey based analysis for observing the status of higher studies particularly online and MOOC based courses has also been discussed in the chapter.

BACKGROUND

Massive Open Online Courses (MOOCs) are web based distance learning programs that provide training to learners at a nominal or no costs (Allen & Seaman, 2013, Pant, 2018, Soyemi & Babalola, 2018). The name itself suggests that MOOCs are massive collection of courses which are open to all through online platforms. The registrations are free and the course contents are open and mostly free of cost to the interested participants (Clow, 2013, Klobas, 2014, Pant, 2018, Teixeira et al., 2016). The mere requirement to access such courses is an internet connection which is the backbone of MOOC based study. MOOCs are large-scale educational courses where the registered students are brought together to learn collaboratively through various internet resources including blogs, online discussion forums, tweets, messages etc. (Calter, 2013, Milheim, 2013). MOOCs constitute a new force in higher education as they are the educational innovations having the potential to reach a massive scale of learners from different countries (Ma & Lee, 2019), however they also disrupt traditional higher education system (Stöhr et al., 2019).

The term MOOC was coined in 2008, which came into action in 2012 (Bansode, 2019, Klobas, 2014, Liyanagunawardena et al., 2013, Pant, 2018). Although MOOCs are online courses, they are different from online learning in the use of teaching approaches, massive participation and openness (Vivian et al., 2015). The online courses have a fixed pedagogy with limited participation contrary to the MOOCs. The attractive point about MOOCs is a huge participation due to the flexibility of the environment. As of the study by Daniel et al. (2015) there were more than 5 million students worldwide registered for MOOCs, of which most were aged between 26 and 45 having university degrees or previous higher education studies. This data tells the status of the MOOCs and its popularity during the span of less than one decade. It was stated by Milheim (2013) that there would be a growing feeling among many individuals that MOOCs would significantly benefit students and academic institutions in the coming

years. The statement has become true as the popularity of MOOCs is being increased over the years. It is an interesting point that four technological characteristics of MOOCs, viz. Perceived usefulness, Performance to cost value, Interactivity and Accessibility as reported by Ma & Lee (2019) are the main factors to influence learners' decision of adopting the courses. Although MOOCs are very attractive in various ways to the learner community throughout the world, they have certain drawbacks including unequal access to the information, issues related to the course contents, evaluation strategy, grading policy, tendency to dropout and many more. Various researchers have observed such issues which could be accessed in De Freitas et al. (2015), Koedinger et al. (2015), Liyanagunawardena et al. (2013), Pant (2018), Rohs & Ganz (2015), Veletsianos & Shepherdson, (2016).

E-LEARNING AND ONLINE LEARNING

E-learning can be defined as the use of computer network technology, primarily over an intranet or through the Internet, to deliver information and instruction to individual (Welsh et al., 2003). The use of computers and internet based technology is the primary component of e-learning which has recently be appended with app based learning. Many other terms are also used to describe e-learning like learning via the internet, internet learning, distance education, computerized learning etc. E-learning has the potential to manage the growth of information that one needs to learn. The role of e-learning can be seen for corporate sector where the users are not involved in direct teaching in physical classrooms but the teaching and learning process is continued using online portals. Due to the pedagogy, it may be argued that e-learning has become an alternative of the conventional learning; however the practical aspects are not in favour of such argument. The limitations of e-resources and dependency on the technology including devices and internet resources are the main hurdle for the success of e-learning. The education system needs a formalism of process starting from the registration to classroom teaching, learning activities, examination etc., the e-learning process doesn't include all these steps in a formal way. Despite of many advantages, there are a number of drawbacks of e-learning and for a successful implementation of such learning significant planning is highly required (Welsh et al., 2003).

The online courses, on the other hand, have become very popular as they are alternative to the traditional classroom teaching. The online learning is different from the e-learning in the sense that the interaction with the course instructor may be through virtual conferencing contrary to the only internet based communication of e-learning. As an anchor point, the online courses are defined as the courses in which at least 80% of the content is delivered online (Allen & Seaman, 2013). MOOCs are the advancements of online courses where the content is available online with proper communication with the instructors including registration, content delivery and participation, submission, examination and evaluation. The participation in MOOCs has been formalized in systematic way and it was defined as the funnel of participation by Clow (2013). The participation is ensured for the earning of the credits after successful completion of the course, however the infamous hurdles of course completion restrict the users to do so leading a small success rate of MOOCs. As far as the course contents are concerned; MOOCs were viewed as multimedia textbooks or educational TV shows in the past (Dasarathy et al., 2014), however today they have become more than that. With the advancements of smart devices, the study has also become smarter and hence MOOCs can't be viewed merely an online collection of study material. Dasarathy et al. (2014) also reported that MOOCs were content-intensive, cloud-based computing systems around which content publishers and consumers could assemble and interact. Thus the view

toward the MOOCs was very wide and futuristic. Video lectures and demonstrations are central learning components of MOOCs which are preferred due to the fact that videos have positive effects on learning performance. A study on specialist and non-specialist participants have been done by Stöhr et al. (2019) and the observations show that videos are more useful to non-specialists for self-directing their study.

One of the positive things about e-learning is availability of study material free of cost; however it has the hidden costs of the learning devices and internet charges which need to be borne by the user. Due to the revolution in telecommunication market, the cost of internet has dropped significantly in past decade and it is now available to each user with a smart device at hand. At the same time the electronic devices are also available at relatively low costs with a lot of choices for various activities, therefore the so called, hidden costs associated with the e-learning have been minimized. These issues are inherently associated with MOOCs but resolved at some extent by the availability of learning devices and internet at hand.

MOOCs, contrary to e-learning, are more formal and systematic in form of fixed course schedule, deadlines for submission of assignments followed by evaluation which were not associated with e-learning. One additional point of MOOCs is the credit associated with the courses which was not a formalized point of e-learning. The courses passed by the students registered for MOOCs are to be awarded in terms of credit hours and now it is being associated with the university courses, i.e., the course earned through MOOCs is to be recognized by the universities provided the mandate of the universities allows them. Thus, earning the credit through MOOCs makes these courses more prominent than the e-learning.

LIBRARY FOR THE MOOCs

Libraries play a central role in the learning with conventional book and reference reading however, with the advancement of technology the library services have rapidly changed over the past decade (Mariano, 2016). Since MOOCs provide the study material along with the registration, a natural question arises about the existence of library for such courses. Does it require building a library for MOOCs? What would be the structure and status of the library for MOOCs? Since physical library with print material is meaningless for MOOCs for obvious reasons, it is mandatory to define a library for MOOCs if it exists. Another point about the study material of MOOCs is their online status, i.e., the study material is available online via various resources, it is compulsory to differentiate the study material of MOOCs from other online resources. Due to the online communication, the print library of the institutions offering MOOCs can't be used by the students enrolled for the courses therefore, such libraries are not at all useful for the MOOCs users. What role might be played by such libraries for MOOCs in this situation? At the same time what should be the role of librarians for MOOCs if the physical libraries are useless? Various studies have been conducted for finding the role of existing libraries and librarians for MOOCs. The roles may be decided on the basis of requirements for various courses provided the librarians are aware of it (Creed & Clark, 2013). Recently, Soyemi & Babalola (2018) reported the awareness of MOOCs among Librarians where their study adopted a survey to ascertain the level of awareness and use of MOOCs for lifelong learning among librarians in selected academic libraries in Ogun state, Nigeria. The study showed that more than half (61%) librarians were aware of MOOCs and they also conducted the study to find the type of courses the librarians were familiar with. Although, the study was limited to a particular geographical area, it highlighted the fact that in today's scenario, library science has become highly advanced and technologically strong and it is ready for the MOOCs or such futuristic approaches of education system.

Hoy (2014) reported that there was no clear answer about how MOOCs would affect libraries. Libraries and librarians are typically supported by larger institutions and if the institutions offer courses to very large groups of students via MOOCs, will the library be expected to provide services (Hoy, 2014)? If yes, what kind of services is expected from the library in a MOOC based scenario and how the services may be provided? In order to highlight the role of libraries and librarians, Massis (2013) could be referred with few interesting questions. Are libraries and librarians under consideration by MOOC developers to serve in the same role they do in the traditional college environment? Who would be assigned to provide reference, research and supplementary library instruction to thousands of students enrolled in the MOOCs? As a rescue of these questions, the libraries were not in consideration while MOOCs were designed and hence the role of libraries and the librarians was initially undefined.

Besides the undefined roles of libraries, an issue facing libraries serving MOOCs students is licensing of resources and copyright (Creed & Clark, 2013, Hoy, 2014). How can the libraries and librarians ensure that the material under copyright is accessed by the authenticated users? Librarians may adopt the responsibility of copyright advisory guidance however; it was observed that with the MOOCs' rapid development, some librarians lack confidence in the construction of curriculum which the library takes part in. If the librarians really want to be involved in the MOOCs teaching team, they need some service innovation. Librarians can know more about MOOCs teaching process, and provide services for other MOOCs throughout the whole teaching link (Luan, 2015). K. Wu suggested that by simply observing how courses are organized and delivered, librarians can learn from a wide range of pedagogical approaches (Azadbakht, 2018, Wu 2013).

Despite the various issues, libraries cannot be left out of the discussion about MOOCs. Hoy (2014) also states that institutions will still expect libraries to manage resources wisely and provide service, even if those services go outside the traditional boundaries of the institution. The library science students and professionals need to update their knowledge and know the latest trends of all fields (Sawant, 2017). Libraries are now being changed to oversee MOOCs development and management from the creation up to the preservation (Mariano, 2016). They are creating new and advanced study material in form of videos and online resources particularly for the MOOC users. As a matter of fact, the role of librarians can't be ignored with the advancement of technology since the library as an ultimate source of knowledge must be managed and updated by librarians irrespective of the mode of study.

TECHNOLOGY SHIFT FROM PRINT TO E-LIBRARY

With the advancement of learning process, the print library has changed its structure in past decade. Earlier, the libraries were supposed to be a collection of huge printed books, references, journals, magazines, papers and related study material which occupied a large area and volume of the library space. The management of such large space and enormous amount of print material was a tedious task involving huge library staff which results a big amount of manpower and associated cost. The responsibilities of librarians were high and sensitive not only for the content management but also for the manpower and budget management. The evolution of internet was a boon for the librarians which immediately replaced the print material by e-contents and the libraries became digital. A digital library is compact in space and volume as compared to the traditional print library and therefore is better to manage and maintain, however digital libraries have their own challenges for the librarians (Saunders, 2015).

In past decades the structure of institutional libraries has been changed and they have adopted the study material in form of e-contents. Most of the books to be printed today are also available in form of e-books which are to be purchased by the libraries at a cheaper rate than the printed books. Similarly, other printed study material including magazines, journals, newspapers, reports etc. are also available in digital format. The libraries have adopted these digital formats with an ease as they are space and cost effective. The e-material is also available at institutional subscription which further reduces the total cost of the product. As far as the space is concerned, there is no need to worry about the physical space in the library buildings since a single copy is available for a large number of subscribed users. The digital content is not to be maintained as the print material needs which also saves the manpower and time of maintenance. This is a great relief for the librarians who can devote the time in other activities including digital content management. The technology shift from print to digital libraries has been observed worldwide in past decades as a revolution in library management.

After the introduction of MOOCs the need of library was sought by the researchers. The issues related to the existence of library for MOOCs have already been discussed in previous section where the new roles for the librarians were also mentioned. As a matter of fact, the library is the prime source of study material for any kind of learning and MOOCs are not the exceptions therefore the changing technology has also affected the library science for MOOCs. The digital library is the backbone for any MOOC based library where the content could be shared to the authenticated users in form of digital content. Here the role of librarians for MOOCs becomes more dominant. The librarians have to ensure the copyright policy of the digital content more carefully and smartly. The technology shift from print to digital to MOOC based library could be managed only by such smart librarians.

COURSE CONTENT MANAGEMENT

MOOCs have become so popular in past few years that many universities have adopted them as a necessary part of curriculum. Consequently, a large number of courses are being offered through MOOC platforms by the institutions. However, the issues of course design and program management are of prime interest for MOOC courses. It has been observed that various courses on contemporary themes and recent technology are being offered by various institutions as a result of possible haste. Many courses are traditional with many experts of the subject associated with the courses whereas a number of courses are new with not much expertise available. The courses must be designed in a simple way for the better understanding of the naive learner. Therefore, it is mandatory to design the courses in such a way that the courses may be learner friendly both in contents and the lectures (Pant, 2018). The flexibility associated with MOOCs suggests that they can adapt the contents and navigation to the diversity of participants. At the same time the participants can improve the contents of the MOOCs (Sein-Echaluze et al., 2017).

A SURVEY BASED STUDY FOR MOOCs AND LEARNING APPS

A quick feedback from 270 students from various institutions including government universities, national and state level institutions, private universities and private institutions have been made for observing the status of higher studies particularly online and MOOC based courses. The students were belonging to higher education systems with around 86% UG and 14% PG students. It has been observed that more

than 68% students preferred to choose online courses which included all types of courses including MOOCs. The choice of video lectures was the prime for many students; however a lot of students have actually registered for MOOCs at various levels. Since the library is the keystone of education system, the need of library was mentioned by many students despite of their choice of online courses. It was also observed that 52% students used to study through e-books which were available in the university library and legal online sources including sample book chapters. At the same time around 63% students followed downloaded books which were available through different internet resources and through redistribution of the e-books among student groups. A significant number of students also reported to follow Google books which was around 37% and only 20% reported to use Amazon Kindle books. The results are very interesting and promising as they show the significance of online resources and books for the higher studies along with the awareness of such resources and their availability through different channels. The significance of library resources peculiarly the online resources besides the print resources has been highlighted by the study which enforces the libraries to update the contents in the form of non-print version of study material. Since the traditional libraries contain a large amount of print material which, as a matter of fact, is useless for MOOCs, there is a big challenge to the librarians to utilize the print material for such kind of education system. At the same time, the contents of the existing libraries must be updated not only in print form but also in online form so that it could be utilized by most of the beneficiaries. The role of librarians has therefore become big, accountable, committed and smart. The major issue in new library management is content management with regular updates of contents with the fast changing technology.

The app based learning is a new approach in the education system which involves some smart device for learning and may be termed as a paradigm shift. The feedback based study also highlighted that 46% students used apps for learning whereas 54% didn't use any app for the learning so far. This data is useful to infer the fact that a large number of students, near to half of the total in this case, are aware of app based learning and they are also following it as an alternative mode of the study. Few questions may be asked at this juncture about the relation between the app based learning and MOOCs. Can app based learning be an alternative for MOOCs? Can they provide the study material to be used as an alternative library for MOOCs? Can MOOCs use the app based study material for the library? The answers to these questions are not simple, however they might be thought of deeply. Pham & Wang (2015) successfully worked on an app named AttentiveLearner for MOOCs which highlights the way to utilize the apps for MOOC based education. Sun et al. (2018) have recently developed a cloud based system for delivering MOOCs learning with the motivation that mobile learning is becoming one of the major methods. Ma et al. (2018) have reported the assessment of app based flipped classroom teaching model for medical students. These studies project apps as promising and futuristic tools for the learning which may enhance the users' exposure to MOOCs.

One interesting point about the app based learning is their cost because many apps do not provide the study material free which makes them ineffective. Although the apps are available for downloads and use, the study material is restricted for a free user therefore, these apps are not useful for general users. Besides their availability, the course content is important for the study point of view as the content must be dynamic and up to date with the change of study session. The same content can't be used in next session or next year for dynamic courses.

CONCLUSION

The present study dealt with the library requirements of MOOCs and the technology shift for MOOC based libraries. It was reported that the role of library can't be ignored for MOOCs although for the online courses with online resources, traditional print library can't be utilized directly. However, the role of library changes for such online courses and the change of role is the technology shift for MOOCs. The libraries can be used for online content management, video based study material preparation, ensuring the copyrights for distributed study material and in many more ways. As a consequence the librarians also get indirectly affected and their new roles have been evolved with the evolution of MOOCs. The study concluded with a quick survey of online course material and its preference among students and observed that the awareness about online courses and MOOCs is continuously growing.

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KEY TERMS AND DEFINITIONS

App-Based Learning: A new approach of education involving smart devices equipped with learning apps.

E-Learning: The use of computer network technology through Internet to deliver the information to individuals.

E-Library: An online library for the users, possibly free to access the contents.

Massive Open Online Courses: Web-based distance learning programs for training the users.

MOOC Library: The library defined for the MOOC users for accessing the contents through web-based portals.

Online Learning: Learning through online platforms where the interaction with the instructor may be through video conferencing.

Chapter 9

Altmetrics: Its Trend and Application in Knowledge Information Centres

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ABSTRACT

According to information scientists, information is modified into knowledge by adding experience. Researchers need powerful and successful filters to help them stay abreast of literature in their field, as well as methods to track the impact of their own research in often very specialized areas of interest. Traditional mechanisms such as peer review and citation searching using bibliometrics are no longer sufficient tools to aid researchers. How can librarians become leaders and powerful allies in this new landscape? Enter the world of Altmetrics. Altmetrics, or alternative citation metrics, provides researchers and scholars with new ways to track influence across a wide range of media and platforms. Altmetrics are metrics and qualitative data that are complementary to traditional, citation-based metrics. Altmetrics is a field of web-based metrics that accounts for total author influence which also looks beyond journal and monographic citation counts to the social web. The aim of this chapter is to explain the concept of library and librarian involvement with altmetrics.

INTRODUCTION TO ALTMETRICS

This term was created by Jason Priem in September, 2010, who is a doctoral student at UNC –Chapter Hill’s School of Information and Library Science. Priem is a supporter of online tools which help to research and to filter the information sources and also identify the related – relevant sources. He is very interested to identifying a set of metrics that could able to describe association between the social facets of the web and the expression of scholarship online with hardly few terms obtainable to bound the diverse yet particular of analytics and decided to familiar one of his own making. The end result of altmetrics is shorter version of metrics system. The altmetrics system is actually the extracted version from print metrics system (Didegah et al., 2015, Ezema and Ugwu, 2017).

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DEFINING ALTMETRICS

Alternative metrics is an area of web based metrics that calculates for total author impact which focuses to across the journal and monographic citation to the social web. Estimating appearing social scholarly activity is new and differs from traditional citation metrics which is how academics have for decades trailed their impact in their regulation. Librarians should introduce the services for researchers and scholars for their library and information centre. They should allow all metrics tools to guide the researchers for their study. Eugene Garfield is a founder of statistical bibliography and citation based measurement, and impact factor. At present moment Altmetrics prepare new ways figure out an impact mainly the behaviours of scientists online, their exchanges with their own (and others) content, and the pervasive use of social media in self-promotion (Konkiel, 2014, Priem et al., 2012).

EVALUATION OF ALTMETRICS

The definition of Altmetrics clears; one of the first conditions for the development was the growing of the Social Web. The part of Internet fascinated on social relationships and affairs. From the year 1990 to 2000 the Internet has been shifted very highly to human's everyday life. It shifted to various innovative toolmakers which offering users more and more ways to invent, share original and personal content on the web. From below table (1), we can understand the evaluation of Altmetrics from Bibliometric (Priem and Costello, 2010, Rodgers and Barbrow, 2013).

BIBLIOMETRICS TO ALTMETRICS

From the past decades metrics systems has been originated for Journal Impact Factor which has recommended on early 1955. As per Wikipedia has describes about bibliometric is basically information management tool statistical analysis of written publications, such as books or articles. Bibliometric methods are frequently used in the field of library and information science, including scientometrics. For this occasion, in 1960 bibliometrics are used to provide quantitative analysis of academic literature or for evaluating budgetary spending. Classically it concerns with analysing the journal article citation which was proposed as early as 1955. It is traditionally concerned with analysing scholarship through the counting and tracking of journal article citations which themselves tend to lean toward citations of other journal articles. The famous indexers of scholarly journal and article like Thomson Reuters (Web of Science, Journal Citation Reports, Book Citation Index, Data Citation Index), Scopus (SCImago Labs, Eigenfactor.org), and the increasingly popular Google Scholar (Google Scholar Profiles, Google Scholar Rankings) are attached with this. After this evaluation the buzzword bibliometrics has been used in various way and concept. This citation methods evaluation and applied in different terms of metrics systems like webometrics and cybermetrics and other portmanteaus ending in metrics in the pre 2010 era literature (Adams, 2014, Roemer and Borchardt, 2012).

Altmetrics

Table 1. History table

Sr. No.	Term	Invented By	Year	Activities
1.	Bibliometric	Alan Pritchard	1960	1. To calculate the scholarly works it used the Journal Impact Factor (JIF) 2. It counted the citation number of Journal and articles. 3. JIF created by Institute of Scientific Information (ISI – now Thomson Reuters) 4. JIF is used to assess the quality and prestige of a journal.
2.	Scientometrics	T. Braunin	1977	1. Scientometrics is the study of measuring and analysing science, technology and innovation. 2. Major research issues include the measurement of impact, reference sets of articles to investigate the impact of journals and institutes, understanding of scientific citations, mapping scientific fields and the production of indicators for use in policy and management contexts.
3.	Informatics	Otto Nacke	1979	1. Informetrics is the study of quantitative aspects of information. This includes the production, dissemination and use of all forms of information, regardless of its form or origin.
1.	Webometrics	Almind and Ingwersen	1997	1. Webometrics can be defined as using of bibliometric techniques in order to study the relationship of different sites on the World Wide Web. 2. These techniques may also be used to map out (called “scientific mapping”) areas of the Web that appear to be most useful based on the number of times they are hyperlinked to other Web sites.
3.	Altmetrics	Jason Priem	2010	1. Altmetrics are metrics and qualitative data that are complementary to traditional, citation-based metrics. (as discussed in this chapter)

PRESENT-DAY ALTMETRICS

The Present Model

The rotation of research is a very simple well-known process for academicians. The process of research is continuing with funding, carry the research properly and publish in at any conference. Then the research can measured through the citation that how much journals are cited it. Now a days it is a very common and transparent way to measures the research. Research Ideas and Outcomes (RIO) is a one of the most transparent new model of whole research model from funding to dissemination (Garfield, 1999, Rodgers and Barbrow, 2013, Tattersall, 2017).

A New Model

The most acceptable factor of new model of research trend is easy applicability, feasibility, less time and easiness of altmetrics. This new model transpiring where the circulation factor is increasing across the whole cycle, and not just at the end of it. Through this new research model can communicate beyond the traditional platforms like conference, meeting, web conference, blogs etc. across the web. Through this new model they can receive the real – time feedback. That feedback comes from the many academic and non-academic platforms such as twitter, blog posts, Slideshare, you-tube, social media and also various technologies. The outputs are also can elaborate through different technical platforms (Chamberlain, 2013, Jason, 2011).

PURPOSE

This chapter aim to recognise the process that librarians can take respecting altmetrics within the framework of the research carry provide by librarians. This paper points to scrutinize how the librarian can execute Altmetrics in their library so it can provide Altmetrics in their library so it can convey high impact articles for the users (Kurniasih,2016). From this study, it can be determined:

1. The roles of librarians on Altmetrics dissemination.
2. The tendency of the scholar in publishing their article on the internet.
3. The scholars share the knowledge and collaborate with other scholar.
4. The impact of scholarly article published in social web.
5. The implementation of Altmetrics in a library.

The solution of this study can be fundamental deliberation for the librarians to frequently or popularity and the need of the users.

TOOLS OF ALTMETRICS

1. **ReaderMeter:** This is freely available tool which created by Dario Taraborelli of the Wikimedia Foundation. It is only intense on readership not citation. For this system only two important impact metrics systems has been used both are H-Index and the G-Index. It assists of this metrics user can estimate impact on the basis of the utilization of scientific content by a population of readers (Chaubey, 2017).
2. **Social Science Research Network (SSRN):** SSRN enable access of academic paper and abstract worldwide. It applying the process of constant dissemination of scholarly research in social science and humanities. It follow various methods to promote the papers and various way to specialized research network. In May 2016, SSRN was bought from Social Science Electronic Publishing Inc. by Elsevier (Chaubey, 2017).

3. **VIVO:** VIVO developed by developed Cornell University in 2006. It is a one of downloadable application of research and scholarship across the all disciplines in nationally and internationally which available in many languages. It furnishes scholarly work of an institution, creating a profile for each scholar and including co-author and co-funded network visualizations, a map of science at the personal, departmental, or institutional level(Chaubey, 2017).
4. **Mendeley:** It is web based programme managing and sharing paper produced by Elsevier in 2008. It is a free reference manager and academic social network which can help organize research, discovering research data and collaborating online. It is focused on sharing bibliographic references and discussing in thematic groups (Chaubey, 2017).
5. **Academia. edu.:** It is a social networking website for academics which was launched in 2008 by Richard Price. The platform can be used to share papers, monitor their impact, and follow the research in a particular field. It was launched in September 2008, with 39 million unique visitors per month as of January 2019 and over 21 million uploaded texts. The website allows its users to create a profile, upload their work(s), select areas of interests and then the user can browse the networks of people with similar interests among the almost, as of December 2017, 58 million users from around the world (Chaubey, 2017).
6. **Research Gate:** This is a social networking site which basically for scientists and researchers. They can share their papers, ask questions and find the collaborators. This does not need any registration for reading articles. Normally members can sign up with user id and passwords and upload their research papers, individual chapters, positive – negative views, and discussion for users (Chaubey, 2017).
7. **Altmetrics.org.:** This free website is an one centre point for information preserve links to new online tools for calculating impact research articles based on a different sources(Chaubey, 2017).
8. **Altmetric.com:** It describes the online impact of research articles based on a variety of sources, initiates as score. It collects data about an individual article and supplies this data to publishers. The publishers who can subscribe the altmteric products, store, present the article level metrics to their readers and authors (Chaubey, 2017).
9. **Plumx:** This is a most prime facia made by Plum Analytics for bringing data from an exceptionally vast variety of sources like twitter, Wikipedia, institutional repositories etc. It that It also provide the information to researchers that how research can contribute and organise (Chaubey, 2017).
10. **PLoS Article Level Metrics:** Public Library of Science tool has appear like the main open access journal repository, in part due to its excessive traditional impact metric factors. PLoS provides a substitute to traditional impact in the from of ALM, ALM can track the individual PLoS articles, from downloaded to mentions in social media and blogs (Chaubey, 2017).
11. **Altmetrics.org:** This free website is a one centre point for information preserve links to new online tools for calculating impact research articles based on a different sources (Chaubey, 2017).

GENERAL RESOURCES

1. **Google Scholar:** This tool contributes in a very easy way to vastly search for scholarly literature discussed from the year 2004 by Google. From this tool any one can search across in many disciplines and sources like articles, books, abstracts, theses, other publisher's web site and online repositories. This tool helps researcher to find relevant work across the world (Chaubey, 2017).
2. **Web of Knowledge:** Web of Knowledge is now known as Web of Science. This is an indexing service in science and social science, humanities. It was begins by the Institute for Scientific Information (ISI), now maintained by Clarivate Analytics. It delivers quality literature through a unified platform that links a wide variety of content with one seamless search and containing multi-disciplinary, high quality research information from the world's leading science, social sciences and arts journals (Chaubey, 2017).
3. **SCImago Journal and Country Rank:** This is a free portal for measure of scientific influence of scholarly journals that accounts not only the number of citations received by a journal but also the importance of the journals where such citations comes from (Chaubey, 2017).
4. **Scopus:** This is a subscription based bibliographic database providing abstracts and citations for academic journal articles. It contains 20000 peer reviewed journals in science, social science, art, humanities and 22000 titles over 5000 publishers (Chaubey, 2017).
5. **Blogs and media:** Jason Priem's Web site: J. Priem has emerged as one of the strongest advocates for altmetrics, and a champion for library involvement. His interests touch on a variety of altmetrics topics, including the future of scientific communication, the open data movement, and author's rights. As the emerging altmetrics landscape continues to move forward, expect Priem to be at the front (Chaubey, 2017).

ALTMETRICS - LIBRARY AND LIBRARIAN

While an altmetrics have appear and activity to grow and progress, so too has the role that academic librarians play in supporting altmetrics, metrics, and impact, from support to professional use to approval. Any librarian in this field will need to pursue not only filling these roles, but also ensuring that they themselves are part of the conversation as it moves forward and staying up-to-date with developments within this area (Roemer and Borchardt, 2013).

ALTMERTRICS AND THE ROLE OF LIBRARIANS

This is important that now a day's altmetrics have a very important role in the field of library and information science for integral part of existing research cycle. Library and information science and its services participate on the most initial part of the research system. It including scoping, literature searching, and reference sources, applying the tools and techniques too. So librarian has most valuable part within library services are significance on open access data and sources (Mounce, 2013).

1. **Acquisition/Evaluation/Access:** Even though the facts and figures of Altmetrics tools are fundamentally marketed toward individual scholars. In that case the librarians remain the main information gate keepers of resources. The researchers can understand the proper and primary resources through library and only librarian guided that which resource is best to fit the needs of their research community. There are several tools like Altmetric Institutional and PlumX to support the acquisition of library resources. Both the tools require the subscription process & backend support and can successfully implemented in library for support the altmetrics services (Roemer and Borchardt, 2015).
2. **Collection Development:** Still the concept of research metrics is not applicable in today's scholarly landscape. The metrics has a powerful indicator of journal usage and imprint. And we know the librarians are familiar with using locally collected usage data, as COUNTER data, careful application of altmetrics can give librarians additional perspective that can be used to make collection decisions such as journal cancellations. Few tools are very effective in this matter like Altmetric Explorer. The fundamental purpose of this tool is to help the librarian to evaluate the journal with exploring the altmetric based data and custom reports. Researchers and scholars are commending for consolidation of altmetrics like CiteULike's social bookmarks or Mendeley's readership metrics into journal evaluation decisions (Konkiel and Scherer, 2013).
3. **Scholarly Research:** Library plays a very role including the field of scholarly research. The activity and services of scholarly research filed is very important among the library services. One the major facet of altmetrics metrics system is scholarly research. In this landscape some of the leading tools of altmetrics attach to library and information science. From old days it is practised that library and librarian attached with bibliometrics services and citation – impact factor services. It has shown that form last few centuries librarians are very pro to present and published book, articles on the subject of bibliometrics and altmetrics. At present condition it require to explore more on altmetrics with scholarly research and communication with incorporation with altmetrics into library – resource centres, institutions and organisations. It also needs research focused and practical application of altmetrics (Roemer and Borchardt, 2013).
4. **Integration with Library Tools:** Now days librarian are most notable used the tools called “institutional repository” which includes the one of impact of altmetric tools. This tool is provided an exclusive opportunity to bring the attention about new and existing research to researchers and scholars with opportunity to accumulate their scholarship to repository as it can access to metrics. This also facilitated to citation services of library for the additional tools for their institutional repository. The altmetric and other tools easily can integrate with the institutional repository for the citation purpose. Altmetrics and other tools are easily can make a digital identifier within the institutional repository. The tools also can provide the individual reports for metrics services(Roemer and Borchardt, 2013).
5. **User Behaviour in Academic, Research and Special Libraries:** Due to the exceptional development of research area the altmetrics is a natural addition for libraries and librarians. There is a several services provided by library which are linked with altmertrics services with directly and indirectly. The one of main activity of library service is user behavioural study. It refers to a series of the user action behaviour (click, search, browse, copy, stay, comment, feedback, etc.) while access websites or use library information service, even including the related assessment, contribute evaluation and friends interaction, etc. in third party websites. The data mainly comes from user log information, user subject information and external environment information. The altmetrics

services provided the spot trends and make informed decision based on deep quantitative evidence. Through tracking the decision behaviour the services like page click and downloading also a spot services and analysis. The researchers also moved across the digital landscape in a series of action. In that case librarian also accommodates the services like open up cluster article series, digital conversation etc (Roemer and Borchardt, 2013).

6. **Open Access:** For the evaluation and growth of altmetrics the open access played a very vital role on the research growth of altmetrics systems. Few services are freely available like Research Gate, Figshare and F1000 are open for all types of research output. It noted that few altmetrics exists for e – books, mainly because of considerable individual working ideas and which apply the current altmetrics (Roemer and Borchardt, 2013).
7. **Institutional Support:** At present era academic, research and special library promptly activate the services on altmetrics on research influence for researchers and scholars. The activity on altmetrics hugely secures interest on library and information science field and services. Knowledge of altmetrics makes libraries and librarians central point to the responsibility of “libraries and librarians” new educational duties. Those are:
 - a. Helping and serving researchers and scholars and institutions to interpret and control their own impact.
 - b. In adding of academic librarians desire to produce researcher assist is the use of altmetrics by publishers to spot recent trends, by grant making agencies for decision making.
8. **Self-Evaluation:** Through library service librarians are not only educating others about altmetrics but also they consume the services for their own purpose. Through different scholarly activities with a few evaluative mechanisms for the quantitative measurement methods like tracking Blog, Twitter, Social media like Facebook, Slide share, Goodreads, Amazon etc(Roemer and Borchardt, 2013).
9. **Google News:** The renowned uses of altmetrics give valuable insight into the translation of the academic kingdom and sometimes give at the most fundamental and public view with practical applications of theoretical topics. Google news can be customised with the other topics which users are interested. It can be access from google news personalised version. It can customise as per the personal choice, topics of interest like altmetrics and research impact. The research topic also references with source like “Guardian Weekly” and “Nature.” It also refers with related column, displaying related new items. The RSS feed can also attached with the reference with the personalised Google News selections(Roemer and Borchardt, 2013).
10. **Training/Marketing:** Librarians are the main sailor who is the main player to distribute and customise the information among the researchers and scholars based on the varying needs of their user population. One of the library tools is educating the user which is hardly using as a tool for outreach programme. So in this case librarians should take care about this tool for their development of library service and programme. Due to the variety of information librarian should take care of to channelize the information to the destinations through the different concepts. The most common way to know the altmetrics as a tool is introducing with link the information resources. As per the article “Research Impact and Citation Analysis”written by a study and research guide has been developed by University of Pennsylvania named “Research Impact and Citation Analysis”. It explained that this guide to places altmetrics in appropriate context and also guide to provide additional information to scholars. Librarian can also make handouts, training materials, online

tutorials for guiding propose and it also helps to create advertising tolls for library and information centre(Roemer and Borchardt, 2013).

11. **Communication:** Educating user an important role of librarians and they are strongest voice of altmetrics movement. Libraries added various new services due to the new development in the field of altmetrics. So, librarian should know about documentation services because of library is a positioning a unique centre of research hub within their institution. With the addition of user education library also enjoy the open communication with many of stakeholder on campus, where they can communicate with different issue like altmetrics. This also makes a valuable platform for librarian's not only national level also in international level. There are several stages and groups such as librarians – researchers, librarians – graduate & Post students, librarians – publishers, librarian – tool makers where they sharing their activity(Roemer and Borchardt, 2013).
12. **Google Scholar Publication Alerts:** Google Scholars searches provided a valuable way to discover many altmetrics publications that fall outside the domain of traditional databases, including white papers, pre-publication manuscripts. Google Scholar can also be setup with periodically send e-mails on topic interest(Roemer and Borchardt, 2013).
13. **Toolmaker and Scholarly Blogs:** All altmetrics tools have their own blogs and websites which regularly update their website, news feedback and special news related issues. Those blogs and websites are reports, features and tagged the library and librarians where they can get easily access new updates. People like researchers and scholars easily know about their sources point. A sampling of those blogs is called as “gray box”. These types of box need much more in academic and research field. These box are covered with resources of individual and as well as organisations and institutions from all over the world. A unique chain has maintained within this box. From this perspective those box covered with all altmetrics information. Several examples in the gray box are listed below(Roemer and Borchardt, 2013).
14. **Presentations, Workshops, and Invited Speakers:** Nowadays several renowned institution use altmetrics as a topic for their conference. Within their past several years renowned institution apply altmetrics in several way. The tools are also apply in different places and departments. Librarians are one of the main resource person to use this tools in several way and methods in nationally and internationally. One of the example of this type of conference is the University of Washington, where the UW libraries partnered with the College of the Environment to bring Heather Piwowar and Jason Priem, cofounders of Impact story, to their institution to speak about altmetrics (Roemer and Borchardt, 2013).

ADVANTAGES AND DISADVANTAGES OF ALTMETRICS

Altmetrics is a new tool so there are so many advantages and disadvantages of this system with traditional metric system. Few are describing here:

Advantages

- **Measures:** The most important advantage is the measurement method of altmetrics. It uses the easiest methods which one layman can understand easily. There is no any particular calculation, in no little part because multiple sources of data allow to triangulation (Konkiel, 2012).
- **Data Collection:** This is totally based on open data. This metric system is mostly use the publicly available data which is open source, so making the process is completely transparent. Where in the traditional method the impact factor only available by subscription basis (Konkiel, 2012).
- **Feasibility:** Altmetrics is nearly a real-time metrics system. So the speed is high rather than the traditional methods(Konkiel, 2012).

Disadvantages

- **Standardization:** The most important advantage of altmetrics can also appraising as a disadvantage. Because of gentility of metrics system. The vast variety of data has lack of standardisation. There is no any particular authentic metric system for altmetrics (Sutton, 2014).
- **Data:** Data are taken from a vast web source and basically it totally biased on open source and technology system. Due to this reason research cannot be based on only social media, blogs, on-line dialog, twitter, etc. The result must be biased (Sutton, 2014).
- **Quality:** Basically we need a distinction between altmetrics and attention metrics system. Social media basically pay attention to measure the input which is not a good quality metrics system. Like an example if anybody states 5 star reviews after watching a movie which is not a box office hit and vice – versa. So this type of measuring process does not identify the quality of article and journal (Sutton, 2014).

CONCLUSION

Throughout the technological advances the dissemination of resources has reach in a new point. Where librarian play a very vital role to serve for research and scholars community. Almetrics offers various types of measure the research impact. The literature and studies explain that how librarian takes a guard of technologies for their services. In future library and librarian will play more make more consent point for the altmetrics. Like past practice from bibliometrics era, they will directly involve with altmetrics in their services. More libraries will implement altmetrics service with the operation of housekeeping and digital library services. Due to enormous growth of technologies and research altmetrics playing a very vital role in academic institutions and organisations. Libraries and librarians can be makers, doers, and important mates in developing infrastructure for platforms, raising awareness and literacy around these new measures of scholarly reach. Libraries are well composed to develop metadata systems, repositories

and bibliographic workflows that capture the non-traditional artifacts being developed and disseminated as part of the scholarly and research lifecycles (Malone and Burke, 2016).

In this chapter, it elaborated that librarians are increasingly well positioned in this society with their various roles and responsibilities like educators, information supporter, and collection development. For many field and review on altmetrics stated that it is source of uncertainty and confusion with the daily changes. However the potential value of altmetrics of all user kind valuable knowledge partners like librarians a worthwhile investment which not only in the future of altmetrics field but also academic, intellectual and scholarly communication field.

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Chapter 10

Modes of Acquisition and Models of Licensing: The Electronic Sources of Information

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ABSTRACT

The advent of electronic sources of information (ESIs), e-resources, or electronic information resources (EIRs) has brought a revolution in the information landscape during 21st century. This has led to a paradigm shift not only in the modes and mechanism of storage, access, and delivery, but the acquisition of information has also witnessed a prominent change. This chapter is a theoretical overview of some newly emerging and popular modes of acquisition currently available for libraries to acquire and subscribe electronic information resources. Due to a visible change in the nature of information storage, access, and delivery, publishers have brought about certain changes in the policies governing the sale of their products in electronic form. As such, new license models have emerged, of which some popular ones have been enlisted for the benefit of libraries. The basic criteria needed to be set in force for prompt assessment of e-resources have also been highlighted at the end of this chapter.

INTRODUCTION

The advent of “Electronic Sources of Information (ESIs)”, “e-Resources” or “Electronic Information Resources (EIRs)” has brought a revolution in the information landscape during 21st century. This has led to a paradigm shift particularly in the mode and mechanism of access, delivery and acquisition of information, as against the scenario experienced during print era. The information is now said to be on the finger tips of a user, as he/she can’t only search it at an unimaginably fast speed and accuracy but also can have access to e-resources on anytime anywhere basis. The changed scenario of information landscape has also made it easy, fast and economical to deliver the right information to a right person at a right time if the job is undertaken by the real experts with an eye on global boundaries of knowledge. Modes and mechanism of acquisition have also witnessed a prominent change. The paper based informa-

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tion society is heading fast towards in real sense a paperless society-a concept propounded by Frederick Wilfrid Lancaster way back in 1978. This chapter is an attempt to canvas a picture about the current status of modes of acquisition facilitated by publishers of electronic information products and availed by the subscribing libraries of digital era. An effort is also made of record a consolidated account on the state of license models which have been emerging in line with the changes taking place in continuously evolving nature and construct of information.

Acquiring an abstract level document, book, journal, thesis in print form was easy in the sense that a tangible entity was being acquired against an authentic cost. It was thus easy and convenient for librarians to make understand the funding agencies about the handsome investment made on collection development in libraries and satisfy them to best possible extent. However, things have now become difficult to enter into heavy transactions related to acquisition of non-tangible and virtual entities i.e. e-databases, e-books, e-journals, in other words the electronic information products. Owing to this fact a variety of new modes of acquisition have emerged which need to be highlighted for the benefit of practical librarians in order to make it easy for them to choose the most economical and appropriate ones under the circumstances at their hand.

Moreover, due to revolutionary changes in the information landscape the library users need not to come physically to library buildings to have or use the information sources of their interest. There is a drastic cut in the library visits or user foot falls, recorded presently at an average in libraries as compared to print era. This emphasizes the librarians to be proactive for ensuring their presence in this metaphysical mode of information transaction and at the same time justify and exhibit their role in this academically sensitive endeavour.

OBJECTIVES

The main objectives of the study are as under:

1. To identify and explain newly emerging means of acquiring the electronic information resources (EIRs);
2. To enlist and different licensing models used for acquisition of EIRs; and
3. To consolidate a minimal assessment framework with regard to acquisition of EIRs.

BACKGROUND

The electronic information resources or e-resources originated rather gained momentum by 1970's, when the optical storage devices i.e. CDROMs were devised and used for storage of audio, visual, textual and multimedia content or information. Experts in the field and concerned agencies started to carve out definition for this new format of information resources and a few definitions among the same are given as under:

Joint Steering Committee for Revision of AACR (2005) stated that an electronic resource is the "material (data and/or program(s)) encoded for manipulation by a computerized device. This material may require the use of a peripheral directly connected to a computerized device (e.g., CD-ROM drive) or a connection to a computer network (e.g., the Internet)."

According to Gibson D. Lewis Health Science Library (n.d.), e-Resources is a “term used to describe all of the information products that a library provides through a computer network. This includes electronic books and journals, bibliographic databases, and library website pages.”

“Any electronic product that delivers a collection of data, be it text, numerical, graphical, or time based, as a commercially available resource” (Lee and Boyle, 2004). “Any work encoded and made available for access through the use of a computer. It includes data available by (1) remote access and (2) direct access (fixed media). Remote access (electronic resources) refers to the use of electronic resources via computer networks” (AACR2, 2002 ed., glossary). “Direct Access (electronic resources) refers to the use of electronic resources via physical carriers (e.g., discs/disks, cassettes, cartridges) designed to be inserted into a computerized device or its auxiliary equipment” (Library of Congress, 2016). “Electronic resources thus include, but are not limited to: web sites, online databases, e-journals, e-books, electronic integrating resources, and physical carriers in all formats, whether free or fee-based, required to support research in the subject covered, and may be audio, visual, executable, and/or text files” (Library of Congress, 2016).

The cost and volume of information in electronic era has become so huge that it is not possible to acquire every item standing as utmost need of a particular library. It is for this reason that “even the wealthiest academic libraries have pulled out of the race to accumulate huge collection of physical resources. Moreover, a very little number of students, faculty members and other academic staff are seen to visit their libraries in person. They do not recognise the librarians to extend any vital support in their teaching and research affairs. A wide disconnect between librarians and its patron is quite visible as the sources of information are stored and made accessible in a virtual stature. This envisages the libraries to adapt to a changing atmosphere of providing access to, rather than ownership of scholarly discourse” (Education Advisory Board, 2011).

The Library of Congress defines *Acquisition of e-Resources* as the process of “acquiring remote or direct access to electronic resource, which (1), the Library provides through official contractual, licensed, or other agreements (any of these electronic resources may or may not be owned by or housed at the Library) or (2), the Library receives through its acquisition processes (e.g., purchase, gift, exchange, copyright deposit, ISSN requests, and transfer).”

The changing scenario has given origin to new concepts like that of “Demand Driven Acquisition” (DDA) of monographs. Tackling the brunt of accelerating cost of information resources the libraries in European countries have started to enter into “Short Time Lending” transactions with actual publishers or vendors to meet the utmost need of their patrons.

Taiga Forum as cited in Attis, 2013 in its 2010-2011 Draft Provocative Statement claimed that by 2015 the “patrons [shall] go elsewhere for information”. The forum substantiated its claim by saying that “our users will meet more than 90% of their information needs from sources that are not directly connected to the library.” Even the forum went on saying that there shall be “no need for traditional librarians” on the ground that “successful libraries will be those that have managed to turn over the majority of their staff or reassigned staff to different roles within the library.” The forum further warned that if not properly defended with sufficient justification a library shall have to act as “a space for more than just books” because authorities shall make efforts to “take over most library space [and utilise it for] functions that have nothing to do with library collections or services.”

The provocative statement has acted as an eye opener for the librarians and enforced them to bring about specific and appropriate changes in their acquisition policies. The modes of acquisition have been revised in a fashion that ensures acquisition of the information which a library must possess to satiate

the needs of its immediate patrons and which are not otherwise available through commonly available search engines like that of Google, Yahoo and so on. Moreover, the libraries have started to re-design and re-modulate their structure (buildings) in a manner to prove them places capable of attracting highest number of patrons and ensure that they do not leave hold or lose track of their clientele for entire period of their study and research.

Having analysed data collected from reliable information handling agencies Razumova and Kuznetsov (2018) found that “more than 90% of world and Russian universities acquire scholarly resources via university consortia... All peer groups demonstrated a steady migration to e-resources to the extent that in 2016, e-resources comprised 91% of total acquisition expenses with e-books forming 63% of the total book acquisition.”

The virtual learning environment (VLE) is also gaining a widespread acceptance in developing countries including India. A number of such platforms have started to facilitate online and user centric learning and achievement of academic pursuits. This is also emphasizing the librarians to develop a strong information base to support online learners and course offering institutions. Library of a particular online course offering institute is supposed to provide online information support to the registered students of all the courses on offer at a particular time in line with their course content and curriculum. A perceived idea of students in this changing environment is “to have resources to support their learning delivered to them online with the speed of a search engine, and the ‘quality stamp’ of their university library or their tutor’s recommendation” (Markland and Kemp, 2004). “We therefore face a two-fold challenge. First, we must develop our procurement practice to achieve as much control as possible of the market in electronic information resources, particularly the developing market in e-books. Second, we must develop an information architecture that will provide a bridge from the current hybrid print and electronic environment to the fully electronic one.” (Ball, 2006).

MAIN FOCUS OF THE CHAPTER

As highlighted in the “Objectives” section, the main focus of this chapter is to identify and define or explain the newly emerging modes and means related to acquisition of EIRs in contemporary Libraries. The chapter also aims at enlisting some popularly used licensing models used to govern the acquisition of EIRs and have brief deliberation about each of them. Effort has also been made to consolidate a framework with regard an important issue i.e. assessment of EIRs from the point of view of their acquisition and use. Deliberations accordingly are given respectively under relevant subheadings as under:

Modes of Acquisition/Subscription

Keeping in view the global customer base, the publishers at present are seen to produce information products in three different ways or formats, viz. (i) print only; (ii) both print & electronic; and (iii) electronic only. The procedures of acquisition, as such, vary from format to format or from one way to another. Moreover, the publishers have devised different marketing strategies to boost their business and have defined varying pricing modules. In view of the changes registered in mode of availability and new price patterns an analysis of a few frameworks of acquisition/subscription of information sources is given as under:

- *Print Only Form:* Three types of modes of acquisition prevalent for acquiring print only form of information sources are:
 - *One Time Payment:* Here the library has to make onetime payment for earning the rights for fair use of the print version of an information source bought against a specific cost till its physical storage medium lasts in the library. This mode commonly applies to print form of monographs like that of text and reference books.
 - *Annual Subscription (Current Year):* Annual subscription means to buy the rights for fair use of the print version of an information source, which is brought out periodically after regular intervals of time. The rights are earned to use a particular set of issues or a particular volume published in a specific year i.e. the year under subscription. This mode applies to print form of journals and other periodical publications.
 - *Life Time Membership:* When the payment is made for buying the fair use rights of print form of journals or any other periodical publication published in a series, it is commonly known as life time membership.
- *Both Print and Electronic Forms:* Description of two main modes of acquisition, generally adopted to acquire the information resources in both print and electronic forms is given as under:
 - *Subscription for Current Year Only:* Under this mode of subscription a source of information is subscribed for its lifetime fair use in print form with rights to use its electronic version for a single year.
 - *Subscription with Perpetual Access:* Here a source of information is subscribed for lifetime access and use; both in print and electronic forms.
- *Electronic Only Form:* This is being commonly known as virtual acquisition of information resources. Mainly, three modes of acquisition are in vogue at international level for acquiring information sources only in electronic form. The detail is given as under:
 - *Current Year & Electronic Only:* Sometimes the subscriber purchases the access and fair use rights of electronic form of information source for a single year only. This is called as *current year and electronic only subscription* as it lasts for a single year and pertains only to electronic sources of information. At the end of year the subscriber ceases the right to access and use the source of information unless its subscription is not renewed.
 - *Current Year & with Perpetual Access to Electronic Archive:* This option allows the subscriber to earn fair use and access rights to an electronic information resource published in the year under subscription and its back-file collection (archive) of desired number of years. The subscriber thus earns the right to use the collection in future through entire of its life. Under this mode of subscription the publishers levy the hosting charges and maintenance fee on annual basis for years to come in future or claim such charges in the license agreement well in advance of subscription.
 - *Perpetual Access to Publications for a Spell of Years (past and future):* This option is similar to the one described above with a difference that agreement is signed and subscription charges are paid in advance for a specified chunk of years in past, present and future.
- *Consortia Based Subscription:* Joint subscription of an information resource, generally consisting of more than one items (abstracts, books, journals, etc.) in electronic form is called as consortium based subscription. Consortium based subscription is considered as the most useful mode of procurement of e-resources of information, as it helps to minimize their cost to a great extent. This aggregated mode of procurement not only enhances the purchasing power of participating institu-

tions, but also, brings many advantages to them. It allows the libraries to avail the truly shelf-ready (catalogued, classified and processed) acquisition of e-resources. Monitoring the quality of service rendered by the publishers or vendors has also become easy and robust, as it is now possible to weigh their performance against a tight set of specifications laid down in the base agreement mutually accepted by the stake holders. Consortium based subscription also results into considerable savings in time needed by individual libraries to manage the complex procurement procedures and the ensuing contracts. Moreover, the Libraries have been able to obtain quite startling discounts on e-books, for both public and academic libraries, under consortium packages (Ball, 2006).

- *Disadvantage with e-Books Consortium Model:* The publishers claim that the advent of e-book model that too on consortium basis has posed a great threat to their business interests as a single e-book serves the purpose of an end number of readers in a library. Thus they are not in a position to sell multiple copies of a book if they do not place a check on unauthorized use of e-books. In order to safeguard their business interests the publishers and aggregators resort to mimic very closely the hard-copy business models, allowing only single concurrent user to access a particular e-book, or fix a specified number of accesses over a period of one year. The electronic medium is ignored and many of its benefits lost under such restrictive models, which do not match the requirements of the modern university students for flexibility and immediacy of access. On the other hand price of soft copies of books are by no means favourable as compared to their hard copies. Some e-book aggregators, for instance, charges the list price plus a fixed premium for outright ownership. Moreover, tax at an average of 17.5% is levied on e-books, as contrary to printed books. The platform maintenance fee is also levied by some aggregators through life-time on year-to-year payment basis (Ball, 2006). Armstrong, Edwards and Lonsdale, (2002) have also witnessed that the consortia based e-book procurement model has lead to an overall decrease in the sale of core textbooks that were selling in relatively large number during print era. That is why the publishers are not willing to make these available to libraries at economic prices because they will lose substantial revenue expected from sale of their print counterparts to libraries and the individual students.
- *Demand Driven Acquisition:* Demand Driven Acquisition of Monographs is defined by NISO (2014) as the “*acquisition of library materials based on patron use at the point of need*”. It facilitates the libraries to offer a wide range of content to their clientele and proceed only to procure a particular information resource in accordance with their demand and request. It is also referred to as *patron driven acquisitions*. The word monographs, indicates that it is particularly related to e-books and other similar items rather than serial publications. It appears to alleviate to a great extent the libraries from the pressure mounting upon them due to increasing cost of e-information products, as it permits the libraries to invest for only highly used items and avoid any compulsive investment required under “big deal” or “bundled subscription” type of procurements. Moreover, much less staff is required to carry out the acquisition and circulation related job segments. Procurement of lesser number of highly demanded items under this option also excels the searching, retrieval and delivery mechanism. eBook Central is said to have offered, for the first time, the mechanism of demand driven acquisition and the Australian librarians are considered to have pioneered this concept and initiated its adoption for enriching their digital libraries and improve the content delivery thereof (Paulson, 2011). Demand driven acquisition ensures library patrons to exercise their choice with regard to selection of books. In this way it ensures appropri-

ate utilisation of the library budget as every selected or procured book will at least get one user of his/her ultimate need.

Another popular term related to e-book acquisition is “non-linear lending” wherein a particular number of “loan days” is allocated for every purchased item during the year under subscription. However, under this option, “the publishers are allowing concurrent, rather than consecutive, lending of e-books. But, mostly more than one patron are seen to borrow a particular e-book at a single time, simultaneously, when it is in high demand – what EBL terms as multiple concurrent access” (Kelly, 2010, p. 3).

Side by side to DDA and “non-linear lending” models, libraries have also begun leasing books for a day or a week on the analogy of *inter library loan* concept, rather than purchasing them to keep forever (Levine-Clark, 2014).

- *Short Term Lending (STL)*: STL is another very interesting e-book business model, which is fast becoming popular among libraries. Keeping in view the changing book purchasing trend and scantiness in library budget, it is Kari Paulson and her EBL partners who came up with this new concept at an Inter Library Loan (ILL) conference in 2002. DDA/STL is proving to be an effective remedial to steer the libraries out of the precarious situation lent to them by the enhanced price of e-books and day-to-day shrinking library budget (Thompson and Zusman, 2015). Most of the libraries are observed to prefer procurement of e-books against curtailed cost instead of buying them in actual on perpetual basis. That is why the DDA now involve temporary leasing of e-books through short term loans for a fixed number of days usable concurrently by a specific number of users depending on their demand. However, new experimental business models need to be explored for providing better ways to balance the publisher’s business interests and the library’s interests of lending them to their clientele with utmost convenience and economy (Schmidt, 2014).

STL is a special case of pay-per-view — another way to provide discounted access to eBook content. This mode is much more flexible for libraries, in the sense that title-by-title choice is exercised right in tune with the user requirement and thus avoids undue budgetary thrust for unused titles. Thus STL/DDA combination allows libraries to facilitate its users with prompt and exponential access to a larger number of titles without any unnecessary investment. This approach is enabling libraries to make appropriate and efficient utilisation of budget to meet out the immediate interests of users and allows them to acquire maximum number of relevant items (Price & Savova, 2015).

Almost all libraries are observed to opt for a one or seven day loan under STL mode of subscription. Longer STLs are more expensive than a single or two day loans, but in some cases these prove to be cheaper than allowing several one day STLs to same patron in a week’s time. Libraries that choose to avail an STL model will register significant savings over the cost of purchasing the books that really find maximum number of users. STL makes it possible for libraries to subscribe the titles via DDA that they never would have purchased in a traditional acquisitions model (NISO RP-20, 2014).

The librarians are still struggling about how to select the appropriate e-book DDA models to ensure appropriate and intelligent utilisation of meager budget at their disposal. They tend to explore every possible means to select the model that ensures greatest returns of the budget available for e-book subscription. Libraries are still experimenting with the variables offered to them by the vendors, that include adjusting number of loans and loan periods before entering into final contract, restricting the titles to the ones of utmost relevance of their users, and the like (Way & Garrison, 2011).

Modes of Acquisition and Models of Licensing

- *Pay-per-View (PPV)*: Pay-per-view mode of access or subscription means the mode which allows registered users to view only an article or chapter for a specific time slot against a pre-determined price. Publishers have also kept open this mode of access for direct purchase of interested users against online payment through credit/debit cards, net banking, etc. “User-driven, pay-per-view (PPV) models for both e-journals and e-books are newly emerging attractive options for libraries facing budget cuts. Such services can be customized to meet their needs and are offered both in mediated and unmediated formats. PPV proves to be an attractive option for libraries anxious to provide affordable and fast content to users without the inherent managerial difficulties associated with traditional subscription. Under this option users can access thousands more articles than previously available through traditional library subscription modes. It is proving dramatically cheaper as compared to seldom used subscriptions of print era. Moreover, there are no storage costs and its evaluation through usage statistics is more convenient and prompt.” (Schell, Ginanni and Heet, 2010).

Acquisition or subscription of print serials has been a different procedure than that of print books in the sense that the former involves advance payment for a set of issues or volumes being published in the year(s) to come in future. In order to play safe and feel secure the libraries and publishers enter into license agreement on mutually agreed upon terms and conditions. The nature of acquisition and use of electronic form of information being different than that of print resources has lead to some changes in licensing agreements existing in print era. Consequent upon these changes a number of new licensing models pertaining to the subscription of e-resources of information have emerged. Following section is an attempt to consolidate an account on a few newly emerged licensing models.

Licensing Models

The concept of Licensing has been there since 1980s, as libraries had been entering into licensing agreements in connection with leasing computer equipment, CD-ROMs, and certain information services. Due to rapid advent of digital formats of information resources, publishers and vendors began to use contracts and licenses for selling or leasing information products to libraries by mid-1990s. Libraries are required to sign license agreements with publishers and vendors as a routine part of the subscription process involved in acquisition of e-resources. In most cases, libraries are purchasing the right to access a product for their patrons for a specific period of time, whereas a trend to acquire e-products of information on perpetual basis has also been in vogue now from quite long time. Facilitation of smooth & reliable access to e-information sources on part of the information provider during this period and obligation to ensure fair & judicious use of the e-products by the library clientele are governed by a legal agreement; a mutually acceptable set of understandings and commitments arrived at through discussion and negotiation between licensors and licensees (Johnson, 2003).

In print era the libraries used to purchase books and periodicals in print form and the users were allowed to borrow, consult within the library or photocopy the required content for personal use at their end. However, the publishers do not usually sell their electronic sources of information, but instead they prefer to *license* it to libraries for use over a specific period of time. They usually started to charge the libraries with a mutually determined amount as fee under pay-per-use or pay-per-unit mode of subscription of the specific amount of information, the library uses over a specific period of time (Estabrook et al. 2010). When libraries do not own these resources, they have less control over older information needed to be

saved for coming generations in future. Moreover, in the electronic age, issues of copyright, intellectual property rights, and the economics of information have become increasingly important for rendering the library service in future. End users also see both liberties and restriction in this changed information landscape so far as the instant access and long term use of information resources is concerned.

So it is quite apparent that there are concerns all for libraries, publishers and users of e-information products. In order to address these concerns stake holders are in continuous process of devising and designing license models suiting to their individual interests. The process has not been a start from scratch, but seems to have been a steady customization of license scripts functional in print era, which has resulted in emergence of a number of new license scripts. The process of designing and development of license models governing the marketing, sale and subscription of e-information products at this point of time can be said to be under evolution. Let us try to see what is the current state of existence of the newly emerging license models is? and also try to explore what one should know about their structure and construct?

The process of designing and development of license models related to digital information products can be said to have started in late 1990s. UK's PA/JISC model license, jointly developed by publishers and librarians from the Publishers Association and the Joint Information Systems Committee (PA/JISC) of the Higher Education Funding Councils happens to be the first ever effort to devise a licensing model. This was followed by the US Principles for Licensing Electronic Resources from the American Library Association et al., and the Statements of Current Perspectives from the International Coalition of Library Consortia, as well as the one placed forth by LIBLICENSE. In order to safeguard their business interests many publishers have developed individual licenses of their own (Ringgold, 2019).

Taylor and Beh (2014) have made an effort to place forth a chronological account of licensing models. While deliberating on model licenses the authors have projected forth following six online license models: (i) LIBLICENSE, (ii) NorthEast Research Libraries' (NERL) Consortium Model License Agreement for Electronic Resources, (iii) Single Academic Institution License from LicensingModels.org, (iv) California Digital Libraries Standard License Agreement, and the (v) Florida Virtual Campus Guidelines for E-Resource License Agreements. (vi) National Site Licensing (NSL)

1. *LIBLICENSE*: The LIBLICENSE Model License Agreement was created in 1997 to provide timely and responsive information and assistance to librarians involved in licensing and maintaining digital collections. The terms of the initial Standard License Agreement of 2001 (revised in 2008) have now formed the basis for a completely updated revision. In November 2014, this totally revised and recast model license was posted on web, after intense, year-long discussions and collaborations with numerous stakeholders, for consultation and use both by libraries and publishers. The LIBLICENSE Model License Agreement comprises of a template that can be used by librarians in negotiating particular licensing agreements that more generally serves as a tool to determine what the academic library community considers as acceptable policy and practice for licensing digital information (Okerson, 2014).
2. *North East Research Libraries' (NERL) Consortium Model License Agreement for Electronic Resources*: It was framed in 1996 out of a conviction that multiple economies and efficiencies were possible for libraries in moving into the world of electronic publication purchasing (Okerson, 1996). In the beginning it was adopted by 12 ARL member institutions for the purposes of collaborating on the subscription, purchase, and licensing of electronic content, consistent with the member

Modes of Acquisition and Models of Licensing

libraries' missions to support higher education and research. Now, this license model is followed by 30 core member institutions and 90+ affiliate member institutions (NERL Consortium, n.d.).

3. *Single Academic Institution License from LicensingModels.org*: This license model was created in 1999 by John Cox (Cox, 2000). V4.0 Oct 6 2009 is the latest and stabilized version available on Licensing Models website of the Ringgold company and can be viewed or downloaded from <https://www.licensingmodels.com/singleacademicinstitutionlicense/>.
4. *California Digital Libraries Standard License (CDLSL)*: CDLSL was last updated in 2011 and now includes new standard clauses. It is now termed as "CDL Licensing Toolkit" and is designed to assist in carrying out the negotiations with respect to licensing process (CDL, 2019).
5. *Florida Virtual Campus Guidelines (FVCG)*: FVCG were last updated in 2013 by Claire Dygert (FVCG, 2013). Unlike the other examples, the FVC Guidelines are not a model license per se, but are a set of guidelines with sample clauses (Taylor & Beh, 2014).
6. *National Site Licensing (NSL)*: "Site licensing as a concept emerged from the software industry has been a common practice in the libraries since mid-1990s. While academic libraries in most countries were struggling to negotiate with information providers individually or collaboratively via consortia,, a few countries began to experiment with national site licensing (NSL), which seemed to have the potential to bring advantageous solutions to many problems in the complex licensing world. Two influential examples of NSL adoption are the Canadian National Site Licensing Project (CNSLP) and the United Kingdom's National Electronic Site Licensing Initiative (NESLI)" (Zhu, 2011).
7. *Licensing Models Website*: M/s. Ringgold Ltd, Bristol, UK consolidated the throughput of a community effort made to produce standard wording aimed to devise standard license negotiations and launched the same in the form a website or web platform available at <https://www.licensingmodels.com/>. This suite of model licenses was originally designed and launched in 1999, with a substantial update in 2000. The website provides an opportunity both to the libraries and publishers to use a comprehensive and well framed licensing skeleton for abstract databases, current journals, journal archives and e-books (monographs of text and reference nature) both on library to library basis or through consortium mode. Sample text to cover 30 or 60 day trials of new e-resources offered by publishers and availed by libraries also stands drafted and facilitated for use of parties. Content and structure of license model has been framed for following six licenses:
 - a. Single Academic Institution License – Single Academic Institution License Commentary;
 - b. Academic Consortia License – Academic Consortia License Commentary;
 - c. Public Libraries License – Public Libraries License Commentary;
 - d. Corporate and other Special Libraries License – Corporate and other Special Libraries License Commentary;
 - e. E-book (and journal archive purchase) License – E-book (and journal archive purchase) License Commentary;
 - f. 30/60 day free trial License

These licenses were originally sponsored by and developed in close co-operation with major subscription agents like EBSCO, Harrassowitz, and Swets. Since that time, this site has been maintained and updated by John Cox and now by Ringgold as a service to publishers and to librarians. They are in the public domain and the libraries and/or publishers stand permitted to use them for entering into mutual

agreements towards rendering and availing information services in an electronic and online environment on reciprocal basis.

The operative statement for all of these models reads “WHEREAS the Publisher holds the rights granted under this License AND WHEREAS the Licensee desires to use the rights and the Publisher desires to grant to the Licensee the license to use the rights for the Fee, subject to the terms and conditions of this License”. All these licensing agreement models comprises of 11 sections pertaining to core aspects of the deal or transaction of e-resources, namely *1. Definition of Terms, 2. Agreement (Main), 3. Usage Rights, 4. Supply of Copies to other Libraries, 5. Course Packs and Electronic Reserve, 6. Prohibited Use, 7. Publisher Undertakings, 8. Licensee’s Undertakings, 9. Undertakings by Both Parties, 10. Term and Termination, and 11. General Conditions*, followed by Signatures/Stamps of two parties/stakeholders along with detail of agreement signing authorities. The agreement also includes a framework to record an account of the “licensed materials’ subscription period and access method” annexed as Schedule 1, required to be signed by the parties entering into the agreement. Detail about the “Library Premises” including the list of addresses of the Licensee’s Library Premises, Domain Name(s) and IP addresses and/or ranges along with some technical credentials of networks likely to be used for facilitating access to e-resources also needs to be drafted and signed by the parties as Schedule 2 of the agreement. In this way these are comprehensive and robust licensing models both from the Licensor’s and the Licensee’s point of view (Ringgold, 2019).

8. *Model License Comparison Website*: Taylor & Beh (2014) have also created a model license comparison website, which compares clauses from the CDL, NERL, the FVC Guidelines, and the single academic institution license from Licensing Models.org. The website can be searched by keyword or browsed by section. Some new terms that are not covered by these model licenses but that may need standard language include: auto-renewal, alumni as authorized users, images and promotional use, text mining, third-party usage statistic collection, cloud hosting, repositories, streaming video, mobile devices and downloading, and Users with Disabilities Act (UDA) compliance. It has been proposed that the website for Securing a Hybrid Environment for Research Preservation and Access/ Rights of Metadata for Open archiving (SHERPA/ROMEO), creating a blog or wiki or something easy to maintain as a uniform license model, and/or revive LIBLICENSE for that matter is quite essential and a prime need of the time.

Another very important issue regarding the acquisition and use of e-resources is the credibility and assessment of their cost and pricing modules. Basic information about this aspect has been consolidated as follows:

Assessment and Evaluation of Electronic Information Resources (EIRs)

The acquisition of electronic information resources (EIRs) has till recent times been mostly made in bunch form. That is the publishers or vendors of EIRs used to mostly offer a bunch of documents relevant to a specific domain of knowledge. This necessitates a library to make hefty investment on subscription of e-resources, which often proves unaffordable. So it is very important to anticipate and be proactive in the process of assessment and evaluation of a particular electronic information resource prior to its final subscription. The library as such needs to assign the responsibility of making assessment and evaluation

Modes of Acquisition and Models of Licensing

of electronic information sources to highly experienced and prudent staff members who qualify for this sensitive job in real sense.

In its report MARS, RUSA & ALA (2006) recommended that the staff on duty of this assignment may avail a trial/preview period and solicit feedback and questions from the fellow library staff members and from the end users. This feedback may suggest adjustments or changes before the final subscription of the new resource(s). Subsequently, the staff may conduct regular exercises to evaluate the electronic information resources available in the trial, in order to determine their effectiveness in meeting information needs of the user community. This will also enable them to take concrete and efficient decisions about future selection or de-selection of these resources. As per the recommendations the evaluation process, among other essentials, should include:

1. Reliability of the publisher/vendor;
2. Relevance and specificity of the selected set of sources of information;
3. Professional and industry standards for information resources;
4. System response and uptime, vendor responsiveness to system problems such as down time and error reports;
5. Collection of qualitative and quantitative data regarding use, usage patterns, user satisfaction, etc.
6. Prompt reporting of the results or conclusions of the evaluation.

CONCLUSION

The advent of electronic form of information resources has lead to emergence of a number of new issues and the overall scenario is full of inherent intricacies. The cost of information resources have gone unimaginably high, as publishers deem that nature of information in electronic form has lead to a decrease in their sale. For this they place forth the reason that in print era multiple copies of books and journals were needed by the libraries to satisfy the needs of their clientele, but the purpose can now be served by a single copy of electronic document. The publishers or copyright holders of electronic information resources are of the feeling that they are at the brink of suffering heavy losses in their business if the issue is not instantly addressed. This has led them to devise different license models with robust mechanism to safeguard their business interests. Under the newly ensuing circumstances the libraries are finding it difficult rather impossible to facilitate desirable access to an adequate number of information resources in electronic form. As such the librarians are striving hard to find new rescue measures to safeguard the privileges of their users. The consortia subscription is one among the viable solutions being resorted to by the libraries to find a remedy to the problem. The consortia moment should thus be strengthened and should also be expanded to cover the e-books and e-theses, as till date the publishers are facilitated consortia based access to e-journals only. The librarians must play an active and effective role in modifying the existing tough license models and should volunteer their services and work hard to devise the new viable ones for the benefit of their users. Librarians from developed countries should come forward to educate their brother fraternity in developing countries regarding the newly emerging business trend in electronic world and should also share their expertise to enable them to acquire quality information products against economical prices for their libraries.

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Section 3

Digital Libraries, Information Literacy, and Bibliometric and Scientometric Studies in Library and Information Science

Chapter 11

A Transitional Shift From Traditional Library to Digital Library

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ABSTRACT

Traditional libraries were considered as the storehouse for books and available for kings and renowned personalities of the society. Later on, libraries were considered information centres, but with the emergence of ICT, the concept of traditional libraries was changed; the books were replaced by information, and now information is for use for dissemination not for preservation. Tremendous advancement in technological developments is taking place in the field of ICT, so the user demand to change according to change in technology, to meet the demand of users and the library were shifting from traditional libraries to digital libraries, electronic libraries, and virtual libraries. This chapter discusses the relationship between digital and traditional libraries. It takes a critical look at the belief that the information technology revolution has destroyed traditional libraries as well as the librarians working them.

INTRODUCTION

Information technology has remodelled the complete world into a worldwide village with a worldwide economy, which is more and more obsessed with the artistic management and distribution of data. Over the past decades, the world has been experiencing significant changes in which the need to acquire, utilize and share knowledge has become increasingly essential. The world goes through associate degree info technology revolution that has drastically modified several aspects of human life, from education, industry, economy, and politics to entertainments, additionally, the unexampled capabilities of the knowledge technology to method, store, refine and circularize information, info and data in an exceedingly type of ways that across geographical boundaries had dramatically modified the ways that within which governments, the public, and therefore the personal sectors and libraries operate everywhere the planet. The potential of what will be achieved in data generation, acquisition, collection, processing, display,

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and dissemination, was terribly exciting and intoxicating and resulted in art movement dreams. of these electronic developments from the premise of the digital library that is equally termed virtual libraries. it's of these technological developments that bit by bit offer birth to what's currently recognize the digital library. At this juncture, one will rise what we have a tendency to mean by the term "Digital Library".

Digital library are often outlined joined within which all the tests and spoken books area unit keep as digital files, which can take a protracted time to realize. A digital or virtual library is that the on-line access provided by alternative facilities or it's going to mean a web site that offers links to varied sites with an outsized store of data in a very listed or archived kind. The term could consult with all material associated with any subject that's out there on the web. A digital library typically is a component of a network with linkages to different libraries.

Generally, the working collection of books, documents, newspapers, audiovisual materials kept and organized for people to read or borrow in a library. Recent advances in computers storage and processing, communication technologies, e-product, networking and internet users have brought a revolutionary change in the functioning of the libraries and its services. ICT makes a lot of impact on the library and it has changed the concept of the library where print and paper media are the main components of the library system. To meet tremendous information explosion and high demand for information, libraries are now changes in the digital library. Due to digitizing the library resources and fast-changing technology, a new type of library has come in existence which is the called-virtual library. Many of us are always very much confused about such terminology of the library.

In the Digital Age, Ansari (2003) stated that the librarians will now not be merely data suppliers or the keepers of data. Technological changes and therefore the use of electronically keep and retrieval data systems have modified the means students and researchers are able to access, retrieve and use data. The instant access to data through the web has created immense amounts knowledge of knowledge } and data obtainable to anyone with a pc, a modem, and a supplier. The future visions need for changes in libraries, trends and challenges before the library professional in the Digital environment and the various changing roles of the LIS professionals also have been discusses in this study.

OBJECTIVES

The objectives of this study are given below:

- The primary objective of this study to define and explain the concept of traditional and ICT based Library.
- To analyze the Difference between Traditional & Digital Libraries.
- To explain the Advantages of Digital libraries over Traditional Libraries.
- To define and explain the impact of information communication Technology on Library services.
- To analyze the various changes and challenges evolved before the library professional in the digital environment
- To discuss the Issue and challenges of Digital Libraries.

DIGITAL VS. TRADITIONAL LIBRARIES

The shift from ancient libraries to the digital isn't simply a technological evolution however needs a amendment within the paradigm by which individuals access and act with info.

A traditional library is characterized by the following:

- Emphasis on storage and preservation of physical things, significantly books and periodicals.
- Cataloguing at a high level instead of one among detail, e.g., author and subject indexes as opposition the complete text.
- Browsing based on the physical proximity of related materials, e.g., books on sociology is near one another on the shelves.
- Passivity; information is physically assembled in one place; users must travel to the library to learn what is and make use of it.

By contrast, a digital library differs from the above in the following ways:

- Emphasis on access to digitized where they'll be placed, with conversion eliminating the requirement to have or store physical item.
- Cataloguing down to individual words or glyphs.
- Browsing supported hyperlinks, keyword, or any outlined live of relatedness; materials on constant subject don't have to be compelled to be close to each other in any physical sense.
- Broadcast technology Dhaka and Arora (1995); users needn't visit a digital library except electronically; for them, the library exists at anywhere will access it, e.g. home, school, office, or in a very automotive.

Characteristics of the Changes

- Printed documents are now available in online digital form.
- Manual housekeeping and library management functions switch over to an automated mechanism.
- User seeking is moved from document to information.
- User prefers access then lending.
- Service on demand converted to service in anticipation.
- Library driven activities move toward users driven approach.
- Collection development change to knowledge management.

CONCEPT OF TRADITIONAL AND ICT BASED LIBRARY

1. Traditional library: The holding or collection of the conventional libraries are generally in print media, manuscripts, etc and are not well organized or classified. The collection in traditional libraries are deteriorating rapidly due to old techniques of conservation and preservation, the collection of information is not easy to trace, searchable and does not easily reach to the user, again the traditional libraries are bounded itself within a wall.

2. Automated library: A library which provides automatic services such as machine-readable catalogue, computerized or online acquisition, circulation, and OPAC is called an automated library (Koteswara, 2004). The holding or collection of automated libraries are the same as that of traditional libraries but the services offered by the automated libraries make them better and offer more and effective services.
3. Electronics library: Adeyinka (2016) said that when automated libraries linked via a network such as LAN, high speed downloading uploading access, online information delivery, providing CD-ROM networking and started access electronic journal and other kinds of publication then it is known as an electronic library.
4. Hybrid library: Those libraries which work in both digital and traditional environment are known as a hybrid library (Chia-Hung, 2013). These libraries are in between the print and digital environment. Reading habit of paper, easy to handling and reading a digital documents needs a medium such as computers, laptops, I-pads, some people cannot handle these machines, so hybrid libraries are quite favourite among the users. It takes care of both types of user's i.e. traditional users and modern users.
5. Digital library: It is a later stage of the electronic library. In digital library high-speed knowledge transfer takes place, knowledge were communicated through networks or net, it provides an in depth vary of Internet-based services and it contains multi-format info i.e. audio, video, graphics, conferencing, etc.
6. Virtual library: Access digital information from any part of the globe through a network (LAN or WAN) or any other gateway such internet (Gangrade, 2016). The term virtual library has attracted the interest of users because of the increasing medium called the WWW (World Wide Web). The virtual library is the single most reachable and important source of information in the world and leads to replacement for the traditional library. A collection of links is also a virtual library, these links are not necessary owned by the virtual library. However, the links are maintained, updated and managed as a normal function of the virtual library.

SWOT ANALYSIS

Strength

Strengths assessing a library's strengths, areas during which it's already thriving, include watching workers skills and competencies, programming, and budget maintenance and community relations. Coming up with for the library's future supported its strengths ought to embody ways that to take care of and improve existing success.

Weakness

Weaknesses analyzing a library's weaknesses conjointly suggests that evaluating internal operations. Verma and Verma (2014) in "Management Basics for data Professionals," signify that weaknesses might lie constant areas as strengths. Careful analysis of library weaknesses suggests that areas would like improvement. Weaknesses conjointly establish areas that require attention to scale back the negative impact of their weaknesses.

Opportunities

Opportunities Factors outside the library itself ought to be evaluated to check what might be acted upon to profit the library. Library opportunities could gift themselves in “economic, political/legal, technological, or cognitive content environments, (Singh, 2017). In his analysis of SWOT. for instance, awareness of a high economic standing of the library’s main patron base provides a population doubtless to participate in fund-raising activities.

Threats

Threats analyzing library threats conjointly suggests that evaluating factors outside the library that hinder its success. Like opportunities, several threats stem from the economic and political surroundings, says Danca for instance, economic downturns threaten to scale back the budgets of publically funded libraries. Maintaining current awareness of threats permits the library administration to set up and act. This space needs frequent attention as a result of the external surroundings typically changes quickly.

ADVANTAGE OF DIGITAL LIBRARY

1. **Preserve:** permits protective rare, out of print and special assortment of documents in digital format will be reproduced in multiple numbers simply while not degrading in quality.
2. **Anytime, Anywhere Access:** Users can have access to the required information without going to the library physically. Users from around the world can have access to particular information at any time and from anywhere.
3. **Multi-User Access:** Digital Library allows the same resource can be accessed by multiple users at the same time.
4. **Easy to search:** Users are able to use any search term to search the entire collection.
5. **Faster access:** Provide faster access to the holdings of libraries worldwide through automated catalogues.
6. **Linked-Data:** Digital library can provide a link to any other resources of other digital libraries (Banerjee and Chakrabarty, 1999).
7. **Resource sharing:** Digital documents can be transferred very easily, thus an effective resource sharing can be achieved.

CHALLENGES FOR DIGITAL LIBRARIES

1. **Selection:** Lack of correct designing for integration of digital data with reference to the right choice of documents or resources that area unit to be digitized. There is a need for a proper policy to identify the resources to be digitized, as it is not recommended to convert all the available print documents to be converted to the digital format. This is an issue which prevents the integration of digital information into the traditional libraries.

2. **Lack of Planning:** Digitization is not a one-time activity, it is a continuous and time-consuming tedious process, and hence proper planning is required. An expert committee can be formed, based on the requirements; the committee can frame the process and technology to be used in the digitization.
3. **Lack of Technical Skills:** It is always difficult to find the personnel with the right background and rapid change in technology and processes in digital libraries necessitates constant retraining of staff. The skilled person is required for achieving the best digitalization results. This issue may cause a delay in the installation and development of a digital library.
4. **Copyright:** Susan Methew (2010) described that copyright is always threatened in electronic publishing and digitalization process as the exchange of information in digital form across the networks is very easy and hassle-free . It is also very easy to download a copy and modify digital documents. To avoid such infringements by users digital library should have copyright declaration and software to prevent unauthorized access and downloads. Digital libraries are also should not carry digital reproduction of the print publications without proper permission from copyright holders or violating any such copyright rules.
5. **Cost:** Rajashekhar (1996) said that digitalization process requires information and communication technology infrastructure. Hardware infrastructures, such as a server, Desktop computers, scanners, networking infrastructure, etc. and Needs huge initial financial support . However, open source Digital library software's can be used to cut down the expenditure as much good DL software is or OSS. Training the current staff or hiring expert from outside also requires financial support. Hence it is very much important to get proper financial support from management or ICT infrastructure, human resources, and their training.
6. **Archival Media:** Kumar and Reddy (2003) stated that preservation of electronic information in a proper archival media format is the most challenging task as a life span of digital storage media like hard disk, CD, DVD, Tape, floppy drives are very short. Also rapidly changing technological advancements makes this task tougher day. Hence digital archival ICT infrastructure needs regular updates, upgrades, and migrations to keep Digital Library system up-to-date.

LIMITATIONS OF THE DIGITAL LIBRARY

- Digital Library requires and needs proper digitization process.
- Require initial high-end ICT hardware infrastructures.
- Require highly skilled and well-trained professionals to perform digitization process.
- Requires high-speed computer network supported by high bandwidth for transfer of digital library content.
- Copyright law restricts you to digitize all the available documents of your Library.
- Digital content cannot replace with pleasure and comfort of printed reading materials.
- Changing the face of a digital document may force you to adopt more and more technological add-ons.

MYTHS

There are many myths about the digital library given by Bamgbade (2015) as follows:

1. The internet is the digital library
2. The fully automated library is a digital library
3. The myth of a single digital library or a one-window view of digital library collections.
4. Digital libraries will provide more equitable access, anywhere, anytime.
5. Digital libraries will be cheaper than print libraries.

TRADITIONAL LIBRARIANSHIP VS DIGITAL LIBRARIANSHIP

In earlier period, there was no definite place that might be referred to as a library: records were scattered and most of the time consumed by fireplace. The records that shaped a part of early libraries constitute four categories as per Ogunsola (2016):-

- Temple collections;
- Government or royal archives;
- Organized business or economic records; and
- Family or kin papers.

Traditional spot is all concerning sitting down within the inside of books and expecting individuals to return and browse. If they are doing not come back, then, the bibliotheca closes at the tip of the day. this can be the daily ritual. However a contemporary bibliotheca within the digital age should be sound within the storage, retrieval, and dissemination of data with the help of data communication technology (ICT).

This could be through the pc, internet, E-mail, CD-ROM, slides, teaching aids, telephones, together with the world system of mobile telecommunications (GSM), fax machines, etc. depository materials can be keep on CD-ROMs for simple retrieval and dissemination to prospective users. Librarians will currently handily store depository materials on CD-ROMs. CD-ROMS are extremely compatible with most computers; this implies very important data may be preserved and retrieved simply once required. The modern libraries are:

- Systematic and organized collection of print and non-print resources.
- Digital in formats so that easily process able by computers.
- The acquisition, storage, disseminates, & retrieval of information is done by the use of technology.
- Access of the entire holding of the library is directly or indirectly accessible across the network with the help of internet.
- Supports and provides more & better online & offline services.

CONCLUSION

Digital Libraries are redefining the role of libraries in society and the role of librarians and information professionals. Due to the emergence of ICT in libraries, the role of libraries and LIS professionals became challenging and scope of improvement is available every day. Digital library is new for libraries despite the availability of paid and open source software for creation and management of digital libraries there are very few libraries in India which are digitized so far. The awareness of benefits and better service capability of digital libraries must be conveyed to the LIS professionals so they can design and develop digital libraries to provide fast and easy access of information to their users at no time.

Traditionally libraries were considered as the storehouse for books and available for kings and renowned personality of the society. Later on, it is considered as library and information centre, but with the emergence of ICT the concept of traditional libraries were changed, the books were replaced by information and now information is for use for dissemination not for preservation. Tremendous advancement in technological developments taking place in the field of ICT, so the user demand to change according to change in technology, to meet the demand of users and the library were shifting from traditional libraries to the digital library, electronic library, and virtual library.

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Chapter 12

Information Literacy

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ABSTRACT

This chapter distinguished the concept of information and literacy before it proceeded to discuss extensively the concept of information literacy, which is the ability to access, evaluate, organize, and use information from several information resources. The historical development of IL was as well traced. Some notable components of IL such as identifying, finding, evaluating, application, and acknowledgment were explained. The chapter went further and elucidated the qualities of an information literate person. Lastly, benefits and challenges of IL were discussed, and a conclusion followed appropriately.

INTRODUCTION: CONCEPT OF INFORMATION AND LITERACY

Information is a resource that has varied definitions according to the format, and media used to package or transfer it, as well as the discipline that defines it (Lau, 2006). Hornby (2010) defines information as fact or details about somebody or something.

Information as it is notably addressed by people as a set of processed data. It is the end product of processed and analyzed data, which contains meaning when communicated. According to Reitz (2004), information is data presented in a readily comprehensible form to which meaning has been attributed within a context for its use.

From the point of Kolawole and Igwe (2010), information is new ideas or knowledge extracted from environment for human use with the aim of modifying behavior, effecting changes, and enhancing efficiency in all human endeavors. It is invaluable in planning, decision making and execution of programs. It has become an indispensable instrument for human survival as globalization beckons.

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Uhegbu (2007) affirmed that hardly can you mention the word ‘information’ without somebody, especially the educated, understanding it from their various backgrounds. The definitions above justified that information may be fact or details that are packaged or transfer with the aim of enlightening, educating or improving someone’s views, impressions or attitudes about something.

Though, the nomenclature or context at which information is mentioned may differ, but the term will manifest when people of the same interests or ideas are in need of something that will assist them in clarifying confusion or uncertainty, which is expected to provide details at the right time.

Literacy simply means the ability to read and write (Hornby, 2010). It is the ability to read, write and understand with minimum proficiency. Literacy is the act of being able to read, write, comprehend at the lowest level. It is the ability to possess minimum level of orientation about something. It implies a set of skills to identify, examine and decide in a particular situation or context, what are to be done to achieve desired results.

Frankel, Rowe, Becker and Pearson (2016) defined literacy as the process of using reading, writing, and oral language to extract, construct, integrate, and critique meaning through interaction and involvement with multimodal texts in the context of socially situated practices.

By integrating these concepts (information and literacy), it is easier for one to note that it will become another phrase or term, which has to carry a uniform meaning, regardless of the nature of purpose, nomenclature or context. This therefore, make information literacy a term that is all embracing, regardless of where it is mentioned.

OBJECTIVES OF THE CHAPTER

This chapter is prepared with the following objectives:

- To contribute to the stream of literature existing on information literacy.
- To show how information literacy is an encompassing concept that goes beyond library and education.
- To enlighten readers on the various skills, techniques and abilities required to become an information literate person.
- To reveal the opportunities attached to the learning and cultivation of information literacy skills and how those skills can be applied to all aspects of human endeavors, as well as sustain it as life-long learner.
- To compile events, issues, policies, decisions and actions that are significant to the global acceptance and usage of information literacy so far.
- To identify issues, procedures and problems affecting the growth and expansion of information literacy beyond its current shores.

HISTORICAL DEVELOPMENT OF INFORMATION LITERACY

Information literacy firstly appeared in 1974 in a report prepared on behalf of the National Commission on Libraries and Information Science by Paul G. Zurkowski, who was at the time President of the Software and Information Industry Association (Zurkowski, 1974). Zurkowski used the phrase to

describe the “techniques and skills” learned by the information literate “for utilizing the wide range of information tools as well as primary sources in molding information solutions to their problems” and drew a relatively firm line between the “literate” and “information illiterates”.

In 1983, report of the seminar titled: “Nation at Risk” revealed the imperativeness of educational reform in the United States. This led the American Library Association (ALA) to gathered a decorated panel of National Educators and Librarians in 1987. It led to the commissioning of the ALA Presidential Committee on Information Literacy. This committee was charged with the tasks to:

- a. Define information literacy within the higher literacies and its importance to student performance, lifelong learning, and active citizenship;*
- b. Design one or more models for information literacy development appropriate to formal and informal learning environments throughout people’s lifetimes; and*
- c. Determine implications for the continuing education and development of teachers.*

In 1988, the A.L.A. Presidential Committee established the National Forum on Information Literacy under the leadership of Dr. Patricia SennBreivik. It was a volunteer network of organizations committed to raising public awareness on the importance of information literacy to individuals, communities, the economy, and to engage citizenship participation in the information literacy challenge.

On the 10th of January 1989, the Presidential Committee on Information Literacy released a report which was finally named the “Presidential Committee on Information Literacy: Final Report.” It emphasized the importance of information literacy, opportunities of cultivating information literacy and an information age school.

Later that year, the recommendations of the Presidential Committee in that report led to the formulation of the National Forum on Information Literacy. The Forum is a congregation of more than ninety National and International Organizations.

During this time, the interest of nations on information literacy was dearth and the concept was not witnessing any significant changes due to lack of its awareness and inadequate formulation of frameworks to enshrine its standardized practices. This trend was gradually changing but persisted till 1996, when the interest of other nations on information literacy had been remodeled and shaped.

After several previous efforts on the standardization of information literacy, Bundy (2004) reported that Australian and New Zealand (AusLib) Press in Adelaide, Australia published “The Seven Faces of Information Literacy” by Dr. Christine Bruce in 1997. It was an award winning doctoral research, which has attracted worldwide interest and usage by providing a theoretical and phenomenological approach to information literacy research.

In 1998, the American Association of School Librarian (AASL) and the Association for Educational Communications Technology (AECT) published “Information Power: Building Partnerships for Learning.” It further created specific goals for information literacy education, defining some nine standards in the categories of information literacy, independent learning and social responsibility (AASL and AECT, 1998).

In the same year also, as recalled by Bent (2007), the Final Report of the Presidential Committee on Information Literacy was produced. Six main recommendations of the original report were analyzed; areas where it has made progress and where they still needed to be worked on were examined. The updated Report emphasized the importance of information literacy and supported continuous advocacy for it.

The efforts of the United States Librarians and Educators on information literacy were awakening the interest of other countries on information literacy at the global context. The passion of other nations' Librarians and Educators on information literacy was ignited, which facilitated initiation and collaborations on programs that would stimulate the interest of information literacy skills.

In 1999 in the United Kingdom, "The Seven Pillars of Information Literacy Model" was published by the Society of College, National and University Libraries (SCONUL). The model was to further facilitate development of ideas amongst practitioners in the field, ...stimulate debates about the ideas and how those ideas might be used by library and other staff in higher education concerned with the development of students' skills towards an information literate society.

In 2001, the president of the Australian Library and Information Association (ALIA) developed, initiated and endorsed the association's "Statement of Information Literacy for All Australians."

By 2003, the importance of information literacy was gaining global prominence. This propelled the United Nations Educational, Scientific and Cultural Organization (UNESCO), together with the National Forum on Information Literacy (NFIL) and National Commission on Libraries and Information Science (NCLIS) to sponsor an international conference to discuss the importance of information literacy at global context. The conference was held in Prague and attended by representatives of twenty countries.

The conference resulted in Prague Proclamation which described information literacy as a "key to social, cultural, and economic development of nations and communities, institutions and individuals in the 21st century," and also declared its acquisition as "part of the basic human rights of lifelong learning.

In 2004, the second edition of Statement on Information Literacy for All Australians was coordinated by Alan Bundy and released with new title: "Australian and New Zealand Information Literacy Framework; Principles, Standards and Practice." In that same year, two studies were conducted in Scotland by Drumchapel Project and Glasgow Caledonian University Students and its Alumni. The former concentrated on the information communications technology (ICT) skills of pupils in deprived area of Glasgow (McLelland and Crawford, 2004), whilst the later looked at the link between the use of electronic information services and information literacy (Crawford, De Vincente & Clink, 2004).

The Drumchapel Project, as revealed by Irving (2011) found out that school pupils were not acquiring basic information literacy skills which they could either develop further at university, or use in the work place for leisure purposes. It further suggested the need for an information literacy strategy that would link secondary and tertiary education.

In 2006, the International Federation of Library Association and Institutions (IFLA) released its own Information Literacy Guidelines. According to Lau (2006), the guidelines was released after it was publicly reviewed from September 2004 to March 2005. Jesus Lau, the Chairman of IFLA Information Literacy Section chaired the reviewing of the document and titled it: "Guidelines on Information Literacy for Lifelong Learning." The guidelines were published with the aim of providing a pragmatic framework for professionals who need or are interested in starting an information literacy program.

According to Brown (2012), the Executive Order S-06-09 signed by the Governor of California, Arnold Schwarzenegger to established a California Digital Literacy Leadership Council, which in turn was later directed to established an ICT Digital Literacy Advisory Committee and the proclamation of

October 2009 as the National Information Literacy Awareness Month by Barrack Obama rose the concept to national consciousness in the United States.

On the 8th of September 2010, the Welsh Information Literacy Project (WILP) was officially launched to mark the UNESCO International Literacy Day of that year. The project was aimed at promoting information literacy in Wales and to provide a consistent framework for the progression from school to university and lifelong learning (WILP, 2010).

In 2013, the De La Salle University organized its first information literacy campaign. This is precipitated by the recommendations of the Philippine Accreditation Association of Schools, Colleges and Universities (PAASCU), “on creative awareness about the availability of the user education program to other research-oriented classes.”

From the histories reviewed, it can be observed that only the developed societies, as the major actors, have considered the place of information literacy on their social advancements. This means that the developing or underdeveloped ones are still struggling to formulate or adopt information literacy framework that will be suitable to their societal needs by impacting positively on the lives of their citizens.

CONCEPT OF INFORMATION LITERACY

Information literacy is the minimum but complementary competencies of identifying when there is need for information, understanding the sources for finding information in requires formats or media, evaluating and using information in compliance with ethical and legal requirements. However, there is no yet a single authoritative definition for the concept. The most acceptable definition of the concept was the one expressed in the 1989 American Library Association Presidential Report:

To be information literate, a person must be able to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information. Ultimately, information literate people are those who have learn how to learn. They know how to learn because they know how information is organized how to find and how to use information in such a way that others can learn from them. They are people prepared for lifelong learning because they always find the information needed for any task or decision at hand.

The information literacy, sometimes referred to as information competency, is generally defined as the ability to access, evaluate, organize and use information from a variety of information sources. Being information literate requires knowing how to clearly define a subject or area of investigation formulate a search strategy that takes into consideration different sources of information and the variables that information is organized, analyzed the date collected for value relevancy, quality, suitability and subsequently turn information to knowledge (Ana, 2005).

The concept of information literacy encompasses a number of competencies. An information literate person must be able to recognize the need for information, formulate questions based on needed information, recognize that accurate, relevant and complete information is the basis for intelligent decision making, identifying potential sources of information, develop successful search strategies, access sources of information from all media, evaluate information, organize information for practical application, integrate new information into an existing body of knowledge and use information in critical thinking and for problem solving.

According to Ode and Ape (2016) information literacy is a necessary skill that is utilitarian in every aspect of person's life. For students, information literacy will lead to independent and student centered learning rather than dependence on the teacher to provide answers to questions or problems that they encounter. This in turn creates a greater responsibility towards their own learning which will help them become dynamic learners and thinkers who are creative, analytical and efficient instead of mere regulators of facts (Sasikala and Dhanraju, 2011).

Information literacy as a prerequisite for lifelong learning and independent decision making should not be misconceived with other form of literacies - digital, computer, library, research, health, legal, etc. It is a set of competencies that has to do with optimization of information generally; whereas other literacies are either restricted to optimization of information in a particular concept or idea.

Although, information literacy surfaced towards the end of the 20th century, but it has given birth to other literacies (library, research, health, financial, legal, computer, media, digital, etc) of the 21st century. It should be noted that when other literacies are changing due to either educational, social, political, technological or environmental context, information literacy has the potential to maintain the stead.

It can be concluded that information literacy is all encompassing because it has contained all other literacies. Because of the techniques that accompanied information literacy, it can be noted that information literacy is connected to problem solving, lifelong learning, decision making, and it is the basis for knowledge society or economy.

QUALITIES OF AN INFORMATION LITERATE PERSON

An information literate person is an individual that must possess some certain qualities of efficient and effective handling of information. These qualities are skills, techniques, competence or abilities in identifying the need for information, search and locate information through efficient sources, apply information for the betterment of humanity and advancement of knowledge, and also appreciate the sources or scholars that created the information he or she is using.

Among other things, an information literate person will possess the following qualities:

- Research and in-depth knowledge enquiry skills,
- Critical thinking skills,
- Problem solving skills,
- Lifelong learning skills,
- Interpretative and inferential skills,
- Information evaluative and analytical skills,
- Appreciate the cost, value and quality of information,
- Acknowledge information as the basis for efficient and effective decision making,
- Have respect for other people's beliefs, opinions, positions, statements and assertions,
- Recognition of legal and ethical aspects of information use, etc.

COMPONENTS OF INFORMATION LITERACY

Information literacy as a set of skills have varied competencies that are cutting across different aspects of efficient and effective optimization of information. These skills become the distinct components of information literacy, which are at various levels revealing the abilities of an information literate individual.

Information literacy components are:

- Identify
- Find
- Evaluate
- Apply
- Acknowledge
 - **Identify:** An information literate individual will always possess the skills to know when information is required, consciously point out when information is needed and know where information is housed, stored, kept or documented. This is concerned with realizing the gap that only information can fill its space.
 - **Find:** This skill implies that an information literate individual is having the understanding and techniques of sourcing, searching or locating information in desired format, irrespective of where it is housed or stored.

After identifying the need for information and information that is needed, an information literate individual must possess the skill to find it. This involves acquainting him or herself with information searching tools like catalogues, indexes, abstracts, bibliographies, URLs, etc.

- **Evaluate:** This component of information literacy has to do with examination or assessment of information in order to ascertain and determine its relevance, timeliness and accuracy to the context on ground. This component involves the ability to analyze information content, details and facts in it; and logically justify its consistency with the point of discuss and context.
- **Apply:** This component implies the ability of using information to achieve desired objective or goal. An information literate individual will not only have fact and details about context alone, he or she will also attach them to the issues on ground in order to either solve problem or add new thing to knowledge without contravening any law or procedure.
- **Acknowledge:** This component has to do with the ability of an information literate person to appreciate and recognize other people for their intellectual works he or she have used. This means that when facts or details that are not directly his or her own are used for one or other purpose, he or she have to validate his or her work by attributing merits that are associated with such works to the genuine owner(s) of the information.

BENEFITS OF INFORMATION LITERACY

Information literacy skills are invaluable to someone's development as a lifelong learner because they promote independent learning and sharpening critical thinking in line with the ultimate aim of emancipating rather than domesticating the learner.

Information Literacy

- **Life-Long Learning:** The concept of lifelong learning was first employed in 1920s by John Dewey, Edward Lindeman and Basil Yeaxle, starting out from the idea that it is a continuous part of everyday life. Lifelong learning is defined by Komisyonu (2016) as learning activities undertaken throughout life, which results in an improvement in knowledge, skills and competencies within a personal, civic, social and/or employment-related perspective.

UNESCO (2009) suggested that every nation should develop information literacy initiatives in the four key domains of education, health, business, as well as citizenship, so that their citizens can perform competitively and productively in the 21st century global information society. Information literacy skills are considered as the important basis for lifelong learning in the age of knowledge based economy because it enables individuals to learn accordingly as they are growing in life.

- **Problem Solving:** Problem solving is the process of designing, evaluating and implementing strategies to answer questions or achieve a desired goal. It is closely related with information literacy skills because they both contribute to individual success. Because so much information is readily available, finding high-quality, credible information can be challenging. Using information that is outdated, of poor quality or biased can result in solutions that fail or decision that are wrong.

Information literacy is of benefit to individual because in unfavorable conditions, it helps them in formulating, assessing and implementing strategic answers as solutions to achieving desirable goals.

- **Avoiding Plagiarism:** Information literacy helps in reducing plagiarism, which has become an important issue in recent years. Without sufficient information literacy skills to handle record and use information well, individuals are prone to committing plagiarisms.

Information literacy helps an individual to identify reliable information, so that they can be able to organize, synthesize and communicate it through paraphrasing, summarizing and quoting. It helps in understanding the ethical and legal restrictions of the use of published, confidential and or proprietary information.

- **Social Citizenship:** W.I.L.P. (2010) explained that in society at large; information literacy is increasingly at large important for effective democracy as the public must be able to seek and compare information and to evaluate its source and content. Information literacy is highly essential to developing effective citizenship skills for education and for life because the nexus of social interaction in a polite, decent and respectful manner is based on awareness to information about social and civic engagements.

- **Digital Inclusion and E-Safety:** Information literate person can find and exchange information using digitally included and empowered platform in a position to benefit from financial, economic and social advantages that internet can offer with thorough observation to privacy or disclosure of personal details that may later hamper his or her personality.

LIMITATIONS TO INFORMATION LITERACY

Despite Zurkowski's call as long ago as 1974 for national and strategic approaches to the development of information literate students and citizens, most governments have until recently been less than wholehearted on their commitment to this goal. In recent years, there has been a flurry of aspirational policies and national agendas about becoming information economies and learning societies, and even some tentative advocacy for information literacy (Wuthami, 2009).

However, few of many national governments have committed to major educational or social initiatives that would see widespread adoption of information literacy training or assessment for their populations. Most initiatives tend to be piecemeal, in general aimed at limited sections of the populations, such as school children, university students, library and information specialists, or those already within or wishing to enter workforce.

The major challenges to information literacy skills are:

- **Lack of Clear Information Literacy Policy Delineating Roles and Responsibilities:** The lack of clear policy guidelines to formally bring the roles and responsibilities of information literacy together leads to uncoordinated initiatives like communication skills course, where librarian play a fringe role. Amunga (2007) noted that a lack of clear information literacy policy is the key challenges to information literacy collaboration.

Mwangu (2007) observed that "the lack of information literacy related policy in local academic institutions fuel the conflicts between librarians and lecturers, as well as cementing negative attention of users..." A clear policy would not only iron out such, but would also state clearly the scope of who to teach what, where and when it should be mounted with specific objectives.

Without clear directives on the teaching, learning and impacts of information literacy, it will be difficult for various authority to gain control of their subjects and foster harmonious understanding with them.

- **Attitudes of the Citizens Towards Information Literacy Programs:** The lack of cooperation between citizens and institutions that should be impacting information literacy is a critical challenge. Even in a semblance of policy, individuals failed to attend their prearranged sessions (as noted by Amunga, 2007).

This implies that in some cases, where information literacy skills imparting institutions have consistent and coherent information literacy program, citizens always restrained from learning it.

- **Attitudes of Library and Information Practitioners Towards Information Literacy Collaboration:** Some Librarians and Information Practitioners are not collaborating among themselves to offer comprehensive information literacy training to users, students or citizens. It can be concluded that if there is no synergy within the Library and Information Practitioners involved in information literacy, the initiative will never take off and the vicious cycle of poor service and negative attention towards information literacy will persist.

- **Attitudes of Lecturers and Educators Towards Information Literacy Collaborations:** Albrecht and Baron, (as cited in Vander Walt et al, 2007) lecturers and educators are no longer instructors of information but teachers of information. Poor attitudes from both lecturers and educators are another major impediment to information literacy.

Positive attitudes of educators and lecturers to information literacy will serve as frontier of coalition on the students, who may be unwilling to accommodate and learn the educational role of information literacy.

CONCLUSION

Information literacy is not a concept that is restricted to either library or educational role alone. It is a concept that encompasses other competitive advantages in exploiting information in educational, cultural, social, economic, political and technological contexts, by empowering and enhancing individual competencies to identify the need for information, search, evaluate, access and use information in any media with respect to legal and ethical tenets.

In the global context, various stakeholders have worked together through collaborations, corporations and dialogues to formulate and develop frameworks, models, principles and guidelines that will standardized information literacy practices. Those societies, organizations or institutions that have adopted these standards are witnessing growth at personal level, which in the end is impacting their collective development in various spheres of their lives and also deepening societal advancement.

In line with these benefits, it is clear that information literacy is akin to cultivating 'learning to learn' skills in individual's lifetime; assist in strengthening both critical thinking and information interpretative skills, which are potent forces to personal and professional development with positive influence on economic and social well-being.

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KEY TERMS AND DEFINITIONS

ALA Presidential Committee: This was a body of individuals constituted in 1987 by government of the United States and charged with the responsibilities of defining, designing and determining some issues about information literacy.

Information: This is the end product of processed and analyzed data, which contained meaning when communicated.

Information Literacy: It is the minimal but complementary abilities, skills or competencies of identifying when there is need for information; understanding the sources for finding and techniques of evaluating information, and using information in compliance with ethical and legal requirements.

Information Literacy Components: These are the distinct skills, techniques or abilities of information literate individuals, which at various levels indicating how information literate individuals can optimize information for desired purpose.

Information Literacy Instructors: These are practitioners in the information industry. These people are saddled with the responsibilities sensitizing and imparting information literacy skills on the citizens.

Information Literacy Qualities: These involve the skills of an information literate individual to efficiently and effectively handle information for desired purpose.

Information Literacy Standards: These are tested, proven and acceptable guidelines, principles, frameworks or models formulated and implemented by bodies or stakeholders concerned with information literacy.

Lifelong Learning: It is the ability of an information literate individual to make quest for learning, improving his skills, competencies and techniques as ways of living for a lifetime.

Literacy: It is the ability to possess minimum level of orientation about something. It involved a set of skills to identify, examine and decide in a particular situation or context, what is to be done to achieve desired result.

Zurkowski, P. G.: He was the Chairman of the Software and Information Industry Association, who used the term to differentiate between “literate” and “information illiterates” in a report he prepared on behalf of the National Commission on Libraries and Information Science.

Chapter 13

Is the Indian Library and Information Science Research Interdisciplinary?

A Case Study Based on the Indian Citation Index Database

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ABSTRACT

This chapter is an attempt to map the interdisciplinary nature of Indian library and information science (LIS) research. For this purpose, citation information of 28 Indian LIS journals is considered from Indian Citation Index (ICI) database. ICI is a bibliographic and citation database of research journals published from India. In order to understand the anatomical pattern of citations, social networking software UCINET is used to map the citation network. The result shows that self-citations (about 23%) are the prevalent pattern of citations among Indian LIS journals. Beside this, citation pattern at large is confined to the subject of LIS (about 93%) area. Further, the analysis also shows that about 7% of articles are cited from non-LIS journals. However, citations of non-LIS fields are from a closely related field, for example, general science and technology, computer science, and so on. Thus, it can be concluded that Indian LIS research does not show true interdisciplinary nature.

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INTRODUCTION

Library and Information Science (LIS) as a subject is highly interdisciplinary in nature. Since the institutionalization of the subject as a scholarly field, it has undergone many changes in its comparatively short history (Prebor 2010). It has evolved dynamically and does not confine only to traditional aspects of LIS, like the collection, storage, retrieval, transmission, use and diffusion of information (Palmer 2010).. The area has grown tremendously, encompassing many other subject areas of Science, Social Science and even Humanities (Aharony 2011). Saracevic, (1999) defines information science as “...is a field devoted to scientific inquiry and professional practice addressing the problems of effective communication of knowledge and knowledge records among humans in the context of social, institutional and individual uses of and needs for information. in addressing these problems of particular interest is taking as much advantage as possible of the modern information technology”. Further, Saracevic (1999) categorize the subject with three general but distinct characteristics. Firstly, the LIS is interdisciplinary in nature. The field has very dynamic relations with another universe of knowledge, and this relation is gradually but steadily changing. Secondly, the information science field is closely associated with information technology (IT). With the evolution of IT, particularly the Web technologies have a tremendous consequence on the various aspects of the LIS field. Thirdly, this field is an active ingredient in the onset of the information. Further, Information science has a strong social and human dimension, which is above and beyond technology (Saracevic 1999). With these unique characteristics, Information science of today is not only of the ‘explicit paradigm’ of the study of the selecting, gathering, organizing, accessing and retrieving information that is the usual description of the field but also has many ‘unarticulated, but important, elements’ which are “below the water line” (Bates 1999).

With this brief background, this study attempts to gauge the interdisciplinary nature of the LIS research in India. The interdisciplinary nature of the LIS research is captured in this study through examining the citations received by the Indian LIS journals for a period 2004 to 2018 (15 years) from Indian Citation Index (ICI) database. The chapter is divided into the following sections. Section 1 deal with the introduction of this study. Section 2 is the background literature review section discusses the interdisciplinary nature of the LIS field in the international context. Section 3 is research questions; Section 4 is objectives of the study; Section 5 discusses the methodology and limitations of the study. Section 6 deals with the major findings. Section 7 deals with the results along with the major findings of the study. Finally, concluding remarks, discusses policy issues and further research.

BACKGROUND

Abundant literatures are available which deals with the interdisciplinary nature of the LIS subject. Many studies have defined the field and inspect the links, relations of the subject with the other universe of knowledge. Empirical observations tried to map other fields’ influence on library science. Some scholars have defined overlapping boundaries between the information science with that of other scholarly fields. However, there are two contrasting views on the nature of the subject. Many of them had contested the interdisciplinary nature of the LIS filed. The empirical observations of 1970’s to 1990s; for example, Broadus (1971) found that library science theses and dissertations had a general tendency to cite more within their own discipline rather than to other disciplines (Peritz 1981). Scholarly literature in the field had a similar experience. Earle and Vickery (1969) defined this citing phenomenon as “self-citation” (Earle

& Vickery 1969). LIS authors cited their own literature and self-citation was the most prevalent among the LIS Scholars (Bracken & Tucker 1989). Buttlar (1999) looked at LIS studies conducted in the years 1994–1997 and found that approximately half of the citations appearing in the studies referred within the field. It is evident from this empirical evidence that during that period LIS research was less interdisciplinary. Also, in comparison to other social sciences fields, library science research was rather close, insulated and the discipline was confined within its own territory. The researchers did not even refer to related research from other social science disciplines (Gatten 1991). So being a close discipline, the field was very limited or no influence on other disciplines (Tang 2004).

However, this paradigm changed by the late 1990s and during the early 2000s. Now LIS is definitely an interdisciplinary field. This hypothesis has been substantiated by numerous empirical observations. Now the field is closely linked with the different Social Science, Science and Humanities disciplines (Buttlar 1999). An empirical investigation by Thang (2004) analyzed the citations to 150 publications in the LIS field. The study supported the assertion that the field has reached its scholarship maturity. The subject is now highly interdisciplinary in nature and attracting learned interests from a variety of disciplines from the domains of science, social science, and the humanities. He also further claimed that LIS research had an “abundance of intellectual substances that are of interest to multiple extra disciplines, including computer science, communication, education, and management science” (Tang 2004).

With the evolution of IT, particularly with the high computational power at low cost, the LIS profession, as well as the research in the field, has undergone many substantial changes and developments. The interdisciplinary nature of the subject is further pronounced. At the same time, scholars from various disciplines, especially from the computer science fields started contributing articles to LIS journals (Meyer & Spencer, 1996). As a result, the percentage of LIS citations and interest in the field had also increased. This has been further evidenced by Odell & Gabbard (2008) using the citation data from Journal Citation Reports (JCR) during the 1996–2004 periods. The study found an increase in the number of LIS journal citations by non-LIS journals. It also observed an interesting fact that the JCR listed journals that put greater emphasis on IT fields and less emphasized on traditional librarianship received more citation and wider interdisciplinary readership (Odell & Gabbard 2008). All these studies have asserted the interdisciplinary nature of information science. So, it can be said that the interest in the field by professionals from various and related areas is undoubtedly on the rise (Prebor, 2007).

Research Questions

It is discussed in the literature review section, that many studies have observed the interdisciplinary nature of the LIS field in the international context. Though, in the initial years of the formation of the subject, the ‘self-citation’ has been prevalent among LIS scholarly journals. However, with the time, the LIS field has emerged as an interdisciplinary field. Many empirical studies have substantiated this fact. The emerging areas are cited more than the traditional areas of LIS. Before this study, the literature investigating the interdisciplinary nature of LIS subject in India is not available. Hence, the probable research questions in this context can be drawn up from the literature review. These questions can be (1) What is the nature of citation pattern of Indian LIS journals? (2) Who are the major actors citing LIS articles published in LIS journals? (3) How do LIS journals cite beyond their subject boundary?

OBJECTIVES

To address the research questions raised above, the objectives of this study is to analyze the citation pattern of 28 LIS journals published from India. Also, the study will identify major journals and their citation pattern. Further, the citation map will be drawn up using social networking software to measure and identify the centrality of different actors. Finally, the study will examine the pattern of citations outside the LIS field.

METHODOLOGY

Journals are important for scientific & scholarly communication. A scientific publication (in print or electronic form) is a kind of written material that contains information with respect to scientific activities. In assessing scientific performance, bibliometric, and citation indicators are important measures of scientific literature. Hence, journals are the carrier of new ideas, methods, research patterns, etc. pertaining to discipline or otherwise. Therefore, a careful evaluation of periodical/journals literature may indicate a complete anatomical picture of the discipline, the profession with which it represents, and everything connected with them (Davarpanah and Aslekia, 2008). So, to examine the interdisciplinary nature of LIS subject in India, this study analyzes the citations received by the selected 28 LIS journals published from India.

Indian Citation Index

With the growth of interdisciplinary academic and sponsored research programs across all major disciplines, there is an unprecedented increase in scholarly literature from India. Although, there are two globally available citation databases (Web of Science, and Scopus), wherein the coverage of journals of Indian origin relatively very less. Primarily, these two citation databases index journals, largely published from developed western countries. Therefore, these citation databases can be tagged as ‘western biased’. Although Google Scholar covers many Indian journals in LIS field, but the poor indexing (for example it searched authors self-archives, etc.), incoherent and inconsistent nature of the database render it unsuitable for reliable citation analysis tool for Indian LIS journals (Jacso 2012, Patra, 2014). Looking at above-mentioned shortcomings of these databases, ICI is an initiative to come over the limitations. ICI is a multidisciplinary citation database which covers all disciplines, i.e., science, technology, medicine, agriculture, social science, and humanities. The database covers multidisciplinary knowledge contents solely from Indian scholarly journals. So, it is a web-based citation database of Indian journals mainly focused on India based research publications (Giri & Das 2011). According to ICI website, till February 2018, the database covered about 1,154 journals published from India and indexed ~ 699,123 research articles. Currently, the ICI database covered articles from 2004 onwards. The contents of ICI are organized in 12 subject groups and 51 main subject classes.

LIS journals which are indexed in ICI are selected for this study. There are 28 journals in LIS subject category indexed in ICI. These journals are: *Annals of Library and Information Studies*; *DESIDOC Journal of Library & Information Technology*; *DESIDOC Bulletin of Information Technology*, *SRELS Journal of Information Management*, *IASLIC Bulletin*, *Library Herald*, *Information Studies*, *Pearl: Journal of Library & Information Science*, *Collnet Journal of Scientometrics and Information Management*, *Library*

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Progress (International), International Journal of Information Dissemination and Technology, Journal of Library and Information Science, Kelpo Bulletin, Indian Journal of Information, Library & Society, World Digital Libraries, International Journal of Information and Computing Science, International Journal of Information Processing, Journal of Digital Information Management, Gyankosh- the Journal of Library and Information Management, Journal of Information Management, International Library Movement, International Journal of Advanced Library and Information Science, International Journal of Digital Library Services, Journal of Library and Information Technology, Indian Journal of Library and Information Science, Electronics Information & Planning, International Journal of Information Sources and Services, International Journal of Library and Information Management. The data for a time span from 2004 to 2018 is collected from the online version of ICI and stored in MS Excel for further analysis.

Limitations of the Study

As per the scope of ICI database, it indexes journals published from India only. Also, in ICI, citations received from Indian LIS journals or other Indian journals or sources only are taken care of. Besides this, the publications, as well as citations received by Indian journals, are for the period of fifteen years (2004-2018). It is widely accepted that LIS is a multidisciplinary field and it is influenced by other subject areas particularly in this Information Technology (IT) era. The post-1990's and the year 2000 (the year of Y2K revolution) has shown a massive impact of the IT revolution world widely including Indian society. Hence, the literature published before 2004 (the year from where ICI started indexing Indian literature) is certainly a missing component. Accordingly, the influence on LIS by other subject fields before and after the IT revolution could not be captured for this study.

RESULTS

Downloaded data of 28 LIS publications are stored in MS Excel for further analysis and examination of publication trend and citation pattern. The citation network map is drawn to plot the linkages of journals. UCINET 6 software package (including NETDRAW) is used for journal citation network analysis. This UCINET software is developed by Analytic Technologies (Borgatti et al., 2002). Another software, VOSviewer, a freely available computer program, is used for mapping subject research areas. VOSviewer is a special bibliographic software that pays special attention to the graphical representation of bibliometric maps (Eck & Waltman, 2010). The results are discussed in the following sections.

Citation Trends

The overall citation pattern of the sample journals during the study period shows that *SRELS Journal of Information Management* (694 articles) has the maximum number of publications followed by *DESIDOC Journal of Library & Information Technology* (585). *Annals of Library and Information Studies* is in the third position with 463 articles. Table 1 shows the list of journals taken for this study indicating the corresponding number of publications (articles), citations received, citation per article, and self-citations.

It is evident from Table 1, that Indian LIS journals are receiving fewer citations. Except for two journals, i.e., *Annals of Library and Information Studies*, *DESIDOC Journal of Library & Information Technology* and *DESIDOC Bulletin of Information Technology*, rest have less than one citation per articles. This

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Table 1. Publication and citation pattern of selected LIS journals

SI No.	Publication	Number of Articles	Number of Citations	Citation per Paper	Number of Self-Citations	Percentage of Self-Citation
1	Annals of Library and Information Studies	463	1144	2.47	200	17.48
2	DESIDOC Journal of Library & Information Technology*	585	709	1.21	183	25.81
3	SRELS Journal of Information Management	694	498	0.72	143	28.71
4	DESIDOC Bulletin of Information Technology*	75	156	2.08	21	13.46
5	IASLIC Bulletin	281	138	0.49	17	12.32
6	Library Herald	322	131	0.41	17	12.98
7	Information Studies	173	107	0.62	22	20.56
8	Pearl: Journal of Library & Information Science	428	105	0.25	22	20.95
9	COLLNET Journal of Scientometrics and Information Management	229	99	0.43	32	32.32
10	Library Progress (International)	310	89	0.29	36	40.45
11	International Journal of Information Dissemination and Technology	285	68	0.24	24	35.29
12	Journal of Library and Information Science	142	37	0.26	5	13.51
13	Kelpro Bulletin	244	36	0.15	14	38.89
14	Indian Journal of Information, Library & Society	310	31	0.10	14	45.16
15	World Digital Libraries	99	21	0.21	3	14.29
16	International Journal of Information and Computing Science	103	14	0.14	7	50.00
17	International Journal of Information Processing	372	13	0.03	4	30.77
18	Journal of Digital Information Management	204	13	0.06	8	61.54
19	Gyankosh- The Journal of Library and Information Management	99	8	0.08	2	25.00
20	Journal of Information Management	56	6	0.11	0	0.00
21	International Library Movement	207	5	0.02	2	40.00
22	International Journal of Advanced Library and Information Science	36	3	0.08	1	33.33
23	International Journal of Digital Library Services	125	3	0.02	1	33.33
24	Journal of Library and Information Technology	133	2	0.02	1	50.00
25	Indian Journal of Library and Information Science	38	1	0.03	0	0.00
26	Electronics Information & Planning	23	0	0.00	0	0.00
27	International Journal of Information Sources and Services	119	0	0.00	0	0.00
28	International Journal of Library and Information Management	24	0	0.00	0	0.00
	Total	6179	3437	0.56	779	22.67

* These are the same journals. DESIDOC Bulletin of Information Technology changed its name to DESIDOC Journal of Library & Information Technology. ICI database indexed both the journals with different names. So, these are dealt as separate journals.

corroborates global trend that LIS journals are less cited than other fields of social sciences. However, the finding is inconclusive because the citations received are confined to journals published from India only. Perhaps the citations data beyond the Indian journals, may reflect complete and clearer picture.

Subject-Wise Distribution of Citations

During the study period (2004-2018) these 28 journals cumulatively published 6,179 articles (Table 1). These articles altogether received 3,437 citations (average 0.56 citations per paper). Among these total citations, 779 articles are self-citation (about 23 percent). These citations (3,437) are coming from 120 journals. In case, we exclude sampled 28 journals taken for this study, the rest citations spread in 92 journals. The subject wise breakup of journals is as shown in Table 2. The name of the journals is given in Table 4.

Table 2 shows that among the total 3437 citations 3,190 articles (about 93 percent) are cited in LIS related journals. The finding and analysis show that LIS journals taken for this study, in the majority, are getting citations from LIS journals only. Thus, based on this study, it can be concluded that Indian LIS community is very close and endemic one and confined to a few actors. There are very limited citations beyond the community.

Network Analysis

Network Analysis has received considerable attention in various scholarly disciplines ranging from sociology, economics, and biology to computer science and telecommunication (Newman 2003). For social scientists, the theory of networks has been a gold mine, yielding explanations for social phenomena in a wide variety of disciplines (Borgatti et al. 2009). The field has started developing since the 1970s along with the scientometrics as a specialized field (Leydesdorff, 2007).

A social network is a set of individuals or groups each of which is in connections of some kind with others. In social network analysis (SNA), the people or groups are called 'vertices', 'actors' or 'nodes' and the connections among them are termed as 'edges', 'ties' or 'links'. Both actors and ties can be defined in various ways depending upon the research questions. An actor can be a single person, a team, or a company. A tie could be an authorship collaboration between authors, citation of a scholarly work, the friendship between people, collaboration or common member between two teams, or a business relationship between companies and so on (Abbasi et al. 2012).

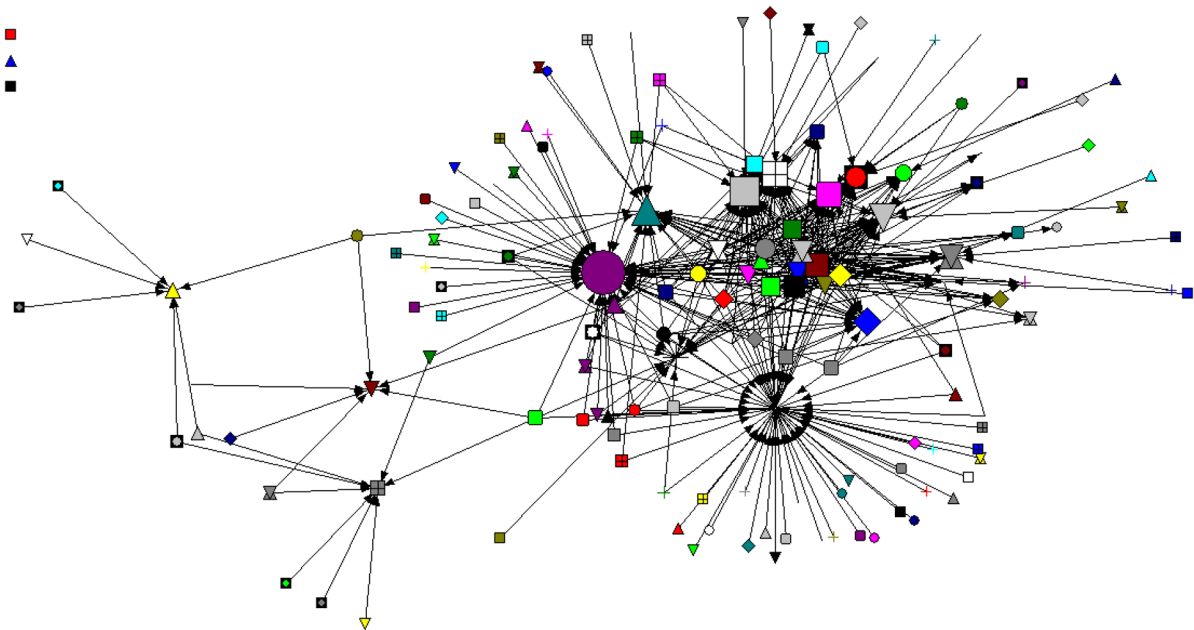
Cooperation network represented in a graphical form can be examined from a macro- (network-centered) or a micro- (actor-centered) perspective. The macro-structure of a graph is about the social structure that arises out of the 'physics of its connections'. The micro-structure of a network is about the individual actor level characteristics that shape their behavior within the network. For example, an actor with many more connections may be more influential and have a higher social status (Li-chun et al. 2006). The network structure of this study will focus more on the micro-perspective rather than the macro-perspectives. The micro-perspective of the network will look at the different centrality measures, i.e., degree centrality, closeness centrality, betweenness centrality and Eigenvector Centrality. According to Freeman (1979, 1980), centrality is an important structural factor influencing leadership, satisfaction, and efficiency. To quantify the importance of an actor in a social network, various centrality measures have been proposed over the years (Scott, 1991). These measures are important to understand the power, stratification, ranking, and inequality in social structures (Wasserman & Faust, 1994; Abbasi et al. 2012).

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Table 2. Subject-wise distributions of journals

Sl. No.	Subject Categories of Journals	Number of Citation	Percentage of Total Citations	Number of Journals	Percentage of Total Journals
1.	Library and information science	3,190	92.81	28	23.33
2.	General science and technology	62	1.80	8	6.67
3.	Management	32	0.93	5	4.17
4.	Others	22	0.64	6	5.00
5.	Computer science and technology	15	0.44	8	6.67
6.	Agriculture	13	0.38	6	5.00
7.	Engineering science and technology	13	0.38	5	4.17
8.	Social science	13	0.38	7	5.83
9.	Biological science	11	0.32	4	3.33
10.	Health science	11	0.32	5	4.17
11.	Computer science and technology library and information science	7	0.20	1	0.83
12.	Biological science health science	4	0.12	1	0.83
13.	Computer science and technology engineering science and technology	4	0.12	4	3.33
14.	Pharmacology and pharmaceutical science	4	0.12	3	2.50
15.	Business and marketing management	3	0.09	3	2.50
16.	Chemistry	3	0.09	2	1.67
17.	Education	3	0.09	2	1.67
18.	Education health science	3	0.09	1	0.83
19.	Agricultural economics research review	2	0.06	1	0.83
20.	Agriculture biological science	2	0.06	2	1.67
21.	Biological science pharmacology and pharmaceutical science	2	0.06	1	0.83
22.	Management social science	2	0.06	1	0.83
23.	Anthropology	1	0.03	1	0.83
24.	Arts and humanities	1	0.03	1	0.83
25.	Arts and humanities education	1	0.03	1	0.83
26.	Biological science biotechnology	1	0.03	1	0.83
27.	Biological science environmental science social science	1	0.03	1	0.83
28.	Computer science and technology management	1	0.03	1	0.83
29.	Education pharmacology and pharmaceutical science	1	0.03	1	0.83
30.	Education psychology	1	0.03	1	0.83
31.	Education social science	1	0.03	1	0.83
32.	Engineering science and technology management	1	0.03	1	0.83
33.	Environmental science	1	0.03	1	0.83
34.	Health science social science	1	0.03	1	0.83
35.	History and philosophy of science and knowledge	1	0.03	1	0.83
36.	History and philosophy of science and knowledge others	1	0.03	1	0.83
37.	Population studies social science	1	0.03	1	0.83
38.	Rural development	1	0.03	1	0.83
		3437	100.00	120	100.00

Figure 1. Citation network of Indian LIS journals



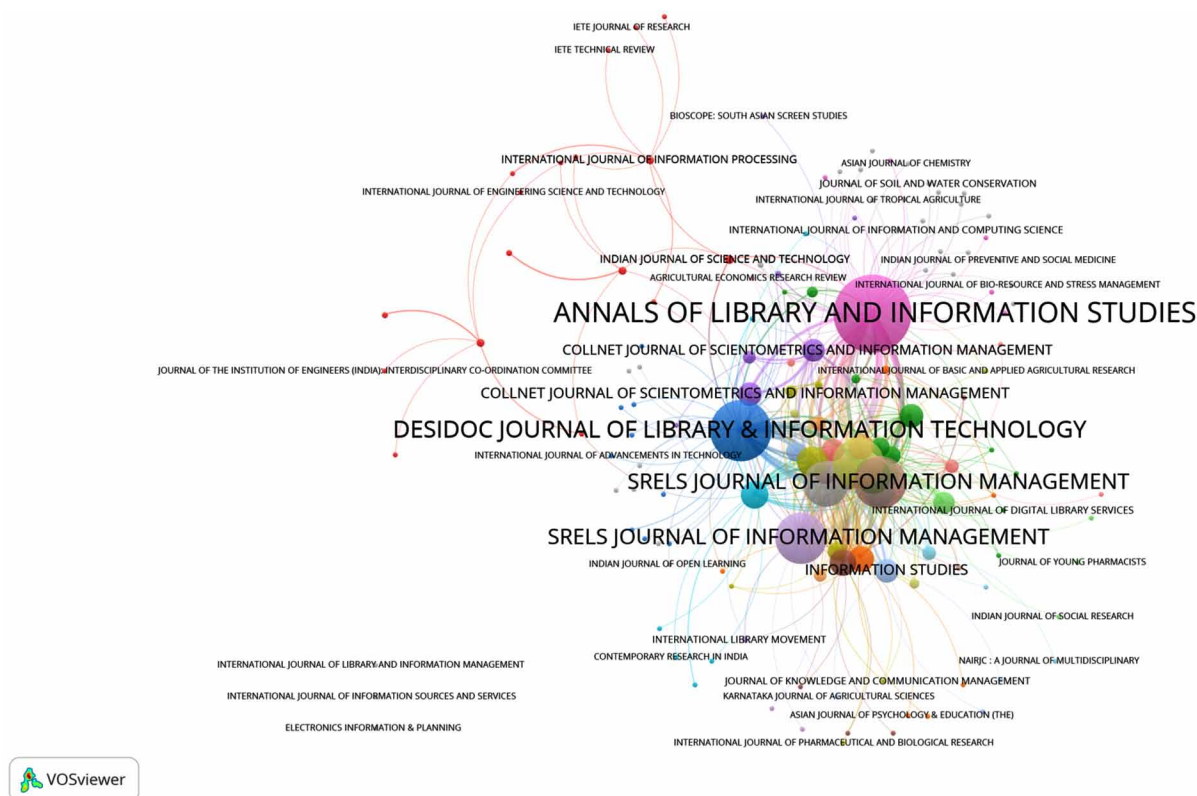
Citation Network

The techniques of social network analysis are helpful to identify the “central” actors in a network, and in this way, prominent journals of a subject can be identified. So, the centrality measure like degree, closeness, between-ness, and eigenvalue are good scaling to measure and find out prominent and important journals. The citations map of 28 LIS journals of Indian origin is drawn using Ucinet 6.375 and NETDRAW as Figure 1, (this includes self-citations).

The whole citation network has 148 nodes and 408 ties among them (Figure 1). The three journals *Electronics Information & Planning*, *International Journal of Information Sources and Services* and *International Journal of Library and Information Management* have not received any citations. So, these journals are not part of the citation network.

Figure 2 shows the density view of the citation network map, and it is drawn using the VOSviewer software based on network data. Figure 2 is another clustering view diagram of Figure 1 wherein points in the map have colors depending on the density of the items at that point. The density view of clustering is useful to get a quick overview of the important areas in a map. Generally, larger numbers of items in the neighborhood of a point show higher weight of the neighboring items.. Conversely, a smaller number of items in the neighborhood of a point shows lower weights of neighboring items (Van Eck & Waltman 2010, 2012).

Figure 2. Density clustering view of citation network



Measures of Centrality

Centrality is one of the most important and widely used conceptual tools to analyze social networks. In two-mode network, the data consist of a correspondence between two kinds of nodes, such as individuals and the events in which they participate (Borgatti et al., 2002; Everett et al., 2005; Borgatti & Everett 2006). Nearly all empirical studies try to identify the four most important factors of centrality. They are; degree, betweenness, closeness, and eigenvector centrality within the network. In this study, these four measures of centrality are calculated using Ucinet social networking software. The centrality measure gives a fair idea which actors (journal) are centrally located within the sample and some indication of the potential flow of knowledge and communication between the actors (Borgatti & Everett 2006). Ucinet software is developed by Borgatti et al. (2002).

The centrality measures calculate the degree and normalized degree centrality of each vertex and give the overall network degree centralization (Borgatti et al., 2002).

Degree Centrality

The degree centrality is the number of neighbors of a vertex. Generally, nodes with a higher degree or more connections are more central to the network and tend to have better ability to influence others (Li-chun et al., 2006). Network nodes with high degrees are often found in dense sections of a network. This produces a dense network because vertices attain more ties to the neighbors (Day, 2011).

As seen from Figure 1 and Table 3 column 2, *Annals of Library and Information Studies* is the most prominent actor with maximum degree. Besides this, the other journals in decreasing values are: *DESIDOC Journal of Library & Information Technology*, *SRELS Journal of Information Management*, *DESIDOC Bulletin of Information Technology*, *Library Herald*, *IASLIC Bulletin* and so on. These journals together have formed a core, and most of the citations are confined among them only.

Betweenness Centrality

Betweenness is a measure of the number of times a vertex occurs on a path between two nodes. It means that particular actor can potentially play an important role in the network by controlling the flow of interactions. These kinds of actors can be viewed as central in a network (Everett & Borgatti 2005). *Annals of Library and Information Studies* have the highest Betweenness (Table 3 column 4) along with the highest degree. The other journals in decreasing betweenness are as follows: *DESIDOC Journal of Library & Information Technology*, *DESIDOC Bulletin of Information Technology*, *International Journal of Information Processing*, *SRELS Journal of Information Management* and *Library Herald*. These journals lie between most of the shortest paths, could be viewed as the central in the network.

Closeness Centrality

Table 3 column 6 shows the closeness centrality of LIS journals in this study. The closeness here can be defined as how close an actor is on an average to all other actors. In this network a journal with high closeness values could be viewed as those journals that can access new information quicker than others. Similarly, information originating from others can be disseminated quickly (Newman 2004; Day et al., 2011). Top 5 actors in terms of closeness are: *International Journal of Information and Computing Science*; *International Journal of Information Processing*, *Indian Journal of Library and Information Science*, *Journal of Digital Information Management*, and *Journal of Library and Information Technology*. Interestingly among all five journals except *Indian Journal of Library and Information Science* rest, other journals are more related towards the computer and information technology areas.

Eigenvector Centrality

Eigenvector centrality is the measure of the importance of a node in a network. A higher eigenvector centrality means the node is important. This is because; either the node is connected to many nodes or is connected to a few very highly connected nodes. The top five journals in terms of Eigenvalue are: *Annals of Library and Information Studies*, *DESIDOC Journal of Library & Information Technology*, *SRELS Journal of Information Management*, *DESIDOC Bulletin of Information Technology*, and *Library Herald*. These journals are important and formed the core of the network of journals.

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Table 3. Centrality measures of Indian LIS citation networks

Name of the Journal	Degree Centrality	Name of the Journal	Betweenness Centrality	Name of the Journal	Closeness Centrality	Name of the Journal	Eigenvector centrality
Annals of Library and Information Studies	64	Annals of library and information studies	4373.28	International journal of information and computing science	1038	Annals of Library and Information Studies	0.193
DESIDOC journal of library & information technology	52	DESIDOC journal of library & information technology	3086.12	International journal of information processing	920	DESIDOC journal of library & information technology	0.182
SRELS journal of information management	29	DESIDOC bulletin of information technology	1376.3	Indian journal of library and information science	894	SRELS journal of information management	0.149
DESIDOC bulletin of information technology	29	International journal of information processing	729.92	Journal of digital information management	888	DESIDOC bulletin of information technology	0.143
Library herald	26	SRELS journal of information management	651.42	Journal of library and information technology	888	Library herald	0.137
IASLIC bulletin	23	Library herald	601.43	International journal of advanced library and information science	882	IASLIC bulletin	0.131
Pearl: journal of library & information science	21	International journal of information and computing science	470.09	International library movement	880	Pearl: journal of library & information science	0.131
COLLNET journal of scientometrics and information management	21	IASLIC bulletin	459.6	International journal of digital library services	878	International journal of information dissemination and technology	0.121
International journal of information dissemination and technology	21	Library progress (international)	454.92	Gyankosh- the journal of library and information management	876	COLLNET journal of scientometrics and information management	0.113
Information studies	19	Journal of digital information management	418.32	Journal of information management	874	Information studies	0.112
Library progress (international)	18	Information studies	398.39	World digital libraries	870	Library progress (international)	0.107
Journal of library and information science	14	COLLNET journal of scientometrics and information management	373.6	Kelpro bulletin	860	Journal of library and information science	0.088
Kelpro bulletin	11	International journal of information dissemination and technology	308.33	Journal of library and information science	852	Indian journal of information, library & society	0.079
Indian journal of information, library & society	11	Journal of library and information science	188.68	Indian journal of information, library & society	850	Kelpro bulletin	0.076
International journal of information processing	8	Kelpro bulletin	151.36	Library progress (international)	844	World digital libraries	0.049
World digital libraries	7	Pearl: journal of library & information science	84.76	Information studies	842	Journal of information management	0.033
International journal of information and computing science	6	Indian journal of information, library & society	20.82	Pearl: journal of library & information science	838	Gyankosh- the journal of library and information management	0.031
Journal of digital information management	6	Journal of information management	7	International journal of information dissemination and technology	830	International library movement	0.028
Journal of information management	5	World digital libraries	5.66	Library herald	828	International journal of digital library services	0.021
Gyankosh- the journal of library and information management	4	International library movement	2.16	IASLIC bulletin	826	International journal of advanced library and information science	0.018
International library movement	4	International journal of advanced library and information science	1.56	COLLNET journal of scientometrics and information management	820	Journal of library and information technology	0.014
International journal of advanced library and information science	3	Gyankosh- the journal of library and information management	1.15	SRELS journal of information management	814	Journal of digital information management	0.008

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Table 3. Continued

Name of the Journal	Degree Centrality	Name of the Journal	Betweenness Centrality	Name of the Journal	Closeness Centrality	Name of the Journal	Eigenvector centrality
International journal of digital library services	3	International journal of digital library services	0.85	DESIDOC bulletin of information technology	802	Indian journal of library and information science	0.007
Journal of library and information technology	2	Journal of library and information technology	0.17	DESIDOC journal of library & information technology	756	International journal of information processing	0.003
Indian journal of library and information science	1	Indian journal of library and information science	0	Annals of Library and Information Studies	732	International journal of information and computing science	0.001
Electronics information & planning	0	Electronics information & planning	0	Electronics information & planning	0	Electronics information & planning	0
International journal of information sources and services	0	International journal of information sources and services	0	International journal of information sources and services	0	International journal of information sources and services	0
International journal of library and information management	0	International journal of library and information management	0	International journal of library and information management	0	International journal of library and information management	0

DISCUSSION

This study is an attempt to map the interdisciplinary nature of LIS research of India. For the analysis, data is extracted from the 'Indian Citation Index' database. ICI is an Indian initiative to construct 'National Citation Index' including all disciplines' journals published from India. Consequently, ICI is the only tool to map the citation pattern of Indian scholarly publications which are not covered in the globally available citation databases like Web of Knowledge or Scopus. The study used different scientometrics and SNA tools to find dynamism in the field. The major finding of this study is, Indian LIS publications are endemic in nature and attract fewer citations. This is contrary to the literature review section, where it is revealed that in the 1970s and 1980s, the citation pattern of LIS research was more global in an international context. Also, the citations outside the field are quite limited. It is found that LIS research has got very few (7%) citations from outside LIS field. 'Self-citation' is also substantially visible (~23%). So, it is established that the Indian LIS research is still in the infancy stage vis-a-vis to the global stage, i.e., before 1980's citation pattern of global LIS research.

There are a couple of top actors (journals) in this field in India and they self-cite a lot and self cites among them. These journals have formed a core group among themselves. It may be possible that these journals are more relevant and publish 'good' quality research in the LIS field, particularly with reference to India. It is mentioned that there are very little citations (7%) from outside LIS subject journals. Most of the outside citations are from computer science subject areas. Computer science and library science are very close subject, rather need integration of respective applications for symbiotic betterment of each other.

CONCLUSION

This study has observed that LIS research of India is not true interdisciplinary in nature in comparison to developed Western countries. Indian LIS research is still in its formative stage of attaining a true interdisciplinary nature. Worldwide IT development could not mark the required impact in the LIS field of India. Probably, Indian LIS research remains immune to the IT revolution and its effective utilization. The study by Odell & Gabbard (2008) is perhaps the most relevant in this context. As it is discussed in the literature review section that the study replicated the earlier works of Meyer & Spencer (1996) and established that LIS journals emphasizing empirical information science research attract a broader interdisciplinary scholar. This is reflected by an increase in about 14 percent citations of the LIS journals by other fields (Odell & Gabbard 2008). So, Indian LIS journals should focus more on the new areas and possibly the computer, Internet technologies, big data and so on rather than sticking to traditional areas. This will give more visibility, citations, and competitive zeal to LIS research of India. However, this study is based on a selected number of journals and based on the database, which has mainly focused on journals published in India. Perhaps another study using ICI database for a similar set of publication in other areas of social sciences may give a clearer picture of the situation to understand the nature of Indian LIS research.

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APPENDIX

Table 4. List of journals citing LIS journals

Name of The Journal	Subject Area
Academicia	Others
African Asian Journal of Rural Development	Rural development
Agricultural Economics Research Review	Agricultural economics research review
Annals of Agri Bio Research	Agriculture biological science
Annals of Library and Information Studies	Library and information science
Annals of Neurosciences	Biological science health science
Asian Journal of Psychology & Education (The)	Education psychology
Asian Journal of Chemistry	Chemistry
Asian Journal of Research in Business Economics and Management	Management
Asian Journal of Research in Chemistry	Chemistry
Asian Journal of Research in Social Sciences and Humanities	Social science
Biosciences, Biotechnology Research Asia	Biological science biotechnology
Bioscope: South Asian Screen Studies	Arts and humanities
COLLNET Journal of Scientometrics and Information Management	Library and information science
Contemporary Research in India	Others
Current Medicine Research and Practice	Health science
Current Science	General science and technology
Delhi Business Review	Business and marketing management
DESIDOC Bulletin of Information Technology	Library and information science
DESIDOC Journal of Library & Information Technology	Library and information science
Economic and Political Weekly	Social science
Educational Quest- An International Journal of Education and Applied Social Sciences	Education / social science
ENVIS Bulletin - Himalayan Ecology	Biological science environmental science / social science
Gyankosh- The Journal of Library and Information Management	Library and information science
IASLIC Bulletin	Library and information science
IASSI Quarterly	Social science
IETE Technical Review	Engineering science and technology
IETE Journal of Research	Engineering science and technology
Indian Journal of Science and Technology	General science and technology
Indian Journal of Social Research	Social science
Indian Journal of Traditional Knowledge	History and philosophy of science and knowledge others
Indian Journal of Agricultural Sciences (The)	Social science
Indian Journal of Gender Studies	Population studies social science
Indian Journal of History of Science	History and philosophy of science and knowledge
Indian Journal of Orthopaedics	Health science
Indian Journal of Preventive and Social Medicine	Health science /social science
Indian Journal of Technical Education (The)	Management/ Social science
Indian Journal of Computer Science and Engineering	Computer science and technology engineering science and technology
Indian Journal of Information, Library & Society	Library and information science
Indian Journal of Library and Information Science	Library and information science
Indian Journal of Open Learning	Education

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Is the Indian Library and Information Science Research Interdisciplinary?

Table 4. Continued

Name of The Journal	Subject Area
Indian Journal of Pharmaceutical Education & Research	Education / pharmacology and pharmaceutical science
Indian Journal of Science and Technology	General science and technology
Indian Journal of Social Research	Social science
Information Studies	Library and information science
International Journal of Advanced Library and Information Science	Library and information science
International Journal of Basic and Applied Agricultural Research	Agriculture
International Journal of Computing and Applications	Computer science and technology
International Journal of Digital Library Services	Library and information science
International Journal of Educational Sciences	Education
International Journal of Environmental Sciences	Environmental science
International Journal of Pharmaceutical and Biological Research	Biological science / pharmacology and pharmaceutical science
International Journal of Information Dissemination and Technology	Library and information science
International Journal of Advanced Computer Research	Computer science and technology / engineering science and technology
International Journal of Bio-Resource and Stress Management	Biological science
International Journal of Computing and Applications	Computer science and technology
International Journal of Information and Computing Science	Library and information science
International Journal of Tropical Agriculture	Agriculture
International Library Movement	Library and information science
International Journal of Advanced Research in Computer Science	Biological science
International Journal of Advanced Trends in Computer Science and Engineering	Computer science and technology / engineering science and technology
International Journal of Advancements in Technology	Engineering science and technology
International Journal of Basic and Applied Agricultural Research	Agriculture
International Journal of Computer Networks & Communications	Computer science and technology
International Journal of Computer Science & Information Technology	Computer science and technology
International Journal of Computer Science and Applications	Computer science and technology
International Journal of Computer Sciences and Engineering	Computer science and technology
International Journal of Distributed and Cloud Computing	Computer science and technology
International Journal of Engineering Science and Technology	Engineering science and technology
International Journal of Hospitality and Tourism Systems	Others
International Journal of Information and Computing Science	Computer science and technology / library and information science
International Journal of Information Processing	Library and information science
International Journal of Information Sources and Services	Library and information science
International Journal of Library and Information Management	Library and information science
International Journal of Research in Computer Application & Management	Computer science and technology / management
International Library Movement	Library and information science
Journal of Information Management	Library and information science
Journal of Knowledge and Communication Management	Management
Journal of Library and Information Science	Library and information science
Journal of Young Pharmacists	Pharmacology and pharmaceutical science
Journal of Chemical and Pharmaceutical Research	Pharmacology and pharmaceutical science
Journal of Commerce and Accounting Research	Business and marketing/ management
Journal of Commerce and Management Thought	Biological science
Journal of Digital Information Management	Library and information science

continued on following page

Is the Indian Library and Information Science Research Interdisciplinary?

Table 4. Continued

Name of The Journal	Subject Area
Journal of Global Communication	Others
Journal of Intellectual Property Rights	General science and technology
Journal of Knowledge and Communication Management	Management
Journal of Library and Information Technology	Library and information science
Journal of Postgraduate Medicine, Education and Research	Education / health science
Journal of Rice Research	Agriculture
Journal of Scientific & Industrial Research	General science and technology
Journal of Soil and Water Conservation	Agriculture
Journal of The Indian Anthropological Society	Anthropology
Journal of The Institution of Engineers (India): Interdisciplinary Co-Ordination Committee	Computer science and technology engineering science and technology
Journal of Vector Borne Diseases	Health science
Journal of Young Pharmacists	Pharmacology and pharmaceutical science
Journal on English Language Teaching	Arts and humanities / education
Karnataka Journal of Agricultural Sciences	Agriculture
Kelpro Bulletin	Library and information science
Library Herald	Library and information science
Library Progress (International)	Library and information science
Nairjc: A Journal of Multidisciplinary	Others
National Medical Journal of India (The)	Health science
Neurology India	Health science
Oriental Journal of Computer Science and Technology	Computer science and technology
Pacific Business Review International	Business and marketing / management
Pantnagar Journal of Research	General science and technology
Pearl: Journal of Library & Information Science	Library and information science
Pranjana	Management
Productivity	Engineering science and technology / management
Researchers World - Journal of Arts Science and Commerce	Others
Sadhana - Academy Proceedings in Engineering Sciences	Engineering science and technology
Science, Technology and Society	General science and technology
Sciexplore: International Journal of Research in Science	General science and technology
Smart Journal of Business Management Studies	Management
South Asian Journal of Socio-Political Studies	Social science
SRELS Journal of Information Management	Library and information science
Trends in Biosciences	Biological science
Virusdisease	Agriculture / biological science
World Digital Libraries	Library and information science

Chapter 14

Research Patterns on the Social Networks and Media: A Scientometric Portrait

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ABSTRACT

The study analyses 11,941 total records on social networks and media retrieved from Web of Science database during the period of study. The predominantly records 2,576 (21.57%) of the publications brought out in 2018, followed by 2,281 (19.10%) records published in 2017. A majority of the publications, 2,207 (18.48%), were published from communication area, on account of the specific nature of the research concentrating on Social networks. Computer communications information systems area scores second with 1,172 (9.81%) of the publications. The study found that more than 10 publications contributed by an individual area out of 11,941 records during period. Liu Y has contributed 37 (0.31%) of the publications as top ranked author in the research.

INTRODUCTION

A social network is a social structure made up of a set of social actors (such as individuals or organizations), sets of dyadic ties, and other social interactions between actors. The social network perspective provides a set of methods for analyzing the structure of whole social entities as well as a variety of theories explaining the patterns observed in these structures. The study of these structures uses social network analysis to identify local and global patterns, locate influential entities, and examine network dynamics. Social networks and the analysis of them is an inherently interdisciplinary academic field which emerged from social psychology, sociology, statistics, and graph theory. Georg Simmel authored early structural theories in sociology emphasizing the dynamics of triads and “web of group affiliations”. Jacob Moreno is credited with developing the first sociograms in the 1930s to study interpersonal relationships. These approaches were mathematically formalized in the 1950s and theories and methods of social networks became pervasive in the social and behavioural sciences by the 1980s (Fernández-Manzanal et al., 2007).

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SCIENTOMETRICS STUDY

Pritchard (1969) coined the term 'bibliometrics' and defined it as "The application of mathematical and statistical methods to books and other media of communication". Fairthorne defined bibliometric as: "The quantitative treatment of the properties of recorded discourse and behaviour pertaining to it". Sengupta (1992) viewed scientometric as "organisation, classification and quantitative evaluation of publication patterns of all macro and micro communications along with their authorship by mathematical and statistical calculus." Broadus viewed scientometric as "Scientometric is the quantitative study of physical published units or of bibliographic units or of surrogates of either."

REVIEW OF LITERATURE

The study profiles research in the field on a series of measures, such as publications growth rate, global share, citation impact, share of international collaborative papers and distribution of publications by sub-areas. The study also profiles top contributing countries, organisations and authors in machine translation research on a series of bibliometric indicators. The study further reports characteristics of highly cited papers in the field (Gupta and Dhawan, 2019). Dong and Chen (2015) analysed publications during 2000-2015, using Web of Science database. The authors reported the current status of research in machine translation in the field in terms of publications trends, geographic distributions, core literature, and the distinctive research areas of machine translation research: theoretical translation studies, translation and interpreting training and descriptive translation studies. Gile (2015) investigated the origins of bibliometric investigations in translation studies (TS), its history and recent developments, inter alia in China. Zanettin, et al (2015). Studied the subfields within translation studies were defined and how research interests and foci have gradually shifted over time. The data for the study was sourced Translation Studies Abstracts (TSA) online database. Baskaran (2013) analyzed Relative growth rate (RGR) was found to be fluctuating trend during the study period. The doubling time (DT) was found to be increased and decreased trend in this study. Degree of collaboration and its' mean value is found to be 0.963. The top three institutions with Alagappa University are Central Electro Chemical Research Institute, National Cheng King University, and Anna University. Baskaran and Rameshbabu (2019) discussed the growth of the publications, RGR and DT of the research output, Collaboration of authors, Collaborative co-efficient etc. in the study. The result of the study found that publications growth rate between 11 (0.26%) in 1989 and 447 (10.76%) in 201. The largest output in was found 447 publications in 2013. It is found the DC between 0.64 and 0.94 and overall DC measured to be 23.08 throughout study period. The study could be found DC was an increased and a decreased trend appeared in the whole study period. Saravanan and Baskaran (2018) explained on map the number of publications, growth rate and doubling time, scattering of publication over journals, and its impact on publication output, authorship patterns and Global citation score of bioremediation research publication in India using the HistCite, VOSviewer software. Indian Institute of technology, Baba atomic research Centre and CSIR are the major producers of research output in the area of bioremediation. Baskaran (2018) analyzed majority of publications 44.15% representing by the two authors in the analysis BM. Guptha was published 18 papers in DJLIT, who is a ranked 1 author. It followed by Chenupathi K. Ramiah shored second his publications 11. University of Delhi was top ranked institution. It is followed by NISTADS (24), DRDO (22), Pondicherry University (13), Banaras Hindu University (11), and Indian Institute of technology (11) and University of Kashmir (10).

OBJECTIVES OF THE STUDIES

1. To analyse the Year wise publications of Social Networks and Media research during 1995-2019
2. To identify the top ranked research areas on Social Networks and Media
3. To observe the top ranked Authors productivity on Social Networks and Media
4. To know the top ranked countries productivity on Social Networks and Media
5. To find out the top ranked Institutions wise distribution on Social Networks and Media

METHODOLOGY

The purpose of the study to analyze the publications output of the Social Networks and Medias during 1995-2019. Total no. 11941 records retrieved from Web of Science (WoS) database during period of study. The results refinemade for the purpose of analysesthe year wise, Ranking of Authors, Countries, Institutions and core journals on the field of research. Further, VOS Viewer applied to provide the Network visualization onthe Research areas, Counties and Institutions based records downloaded from Web of Science and exported to VOS Viewer.

ANALYSIS AND INTERPRETATIONS

See Table 1.

Table 1. Year wise publications of social networks and media research

Year	No. of Records	Percent
1995	12	0.1
1996	14	0.117
1997	15	0.126
1998	21	0.176
1999	13	0.109
2000	23	0.193
2001	15	0.126
2002	22	0.184
2003	30	0.251
2004	31	0.26
2005	32	0.268
2006	58	0.486
2007	54	0.452

continues in next column

Table 1. Continued

Year	No. of Records	Percent
2008	118	0.988
2009	153	1.281
2010	214	1.792
2011	342	2.864
2012	479	4.011
2013	723	6.055
2014	885	7.411
2015	1591	13.324
2016	2016	16.883
2017	2281	19.102
2018	2576	21.573
2019	192	1.608
	11941	

YEAR WISE PUBLICATIONS OF SOCIAL NETWORKS AND MEDIA RESEARCH

Table 1 presents on the data shows the year wise publications of Social Networks Media during 1995-2019 according to data available in Web of Science. It is observed that 11941 total records were retrieved from Web of Science database during the Period of study. The predominant records 2576 (21.57%) of the publications brought out in 2018, it followed by 2281 (19.10%) of the records published in 2017. The study could find that less than 100 records published on the research during 1995-2007. More than 100 publications contributed by the researchers during 2008-2014. Further, the study reveals that more than 100 records distributed during 2015-2018. Further, the research reflects that the publications trend was slowly increasing trend appeared over the study period except the years 1999, 2007 and 2019.

TOP RANKED RESEARCH AREAS ON SOCIAL NETWORKS AND MEDIA

The study is observed that research area of the Social Networks and Medias, more than 50 publications contributed from each area of the study. Table 2 observed that majority of the publications 2207 (18.48%) of the publications published from Communication area, on account of the research more rely on the specific nature of the research more concentrates Social Networks. Computer communications Information Systems areas scores second position shares 1172 (9.81%) of the publications. Information Science and Library Science has achieved more than 1000 records 9.21% of the Publications. Further, the quantum of records between 500 and 1000 shares 3127 (26.18%), 100 and 500 publications share 6565 (54.97%) 50 and 100 shares the publications 2196(18.39%).

TOP RANKED AUTHORS PRODUCTIVITY ON SOCIAL NETWORKS AND MEDIA

Table 3 presents on the data elucidate the authors wise productivity of the publications in the Social Networks and Medias during 1995-2019. The study found that more than 10 publications contributed by an individual area out of 11941 records during period. Liu Y has contributed 37 (0.31%) of the publications as top ranked author in the research. Park HW was a second ranked author who brought 35 (0.29%) of the publications in the particular area of research. Kim Y, Young SD, Lee S, Dezunig HG and Lee H contributed more than 20 Publications on the Social Networks area. Further, the study analyzes totally 700 publications contributed by 35 authors; they contributed publications between 10 and 20.

TOP RANKED COUNTRIES PRODUCTIVITY ON SOCIAL NETWORKS AND MEDIA

The country wise productivity of the publications of the researchers has contributed in the Social Networks and Media research during 1995-2019. Table 4 shows more than 10 publications contributed from respective country. USA hold 4260 (36.67%) of the publications seems that top most productivity brought out in Social Networks and Media research. England and People of China made remarkable productivity above 1000. Spain, Australia and Canada scored the publications records more than 500. It is analyzed that 1548 (12.96%) of the publications witnessed that less than 100 and above 10.

Research Patterns on the Social Networks and Media

Table 2. Top ranked research areas on social networks and media

S.No	Name of the Area of Research	Records	%
1	COMMUNICATION	2207	18.483
2	COMPUTER SCIENCE INFORMATION SYSTEMS	1172	9.815
3	INFORMATION SCIENCE LIBRARY SCIENCE	1100	9.212
4	BUSINESS	722	6.046
5	PSYCHOLOGY MULTIDISCIPLINARY	658	5.51
6	EDUCATION EDUCATIONAL RESEARCH	631	5.284
7	SOCIOLOGY	566	4.74
8	MANAGEMENT	550	4.606
9	PSYCHOLOGY EXPERIMENTAL	470	3.936
10	SOCIAL SCIENCES INTERDISCIPLINARY	442	3.702
11	PUBLIC ENVIRONMENTAL OCCUPATIONAL HEALTH	437	3.66
12	COMPUTER SCIENCE ARTIFICIAL INTELLIGENCE	371	3.107
13	ENGINEERING ELECTRICAL ELECTRONIC	351	2.939
14	HEALTH CARE SCIENCES SERVICES	336	2.814
15	COMPUTER SCIENCE INTERDISCIPLINARY APPLICATIONS	325	2.722
16	POLITICAL SCIENCE	312	2.613
17	COMPUTER SCIENCE SOFTWARE ENGINEERING	301	2.521
18	MULTIDISCIPLINARY SCIENCES	290	2.429
19	TELECOMMUNICATIONS	285	2.387
20	COMPUTER SCIENCE THEORY METHODS	283	2.37
21	MEDICAL INFORMATICS	246	2.06
22	HOSPITALITY LEISURE SPORT TOURISM	196	1.641
23	PSYCHOLOGY SOCIAL	195	1.633
24	GEOGRAPHY	184	1.541
25	PSYCHIATRY	173	1.449
26	ENVIRONMENTAL STUDIES	163	1.365
27	OPERATIONS RESEARCH MANAGEMENT SCIENCE	158	1.323
28	PSYCHOLOGY CLINICAL	135	1.131
29	ECONOMICS	131	1.097
30	FILM RADIO TELEVISION	127	1.064
31	COMPUTER SCIENCE CYBERNETICS	114	0.955
32	ENVIRONMENTAL SCIENCES	114	0.955
33	ANTHROPOLOGY	109	0.913
34	EDUCATION SCIENTIFIC DISCIPLINES	108	0.904
35	HUMANITIES MULTIDISCIPLINARY	106	0.888
36	MEDICINE GENERAL INTERNAL	103	0.863
37	LINGUISTICS	97	0.812
38	PSYCHOLOGY DEVELOPMENTAL	97	0.812

continues on following page

Table 2. Continued

S.No	Name of the Area of Research	Records	%
39	NURSING	95	0.796
40	PHYSICS MULTIDISCIPLINARY	94	0.787
41	CULTURAL STUDIES	93	0.779
42	SOCIAL SCIENCES BIOMEDICAL	93	0.779
43	HEALTH POLICY SERVICES	90	0.754
44	SUBSTANCE ABUSE	90	0.754
45	REGIONAL URBAN PLANNING	89	0.745
46	PEDIATRICS	87	0.729
47	LANGUAGE LINGUISTICS	81	0.678
48	COMPUTER SCIENCE HARDWARE ARCHITECTURE	80	0.67
49	MATHEMATICS INTERDISCIPLINARY APPLICATIONS	77	0.645
50	SURGERY	74	0.62
51	HISTORY	72	0.603
52	ERGONOMICS	69	0.578
53	INTERNATIONAL RELATIONS	69	0.578
54	AREA STUDIES	66	0.553
55	ETHICS	63	0.528
56	PSYCHOLOGY APPLIED	63	0.528
57	PHARMACOLOGY PHARMACY	62	0.519
58	GREEN SUSTAINABLE SCIENCE TECHNOLOGY	58	0.486
59	NEUROSCIENCES	57	0.477
60	PUBLIC ADMINISTRATION	57	0.477
61	SOCIAL WORK	57	0.477
62	PHYSICS MATHEMATICAL	56	0.469
63	ENGINEERING INDUSTRIAL	54	0.452
64	ENGINEERING MULTIDISCIPLINARY	53	0.444
65	FAMILY STUDIES	52	0.435
66	SOCIAL ISSUES	51	0.427

TOP RANKED INSTITUTIONS WISE DISTRIBUTION ON SOCIAL NETWORKS AND MEDIA

Table 5 present the Top ranked institutions productivity of the Social Networks and Media research during 1995-2019. It is observed that maximum of 295(2.47%) of the publications come out from University of California System, it followed by University of London with 219 (1.83%) of the publications. 2702 (22.62%) of the publications shared by 19 Institutions above 100. The study was analyzed that 50 institutions contributed between 50 and 100 publications together 3442 (28.82%).



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Table 3. Top ranked authors productivity on social networks and media

S.No	Authors	Records	%
1	LIU Y	37	0.31
2	PARK HW	35	0.293
3	KIM J	33	0.276
4	KIM Y	29	0.243
5	YOUNG SD	26	0.218
6	LEE S	21	0.176
7	DE ZUNIGA HG	20	0.167
8	LEE H	20	0.167
9	YANG CC	19	0.159
10	WANG Y	18	0.151
11	ZHANG Y	18	0.151
12	MORENO MA	17	0.142
13	LEE J	16	0.134
14	LIU H	16	0.134
15	ZHANG J	15	0.126
16	GRIFFITHS MD	14	0.117
17	HIMELBOIM I	14	0.117
18	KIM H	14	0.117
19	VELETSIANOS G	14	0.117
20	CHEN WH	13	0.109
21	KIM E	13	0.109
22	WANG H	13	0.109
23	BODE L	12	0.1
24	DHIR A	12	0.1
25	FERRARA E	12	0.1
26	FOX J	12	0.1
27	GUO L	12	0.1
28	KIM M	12	0.1
29	LI X	12	0.1
30	MERCEA D	12	0.1
31	MORENO Y	12	0.1
32	UTZ S	12	0.1
33	WELLMAN B	12	0.1
34	WOHN DY	12	0.1

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Table 3. Continued

S.No	Authors	Records	%
35	HAMPTON KN	11	0.092
36	HUTCHINS B	11	0.092
37	KIM S	11	0.092
38	KIMMONS R	11	0.092
39	LEE JK	11	0.092
40	LI L	11	0.092
41	PARK S	11	0.092
42	PRIMACK BA	11	0.092
43	THEOCHARIS Y	11	0.092
44	TIGGEMANN M	11	0.092
45	WANG Z	11	0.092
46	XU CS	11	0.092
47	BORGE-HOLTHOEFER J	10	0.084
48	CAVAZOS-REHG PA	10	0.084
49	CHEN F	10	0.084
50	CHEN HC	10	0.084
51	CHEN Y	10	0.084
52	ELLISON NB	10	0.084
53	GONZALEZ-BAILON S	10	0.084
54	HOSSAIN MS	10	0.084
55	KANE GC	10	0.084
56	KRAUSS MJ	10	0.084
57	LAI CH	10	0.084
58	LEE FLF	10	0.084
59	LI C	10	0.084
60	LI Y	10	0.084
61	MENCZER F	10	0.084
62	QUAN-HAASE A	10	0.084
63	QUATTROCIOCCHI W	10	0.084
64	SHENSA A	10	0.084
65	WANG L	10	0.084
66	WANG N	10	0.084
67	WILSON C	10	0.084

Research Patterns on the Social Networks and Media

Table 4. Top ranked countries productivity on social networks and media

S.No	Countries	Records	%
1	USA	4260	35.675
2	ENGLAND	1119	9.371
3	PEOPLES R CHINA	1064	8.91
4	SPAIN	890	7.453
5	AUSTRALIA	822	6.884
6	CANADA	589	4.933
7	GERMANY	485	4.062
8	SOUTH KOREA	410	3.434
9	NETHERLANDS	373	3.124
10	ITALY	359	3.006
11	BRAZIL	236	1.976
12	TAIWAN	225	1.884
13	FRANCE	212	1.775
14	INDIA	211	1.767
15	SINGAPORE	176	1.474
16	TURKEY	171	1.432
17	SWEDEN	170	1.424
18	BELGIUM	157	1.315
19	RUSSIA	155	1.298
20	FINLAND	150	1.256
21	SCOTLAND	148	1.239
22	ISRAEL	147	1.231
23	SWITZERLAND	133	1.114
24	SOUTH AFRICA	129	1.08
25	MALAYSIA	125	1.047
26	JAPAN	123	1.03
27	NORWAY	122	1.022
28	SAUDI ARABIA	120	1.005
29	AUSTRIA	113	0.946
30	DENMARK	113	0.946
31	GREECE	100	0.837
32	NEW ZEALAND	98	0.821
33	IRELAND	96	0.804
34	IRAN	87	0.729
35	MEXICO	81	0.678
36	CHILE	74	0.62

continues in next column

Table 4. Continued

S.No	Countries	Records	%
37	PORTUGAL	74	0.62
38	PAKISTAN	72	0.603
39	POLAND	69	0.578
40	WALES	66	0.553
41	ARGENTINA	57	0.477
42	COLOMBIA	50	0.419
43	ROMANIA	50	0.419
44	THAILAND	39	0.327
45	NIGERIA	36	0.301
46	U ARAB EMIRATES	36	0.301
47	ECUADOR	32	0.268
48	EGYPT	32	0.268
49	HUNGARY	31	0.26
50	SLOVENIA	30	0.251
51	UKRAINE	30	0.251
52	CZECH REPUBLIC	29	0.243
53	VIETNAM	28	0.234
54	INDONESIA	27	0.226
55	CROATIA	25	0.209
56	NORTH IRELAND	25	0.209
57	LITHUANIA	24	0.201
58	KUWAIT	23	0.193
59	PERU	21	0.176
60	QATAR	21	0.176
61	SERBIA	21	0.176
62	CYPRUS	20	0.167
63	SLOVAKIA	20	0.167
64	JORDAN	16	0.134
65	BANGLADESH	15	0.126
66	PHILIPPINES	15	0.126
67	KENYA	14	0.117
68	LEBANON	14	0.117
69	TUNISIA	14	0.117
70	ESTONIA	13	0.109
71	OMAN	13	0.109
72	COSTA RICA	10	0.084

Figure 2. Network visualization of the countries on the publications

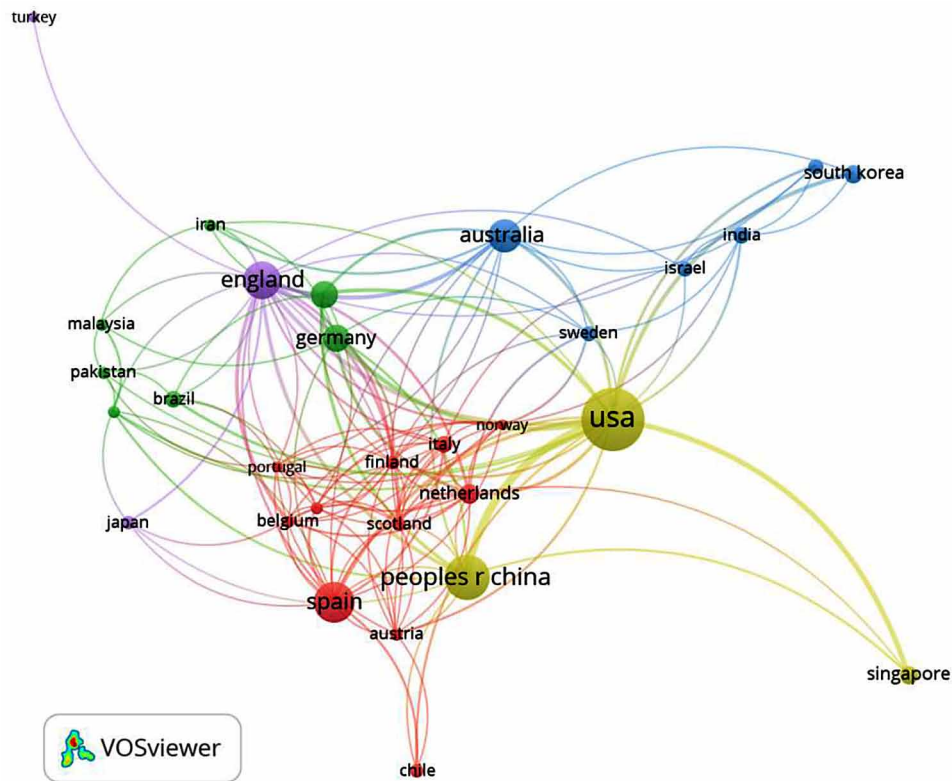
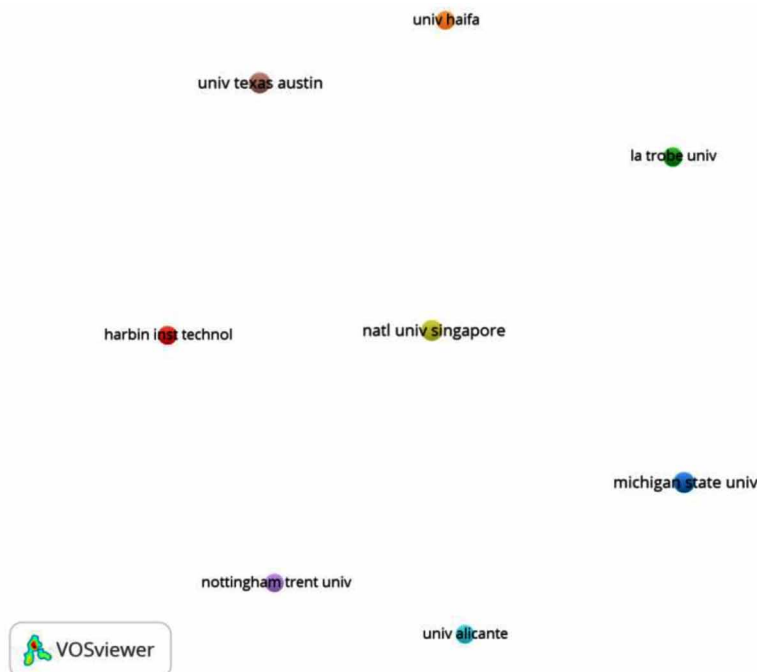


Figure 3. Network visualization of institutions wise distribution on the publications



Research Patterns on the Social Networks and Media

Table 5. Top ranked institutions wise distribution on social networks and media

	Name of the Institutions	Records	%
1	UNIVERSITY OF CALIFORNIA SYSTEM	295	2.47
2	UNIVERSITY OF LONDON	219	1.834
3	UNIVERSITY OF TEXAS SYSTEM	206	1.725
4	STATE UNIVERSITY SYSTEM OF FLORIDA	198	1.658
5	PENNSYLVANIA COMMONWEALTH SYSTEM OF HIGHER EDUCATION PCSHE	170	1.424
6	UNIVERSITY OF NORTH CAROLINA	152	1.273
7	UNIVERSITY OF WISCONSIN SYSTEM	126	1.055
8	HARVARD UNIVERSITY	125	1.047
9	UNIVERSITY OF SOUTHERN CALIFORNIA	123	1.03
10	UNIVERSITY OF MICHIGAN SYSTEM	118	0.988
11	UNIVERSITY SYSTEM OF GEORGIA	118	0.988
12	UNIVERSITY OF MICHIGAN	117	0.98
13	UNIVERSITY OF TORONTO	111	0.93
14	CHINESE ACADEMY OF SCIENCES	108	0.904
15	UNIVERSITY OF ILLINOIS SYSTEM	108	0.904
16	STATE UNIVERSITY OF NEW YORK SUNY SYSTEM	104	0.871
17	UNIVERSITY OF AMSTERDAM	103	0.863
18	UNIVERSITY OF TEXAS AUSTIN	101	0.846
19	UNIVERSITY OF OXFORD	100	0.837
20	UNIVERSITY OF PENNSYLVANIA	99	0.829
21	CALIFORNIA STATE UNIVERSITY SYSTEM	96	0.804
22	INDIANA UNIVERSITY SYSTEM	93	0.779
23	MICHIGAN STATE UNIVERSITY	93	0.779
24	UNIVERSITY OF SYDNEY	89	0.745

continues in next column

Table 5. Continued

	Name of the Institutions	Records	%
25	UNIVERSITY OF WASHINGTON	89	0.745
26	UNIVERSITY OF WASHINGTON SEATTLE	87	0.729
27	UNIVERSITY OF WISCONSIN MADISON	87	0.729
28	ARIZONA STATE UNIVERSITY	85	0.712
29	PENN STATE UNIVERSITY	85	0.712
30	UNIVERSITY SYSTEM OF MARYLAND	84	0.703
31	NORTHWESTERN UNIVERSITY	82	0.687
32	NANYANG TECHNOLOGICAL UNIVERSITY	79	0.662
33	NANYANG TECHNOLOGICAL UNIVERSITY NATIONAL INSTITUTE OF EDUCATION NIE SINGAPORE	79	0.662
34	UNIVERSITY OF CALIFORNIA LOS ANGELES	79	0.662
35	TSINGHUA UNIVERSITY	76	0.636
36	UNIVERSITY OF MELBOURNE	76	0.636
37	CITY UNIVERSITY OF HONG KONG	75	0.628
38	OHIO STATE UNIVERSITY	75	0.628
39	NATIONAL UNIVERSITY OF SINGAPORE	74	0.62
40	INDIANA UNIVERSITY BLOOMINGTON	73	0.611
41	UNIVERSITY OF FLORIDA	72	0.603
42	MONASH UNIVERSITY	70	0.586
43	UNIVERSITY OF MINNESOTA SYSTEM	68	0.569
44	UNIVERSITY OF MINNESOTA TWIN CITIES	67	0.561
45	UNIVERSITY OF NORTH CAROLINA CHAPEL HILL	67	0.561
46	NEW YORK UNIVERSITY	66	0.553
47	UNIVERSITY OF MASSACHUSETTS SYSTEM	64	0.536

continues on following page

Table 5. Continued

	Name of the Institutions	Records	%
48	GHEENT UNIVERSITY	63	0.528
49	UNIVERSITY OF ALABAMA SYSTEM	62	0.519
50	CORNELL UNIVERSITY	61	0.511
51	CHINESE UNIVERSITY OF HONG KONG	57	0.477
52	JOHNS HOPKINS UNIVERSITY	57	0.477
53	RUTGERS STATE UNIVERSITY NEW BRUNSWICK	57	0.477
54	UNIVERSITY OF ARIZONA	57	0.477
55	UNIVERSITY OF PITTSBURGH	57	0.477
56	COLUMBIA UNIVERSITY	55	0.461
57	QUEENSLAND UNIVERSITY OF TECHNOLOGY QUT	55	0.461
58	UNIVERSITY COLLEGE LONDON	55	0.461
59	UNIVERSITY OF ILLINOIS URBANA CHAMPAIGN	55	0.461
60	UNIVERSITY OF MARYLAND COLLEGE PARK	55	0.461
61	VRIJE UNIVERSITEIT AMSTERDAM	55	0.461
62	COMPLUTENSE UNIVERSITY OF MADRID	54	0.452
63	UNIVERSITY OF COLORADO SYSTEM	52	0.435
64	VIRGINIA POLYTECHNIC INSTITUTE STATE UNIVERSITY	52	0.435
65	DEAKIN UNIVERSITY	51	0.427
66	ROYAL MELBOURNE INSTITUTE OF TECHNOLOGY RMIT	51	0.427
67	UNIVERSITY OF ILLINOIS CHICAGO	51	0.427
68	UNIVERSITY OF ILLINOIS CHICAGO HOSPITAL	51	0.427
69	STANFORD UNIVERSITY	50	0.419

Table 6. Top ranked journals wise distribution on social networks and media

S.No	Name of the Journal	Records	% of 11941
1	COMPUTERS IN HUMAN BEHAVIOR	444	3.718
2	NEW MEDIA SOCIETY	197	1.65
3	INFORMATION COMMUNICATION SOCIETY	175	1.466
4	JOURNAL OF MEDICAL INTERNET RESEARCH	157	1.315
5	PLOS ONE	146	1.223
6	SOCIAL MEDIA SOCIETY	112	0.938
7	TELEMATICS AND INFORMATICS	80	0.67
8	INTERNATIONAL JOURNAL OF COMMUNICATION	78	0.653
9	CYBERPSYCHOLOGY BEHAVIOR AND SOCIAL NETWORKING	76	0.636
10	PROFESIONAL DE LA INFORMACION	72	0.603
11	JOURNAL OF COMPUTER MEDIATED COMMUNICATION	61	0.511
12	PUBLIC RELATIONS REVIEW	61	0.511
13	MULTIMEDIA TOOLS AND APPLICATIONS	59	0.494
14	SOCIAL NETWORK ANALYSIS AND MINING	57	0.477
15	IEEE ACCESS	56	0.469
16	ONLINE INFORMATION REVIEW	55	0.461
17	COMUNICAR	54	0.452
18	AMERICAN BEHAVIORAL SCIENTIST	51	0.427
19	INTERNATIONAL JOURNAL OF INFORMATION MANAGEMENT	51	0.427
20	MEDIA CULTURE SOCIETY	49	0.41

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Table 6. Continued

S.No	Name of the Journal	Records	% of 11941
21	SOCIAL SCIENCE COMPUTER REVIEW	49	0.41
22	INTERNET RESEARCH	47	0.394
23	JOURNAL OF BROADCASTING ELECTRONIC MEDIA	47	0.394
24	JOURNAL OF COMMUNICATION	47	0.394
25	PHYSICA A STATISTICAL MECHANICS AND ITS APPLICATIONS	42	0.352
26	COMPUTERS EDUCATION	41	0.343
27	EXPERT SYSTEMS WITH APPLICATIONS	40	0.335
28	IEEE TRANSACTIONS ON MULTIMEDIA	37	0.31
29	SUSTAINABILITY	37	0.31
30	GOVERNMENT INFORMATION QUARTERLY	36	0.301
31	NEUROCOMPUTING	34	0.285
32	DIGITAL JOURNALISM	33	0.276
33	ASIAN JOURNAL OF COMMUNICATION	32	0.268
34	BMC PUBLIC HEALTH	32	0.268
35	DECISION SUPPORT SYSTEMS	32	0.268
36	MASS COMMUNICATION AND SOCIETY	32	0.268
37	CONVERGENCE THE INTERNATIONAL JOURNAL OF RESEARCH INTO NEW MEDIA TECHNOLOGIES	30	0.251
38	REVISTA LATINA DE COMUNICACION SOCIAL	30	0.251
39	INFORMATION SCIENCES	29	0.243
40	POLITICAL COMMUNICATION	29	0.243
41	INFORMATION SOCIETY	28	0.234

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Table 6. Continued

S.No	Name of the Journal	Records	% of 11941
42	KNOWLEDGE BASED SYSTEMS	28	0.234
43	MEDIA INTERNATIONAL AUSTRALIA	28	0.234
44	BEHAVIOUR INFORMATION TECHNOLOGY	27	0.226
45	JOURNAL OF ADOLESCENT HEALTH	27	0.226
46	JOURNAL OF BUSINESS RESEARCH	27	0.226
47	JOURNAL OF HEALTH COMMUNICATION	27	0.226
48	INFORMATION MANAGEMENT	26	0.218
49	TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE	26	0.218
50	INFORMATION SYSTEMS FRONTIERS	25	0.209
51	INFORMATION TECHNOLOGY PEOPLE	25	0.209
52	ELECTRONIC LIBRARY	24	0.201
53	MEDIA AND COMMUNICATION	24	0.201
54	PERSONALITY AND INDIVIDUAL DIFFERENCES	24	0.201
55	REVISTA MEDITERRANEA COMUNICACION JOURNAL OF COMMUNICATION	24	0.201
56	IEEE TRANSACTIONS ON KNOWLEDGE AND DATA ENGINEERING	23	0.193
57	EPJ DATA SCIENCE	22	0.184
58	HISTORIA Y COMUNICACION SOCIAL	22	0.184
59	JOURNALISM MASS COMMUNICATION QUARTERLY	22	0.184
60	PRISMA SOCIAL	22	0.184
61	QUALITY QUANTITY	22	0.184
62	SOCIAL NETWORKS	22	0.184

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Table 6. Continued

S.No	Name of the Journal	Records	% of 11941
63	BUSINESS HORIZONS	21	0.176
64	FRONTIERS IN PSYCHOLOGY	21	0.176
65	INFORMATION SYSTEMS RESEARCH	21	0.176
66	JOURNAL OF INFORMATION SCIENCE	21	0.176
67	MOBILE MEDIA COMMUNICATION	21	0.176
68	SCIENTIFIC REPORTS	21	0.176
69	EDUCATION AND INFORMATION TECHNOLOGIES	20	0.167
70	INTERNATIONAL JOURNAL OF ADVANCED COMPUTER SCIENCE AND APPLICATIONS	20	0.167
71	JOURNALISM PRACTICE	20	0.167
72	TELEVISION NEW MEDIA	20	0.167
73	ACM TRANSACTIONS ON INTELLIGENT SYSTEMS AND TECHNOLOGY	19	0.159
74	ASLIB JOURNAL OF INFORMATION MANAGEMENT	19	0.159
75	COMMUNICATION RESEARCH	19	0.159
76	COMMUNICATION SOCIETY SPAIN	19	0.159
77	INDUSTRIAL MANAGEMENT DATA SYSTEMS	19	0.159
78	INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH	19	0.159
79	JOURNAL OF MANAGEMENT INFORMATION SYSTEMS	19	0.159
80	LEARNING MEDIA AND TECHNOLOGY	19	0.159

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Table 6. Continued

S.No	Name of the Journal	Records	% of 11941
81	SOCIAL MOVEMENT STUDIES	19	0.159
82	TOURISM MANAGEMENT	19	0.159
83	ELECTRONIC COMMERCE RESEARCH AND APPLICATIONS	18	0.151
84	INFORMATION RESEARCH AN INTERNATIONAL ELECTRONIC JOURNAL	18	0.151
85	JMIR RESEARCH PROTOCOLS	18	0.151
86	JOURNAL OF INTERACTIVE MARKETING	18	0.151
87	JOURNAL OF THE ASSOCIATION FOR INFORMATION SCIENCE AND TECHNOLOGY	18	0.151
88	SOCIAL SCIENCE MEDICINE	18	0.151
89	ACM TRANSACTIONS ON KNOWLEDGE DISCOVERY FROM DATA	17	0.142
90	ACM TRANSACTIONS ON MULTIMEDIA COMPUTING COMMUNICATIONS AND APPLICATIONS	17	0.142
91	EUROPEAN JOURNAL OF COMMUNICATION	17	0.142
92	JOURNAL OF BUSINESS ETHICS	17	0.142
93	JOURNAL OF INFORMATION TECHNOLOGY POLITICS	17	0.142
94	JOURNAL OF ORGANIZATIONAL COMPUTING AND ELECTRONIC COMMERCE	17	0.142
95	JOURNALISM	17	0.142
96	JOURNALISM STUDIES	17	0.142
97	PHYSICAL REVIEW E	17	0.142

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Table 6. Continued

S.No	Name of the Journal	Records	% of 11941
98	REVISTA ICONO 14 REVISTA CIENTIFICA DE COMUNICACION Y TECNOLOGIAS	17	0.142
99	SCIENTOMETRICS	17	0.142
100	SOCIAL BEHAVIOR AND PERSONALITY	17	0.142
101	TURKISH ONLINE JOURNAL OF DESIGN ART AND COMMUNICATION	17	0.142
102	CHINESE JOURNAL OF COMMUNICATION	16	0.134
103	FUTURE GENERATION COMPUTER SYSTEMS THE INTERNATIONAL JOURNAL OF ESCIENCE	16	0.134
104	HUMAN COMMUNICATION RESEARCH	16	0.134
105	INTERNATIONAL JOURNAL OF GEOGRAPHICAL INFORMATION SCIENCE	16	0.134
106	JOURNAL OF UNIVERSAL COMPUTER SCIENCE	16	0.134
107	BMJ OPEN	15	0.126
108	CYBERPSYCHOLOGY JOURNAL OF PSYCHOSOCIAL RESEARCH ON CYBERSPACE	15	0.126
109	HEALTH COMMUNICATION	15	0.126
110	INTERNATIONAL COMMUNICATION GAZETTE	15	0.126
111	INTERNATIONAL JOURNAL OF HUMAN COMPUTER INTERACTION	15	0.126
112	INTERNATIONAL REVIEW OF RESEARCH IN OPEN AND DISTRIBUTED LEARNING	15	0.126

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Table 6. Continued

S.No	Name of the Journal	Records	% of 11941
113	JOURNAL OF BEHAVIORAL ADDICTIONS	15	0.126
114	KNOWLEDGE AND INFORMATION SYSTEMS	15	0.126
115	POLICY AND INTERNET	15	0.126
116	PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA	15	0.126
117	WORLD WIDE WEB INTERNET AND WEB INFORMATION SYSTEMS	15	0.126
118	AUSTRALASIAN JOURNAL OF EDUCATIONAL TECHNOLOGY	14	0.117
119	DISCOURSE CONTEXT MEDIA	14	0.117
120	IEEE TRANSACTIONS ON COMPUTATIONAL SOCIAL SYSTEMS	14	0.117
121	INFORMATION PROCESSING MANAGEMENT	14	0.117
122	INTERNATIONAL JOURNAL OF MODERN PHYSICS C	14	0.117
123	JAVNOST THE PUBLIC	14	0.117
124	JURNAL KOMUNIKASI MALAYSIAN JOURNAL OF COMMUNICATION	14	0.117
125	MIS QUARTERLY	14	0.117
126	ONLINE JOURNAL OF COMMUNICATION AND MEDIA TECHNOLOGIES	14	0.117
127	PEDIATRICS	14	0.117
128	AIDS AND BEHAVIOR	13	0.109
129	COMMUNICATION RESEARCH AND PRACTICE	13	0.109
130	EUROPEAN JOURNAL OF MARKETING	13	0.109
131	GEOFORUM	13	0.109

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Table 6. Continued

S.No	Name of the Journal	Records	% of 11941
132	INTERNATIONAL JOURNAL OF ADVERTISING	13	0.109
133	INTERNATIONAL JOURNAL OF CONTEMPORARY HOSPITALITY MANAGEMENT	13	0.109
134	ISPRS INTERNATIONAL JOURNAL OF GEO INFORMATION	13	0.109
135	JOURNAL OF DOCUMENTATION	13	0.109
136	JOURNAL OF KNOWLEDGE MANAGEMENT	13	0.109
137	JOURNAL OF RESEARCH IN INTERACTIVE MARKETING	13	0.109
138	JOURNAL OF THE AMERICAN SOCIETY FOR INFORMATION SCIENCE AND TECHNOLOGY	13	0.109
139	MANAGEMENT SCIENCE	13	0.109
140	PALABRA CLAVE	13	0.109
141	SEX ROLES	13	0.109
142	ADCOMUNICA REVISTA CIENTIFICA DE ESTRATEGIAS TENDENCIAS E INNOVACION EN COMUNICACION	12	0.1
143	ADDICTIVE BEHAVIORS	12	0.1
144	AMERICAN JOURNAL OF PREVENTIVE MEDICINE	12	0.1
145	AMERICAN JOURNAL OF PUBLIC HEALTH	12	0.1
146	ANNALS OF THE AMERICAN ACADEMY OF POLITICAL AND SOCIAL SCIENCE	12	0.1
147	BODY IMAGE	12	0.1

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Table 6. Continued

S.No	Name of the Journal	Records	% of 11941
148	BRITISH JOURNAL OF EDUCATIONAL TECHNOLOGY	12	0.1
149	COMMUNICATIONS EUROPEAN JOURNAL OF COMMUNICATION RESEARCH	12	0.1
150	DIGITAL HEALTH	12	0.1
151	INTERNATIONAL JOURNAL OF COMPUTER SCIENCE AND NETWORK SECURITY	12	0.1
152	JMIR MENTAL HEALTH	12	0.1
153	JOURNAL OF ELECTRONIC COMMERCE RESEARCH	12	0.1
154	JOURNAL OF MARKETING MANAGEMENT	12	0.1
155	JOURNAL OF YOUTH STUDIES	12	0.1
156	MARKETING INTELLIGENCE PLANNING	12	0.1
157	MEDICAL TEACHER	12	0.1
158	PSYCHOLOGY MARKETING	12	0.1
159	TRANSACTIONS IN GIS	12	0.1
160	TRANSLATIONAL BEHAVIORAL MEDICINE	12	0.1
161	TRANSPORTATION RESEARCH PART C EMERGING TECHNOLOGIES	12	0.1
162	BIG DATA SOCIETY	11	0.092
163	COMMUNICATION THEORY	11	0.092
164	ENVIRONMENTAL COMMUNICATION A JOURNAL OF NATURE AND CULTURE	11	0.092
165	GLOBAL NETWORKS A JOURNAL OF TRANSNATIONAL AFFAIRS	11	0.092

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Table 6. Continued

S.No	Name of the Journal	Records	% of 11941
166	INFORMATION SYSTEMS	11	0.092
167	INFORMATION SYSTEMS JOURNAL	11	0.092
168	INTERNATIONAL JOURNAL OF MARKET RESEARCH	11	0.092
169	INTERNATIONAL JOURNAL OF PUBLIC OPINION RESEARCH	11	0.092
170	INTERNATIONAL REVIEW OF RESEARCH IN OPEN AND DISTANCE LEARNING	11	0.092
171	JOURNAL OF COMPUTATIONAL SCIENCE	11	0.092
172	JOURNAL OF ETHNIC AND MIGRATION STUDIES	11	0.092
173	JOURNAL OF THE AMERICAN MEDICAL INFORMATICS ASSOCIATION	11	0.092
174	MULTIMEDIA SYSTEMS	11	0.092
175	TECHTRENDS	11	0.092
176	THEORETICAL AND PRACTICAL ISSUES OF JOURNALISM	11	0.092
177	AIDS CARE PSYCHOLOGICAL AND SOCIO MEDICAL ASPECTS OF AIDS HIV	10	0.084
178	COMPLEXITY	10	0.084
179	COMPUTER NETWORKS	10	0.084
180	CONCURRENCY AND COMPUTATION PRACTICE EXPERIENCE	10	0.084
181	DATA BASE FOR ADVANCES IN INFORMATION SYSTEMS	10	0.084
182	DIGITAL CREATIVITY	10	0.084
183	DOXA COMUNICACION	10	0.084

continues in next column

Table 6. Continued

S.No	Name of the Journal	Records	% of 11941
184	EDUCATIONAL TECHNOLOGY SOCIETY	10	0.084
185	INTERNATIONAL JOURNAL OF CULTURAL STUDIES	10	0.084
186	INTERNATIONAL JOURNAL OF ONLINE MARKETING	10	0.084
187	INTERNET AND HIGHER EDUCATION	10	0.084
188	JASSS THE JOURNAL OF ARTIFICIAL SOCIETIES AND SOCIAL SIMULATION	10	0.084
189	JMIR MHEALTH AND UHEALTH	10	0.084
190	JOURNAL OF ACADEMIC LIBRARIANSHIP	10	0.084
191	JOURNAL OF AFRICAN MEDIA STUDIES	10	0.084
192	JOURNAL OF COMPUTER INFORMATION SYSTEMS	10	0.084
193	JOURNAL OF ORGANIZATIONAL AND END USER COMPUTING	10	0.084
194	MEDIAOBRAZOVANIE MEDIA EDUCATION	10	0.084
195	MOBILIZATION	10	0.084
196	REVISTA DE COMUNICACION DE LA SEECI	10	0.084
197	SAGE OPEN	10	0.084
198	TEKNOKULTURA REVISTA DE CULTURA DIGITAL Y MOVIMIENTOS SOCIALES	10	0.084
199	THEORY CULTURE SOCIETY	10	0.084
200	TRIPLEC COMMUNICATION CAPITALISM CRITIQUE	10	0.084

CONCLUSION

The studies described that Scientometrics analysis of the Publications of Social networks Media during 1995-2019. The Researchers can share the research information through Social Networks, there are many Social Networks are using the researchers to gain and update the research information. Nowadays Web of Science, Scopus and Google Scholar are predominantly use for measuring the Citations and h-Index of the publications. The Research Gate and Academic widely used by the researchers for update the publications on their own account. "As educators, we always want to know where our students are coming from and what they're interested in so we can build on that in our teaching. By understanding how students may be positively using these networking technologies in their daily lives and where the as yet unrecognized educational opportunities are, we can help make schools even more relevant, connected and meaningful to kids."The study also found that many researchers are still unaware of the academic and professional opportunities that social media can offer; highlighting to the need for teachers to spend more time highlighting these opportunities and working with students to enhance their experiences on social networking sites.

ACKNOWLEDGMENT

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Chapter 15

Initiatives of an Institutional Repository (IR) of the Academic Institutions in the Indian Scenario: Prospects and Challenges

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ABSTRACT

The chapter analyses that more than 60 academic and research institutions have set up their institutional repositories as indicated by ROAR (Registry of Open Access Repository) and DOAR (Directory of Open Access Repository) (e.g., IISc, IIMK, ISI, NCL, NIO, RRU, NAL, NIT, and so on). There are a few institutions that have not registered in ROAR or DOAR. IRs has been increasing worldwide. Currently, ROAR lists 1,793 and Open DOAR lists about 1,966 IRs all over the world. It is found that more institutions (47) installed the D-Space (62%). It is followed by e-prints adopted (26), and two institutions implemented OAR through GSDL.

INTRODUCTION

Few years ago, Institutional repository initiatives were initiated only in some developed countries. In India, Institutional repository movement was started in 2004 and is gaining momentum and new initiatives are emerging around the country. Institutional repositories are already well established in many IITs, IIMs and other institutes having national importance. Institutional Repository has become an essential part or component of digital library that provides an alternative platform for sharing knowledge globally. Institutional Repository has four characteristics as defined by Johnson (2002). They are mentioned below: institutionally defined (as opposed to discipline- or subject-focused); scholarly (containing the

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products of faculty, research staff, and students); cumulative and perpetual (the content will be preserved on a long-term basis); and open and interoperable (attentive to the Open Archives Initiative—Protocol for Metadata Harvesting).

INSTITUTIONAL REPOSITORY (IR): DEFINITION

In simplest terms, a digital repository is where digital content, assets, are stored and can be searched and retrieved for later use. A repository supports mechanisms to import, export, identify, store and retrieve digital assets. According to the SPARC (Scholarly Publishing and Academic Resources Coalition) position paper on institutional repositories “an institutional repository is a digital archive of the intellectual product created by faculty, research staff, and students of an institution, with few if any barriers to access”(Crow, 2002). According to Lynch (2003), “a university-based institutional repository is a set of services that a university offers to the members of its community for the management and dissemination of digital materials created by the institution and its community members. It is most essentially an organizational commitment to the stewardship of these digital materials, including long-term preservation where appropriate, as well as organization and access or distribution.”

REVIEW OF LITERATURE

Dutta and Paul (2014) has made a study on institutional repository related issues among faculty members of university of Calcutta. The paper discussed faculty members awareness and their willingness to participate in IR. It reported faculty members have more or less positive attitude towards IR and their lack of awareness and confusion about copyright issues discourage them to participate in it. Lemayehu (2010) explained about researchers' attitude of using institutional repository of Oslo university found that researchers have low awareness of institutional repository but interested in contributing their work in to the university repository and have very positive attitude towards providing free access to their work through their university institutional repository. Dulle and Minishi- Majanja (2009) explored Tanzanian researcher's awareness and usage of open access scholarly communication. The study revealed that majority of researchers in Tanzanian public universities was aware of open access scholarly communication and use these resources to access scholarly content than to disseminate their research findings. Awasthi (2016) made a comparative study on attitude of research and academic community towards the use of institutional repository. The study also compared the similarities and differences in the attitude of both the community towards the institutional repository. These studies show the importance of institutional repositories and open access publishing in scholarly communication and necessary of researchers having awareness about it. University Grants Commission (2005) has already developed a policy document on building University level Institutional Digital Repository in India. UGC has recommended that all the universities should set up theses repository to facilitate e-submission, archiving, maintenance and access to these repository at the university level. University Grants Commission (2005) enacted “UGC (Submission of Metadata and Full-text of Doctoral Theses in Electronic Format) regulations, 2005” to strengthen national capability of producing electronic theses and dissertations, and, to maintain university-level and national level databases of theses and dissertations. This Regulation proposed two sets of planned actions, such as: Creation of Indian National Theses Database (INTED). Internet accessing

for scientific information in which global level publications. This study reveals that faculty of science respondents secured maximum level due to keen search and obtained information by scientific journals and electronic publications. The maximum number of users are visited the library for preparing seminars, conferences and assignments. The Internet users prefer Yahoo search engine and Google is next position in this study. Many universities and research institutes in India have developed institutional repository for archiving documents of their own. It is not only limited to Science and Technology but also on other disciplines. More than 60 academic and research institutions have set up their Institutional Repositories as indicated by ROAR (Registry of Open Access Repository) and DOAR (Directory of Open Access Repository) viz., IISc, IIMK, ISI, NCL, NIO, RRU, NAL, NIT and so on. There are a few institutions have not registered in ROAR or DOAR. Recently, MHRD (Ministry of Human Resource Development) has also advised all INDEST members (Indian National Digital Library in Engineering, Sciences and Technology) to set up institutional repository using open source software. The following table shows the growth and development of IR in India. It analyses the websites of the IRs in India to determine the total deposits to each IR and the use of various open source software for their development. The result reveals that the growth and development of IR in India is encouraging with the significant proliferation of open access and digital library initiatives. The study will help the institutions in India which are in their initial stages or planning stage to develop their own IRs. The researchers have attempted to find out the perceptions and outlook of the university library users with highly response to utilize the facility is available. The study shows that the quality of collection with respect to books, Journals and e-resources. Yahoo is most popular search engine among the user for browsing the net. Book lending service is the most prefer by the staff (Gohain, 2011). The term MOOC has been around since 2008, but the concept began to generate significant media attention and debate in 2012 with the launch of MOOCs offered by or in association with prestigious US institutions through providers such as EdX, Coursera, and Udacity. In response to widespread media attention and debate, uptake of MOOCs has since spread globally. Coursera and EdX have partnered with elite institutions in Europe, Asia, and Australasia, and new MOOC platforms have been developed including Future Learn in the UK, OpenupEd, and iVersity in Europe and Open2Study in Australia (Baskaran, 2011). Open DOAR takes initiatives to harvest and assign metadata to the contents of the registered repositories and to allow categorization and analysis to assist the wider use and exploitation of repositories. Gradually the numbers of IRs have been increasing worldwide. Currently, ROAR lists out 1,793 and Open DOAR lists about 1,966 IRs all over the world.

OBJECTIVES OF THE STUDY

1. To analyse the name of the countries and they have ROAR and Open DOAR
2. To observe the usage of Institutional repository software in India
3. To analyse the advantage and disadvantage of the IR in India

METHODOLOGY

The study relate to analyze the data retrieved from Google, the data contain various countries acquired the value of ROAR and Open DOAR. The study finds the limitations and advantages of IR were implemented in the world

Initiatives of an Institutional Repository (IR) of the Academic Institutions in the Indian Scenario

Table 1. ROAR and Open DOAR worldwide development

S.No	Country	ROAR	Open DOAR
1	US	338	396
2	UK	178	191
3	Germany	113	145
4	Brazil	93	56
5	Japan	89	133
6	India	60	47
7	Taiwan	59	56
8	Canada	56	53
9	Australia	53	60
10	Italy	53	64

ROAR and Open DOAR Worldwide Development

Table 2 observed that no. of institutions have installed the Open access repository in India. It is found that more no. of institutions 47 installed the D-Space, 47 (62%), It followed by E-Prints adopted 26 and 02 institutions are implemented that OAR through GSDL (fig.1).

ROAR AND OPEN DOAR WORLDWIDE DEVELOPMENT

The Institutional repositories have implemented in the higher learning environment it needed while assess some challenges to adopt and use. The challenges are disclose in terms of the structure and facilities, including the technology, are quite robust and the functionality is valuable, especially to the academic community. The network implementation is excellent and the server functionality is effective. Although the implementation of the digital library has brought some major benefits, much still needs to be done to provide the state-of-the-art services expected of a digital library that is worthy of the name. It goes without saying that an ambitious project like this is often faced advantages and challenges given below (Fig.2).

Table 2. Usage of institutional repository software in India

S.No	Name of the Software	No. of Institutions
1	D-Space	47
2	E-Prints	26
3	GSDL	02

Figure 1. ROAR and open DOAR worldwide development

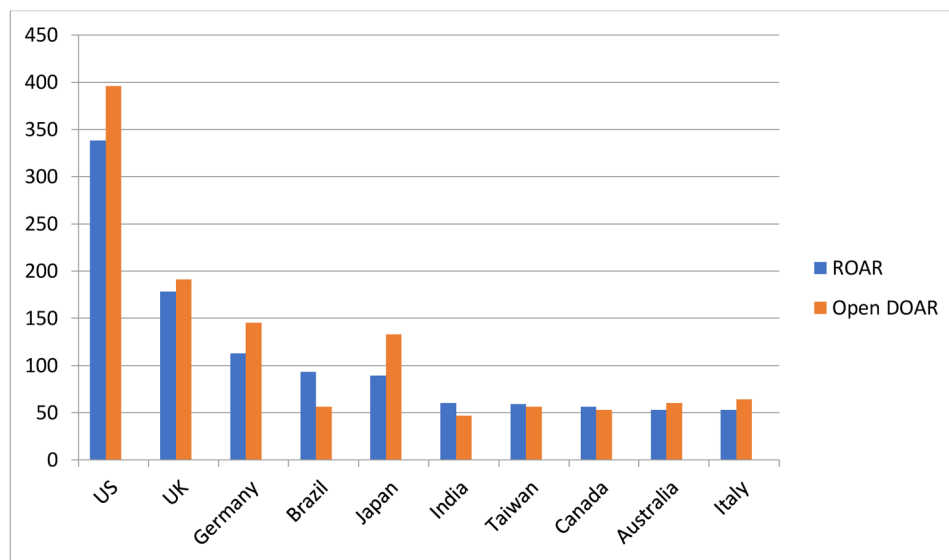
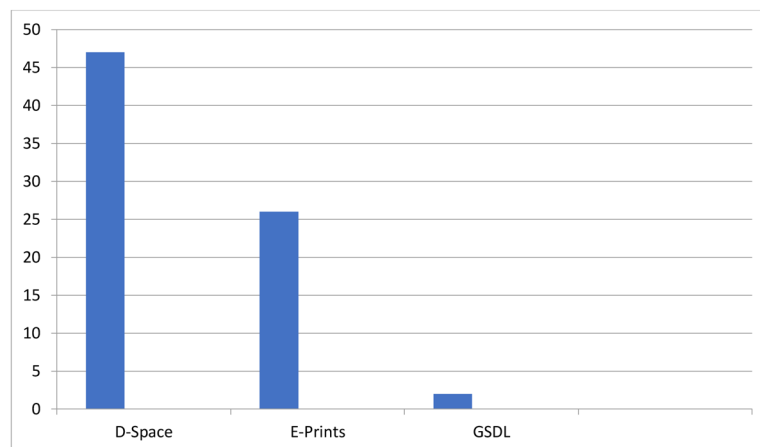


Figure 2. Usage of institutional repository software in India



ADVANTAGES

We can find the advantages while adopt the IR in the institutions

1. IR Increases visibility and prestige. A high profile IR may be used to support marketing activities to attract high quality staff, students and funding.
2. It helps in centralization and storage of all types of institutional output, including unpublished literature.
3. It supports for learning and teaching. Links may be made with the virtual teaching environment and library catalogues.

4. Standardization of institutional records. The compilation of an „Institutional CV“ and individual online dossiers linked to the full text of articles become possible.
5. To keep track of and analyze research performance.
6. It breaks down publisher's costs and permissions barrier, alleviation of requirement to trust publishers to maintain information in the long term, without any commercial benefit for the authors. Thus institutional repositories promote a wider communication.

CHALLENGES

There are some challenges bring to provide here,

1. **Lack of awareness:** Lack of adequate knowledge of the nature of this project on the part of the university management hinders the prompt and appropriate action required for effective implementation. Furthermore, many university staff think of the digital library as a kind of advanced internet service and so do not respond to calls to contribute materials to build the content.
2. **Bureaucracy:** Implementation of technology requires prompt decisions and immediate action, but these are often bogged down in time-consuming bureaucracy. Unfortunately, this has been the case in the university. Activities involving modification of the technology, facility acquisition and recruitment of personnel, have encountered a long delays.
3. **No internet access:** The University has so far not been able to provide a dedicated internet access to allow for full utilisation of the features of the digital library. Furthermore, the server requires Internet protocol to make the local contents accessible globally. These have not yet been implemented.
4. **Funding:** actually stalks the management process of digital libraries in the Northwest. - Lack of keeping to standards: As earlier noted Northwest Universities are finding it difficult to cope with the standards existing in other parts of the world.
5. **Lack of Acquisition of new skills and training of staff:** It is a fact that Librarians need more than basic ICT Kills to be able to cope with the challenges of managing the digital libraries.
6. **Problems of infrastructures:** The country constant experience disruption in electricity power supply and also vandalization of telephone wires affects digital libraries usage.
7. **Licensing, ownership and cost:** In the digital environment, acquisition of resources is done through licensing which is very confusing, problematic and also very costly.

CONCLUSION

The article discussed above growth of IR initiatives in academic and research institutions in India. The administrator need to observe prospects while concentrate the challenges and impediment of developing the IR. It is quite satisfactory in compare with other developing countries. Based on the background information and discussion presented in this paper, it is found that there is scope for developing a 'Best Practice Guidelines' for designing institute oriented IR. Manpower requirements, quality and quantity of contents, metadata standards, technical specifications, copyrights barrier, and policy issues are major

concerns that need to be addressed for developing IDRs as component of open access knowledge movement. However, the findings of our study suggest that IDRs could become a compelling and useful tool for collecting, organizing and disseminating intellectual output of the institutions.

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Section 4

Case Studies and Survey Studies in Library and Information Science

Chapter 16

Impact of Digital Marketing on ICDL 2016 Event Promotion: A Success Story

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ABSTRACT

Today's world is technology-driven. Technology has penetrated almost every sphere of human life. Digital marketing is one of the technologies that have attracted people from different age groups all over the world with their advanced nature of applications and uses. One of the foremost reasons why patrons like to use this technology is because these are not only user-friendly in nature and innovativeness but also carry the knowledge economies. Marketing and branding through digital media channels are very decent ventures that have steadily increased in value and are thereby considered safe and secure investments. In this chapter, the authors discuss a case study of ICDL 2016 conference where social media and other technology is widely used to market this event and catch prospective users.

INTRODUCTION

Digital Marketing

The main objective of the digital marketing is to reach out to a larger client base in lesser time with the help of digital media. It is so simple that end users have access to all kind of information in a single click button, no matter what time it is or which place the customer is standing. Digital Marketing is not only provide companies an opportunities to reach out to a large number targeted audience but also save money which were earlier consumed in conventional ways of marketing like printed flyers, banners, newspaper ads, flex, posters etc..

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Digital marketing is opening doors of prospects for everyone including big event companies and organizations who want to catch a wide range of online customers or prospective participants to promote their events, services and products among a wide range of channels such as robust websites, email, social media, organic search, paid search, mobile and display ads etc.,. But which digital channel one should use is still a confusing question?

Before planning an active digital marketing strategy, one should require to understand what are various kinds of digital marketing channels, and prepare a marketing strategy to decide which channels are most likely to work best for their businesses.

Channels of Digital Marketing

There are many digital marketing channels (YourStory, 2017) which are different from other marketing channels and require a new fresh approach and understanding of the behaviour of digital users.

A digital user can search the relevant information in various ways, such as by using an online app, search engine, websites, social media, etc. All of these channels are fairly different from, telemarketing, SMS and require trained manpower having proper knowledge of how each functions before marketing can be effectively commenced.

Further digital marketing channels are both internet and non-internet based.

Internet-Based Digital Marketing Channels

- *SEM (Search Engine Marketing)*
- *PPC (Pay per Click) is a paid advertising model.*
- *Search Engine Optimisation (SEO) – this is used to drive targeted website traffic to your website from search engines, e.g. content marketing strategies such as blogging and online person relations (E-PR).*
- *Internet Advertising – paid advertising across a variety of methods, e.g. banner/posters, in-app advertising, PPC (as mentioned above), social media advertising, etc.*
- *Social Media Marketing: One of the most popular forms of organic marketing utilising sites and networks such as Facebook, Instagram, LinkedIn, Pinterest, Twitter, and YouTube etc.*

Non-Internet-Based Digital Marketing Channels

- *Downloadable apps*
- *Digital display publicity*
- *Mobile phones (including SMS and MMS)*

One can use both direct and indirect digital marketing channels as mentioned above together to catch wide range of target audience, however the best approach is generally to use a variety of marketing channels to penetrate in the targeted niche.

Among various digital marketing channels mentioned above, the most important are content marketing, email marketing, search engine optimization and social media marketing.

Both direct and digital marketing can have high success rates when planned properly and targeted correctly. The key to success in both direct and digital marketing is to keep building clarity around who you serve, why they buy from you, and how you can better bring value to their lives. It's a part of the one's digital marketing strategy which combines various direct and indirect digital marketing channels.

In this chapter we will discuss how TERI Knowledge resources Centre extensively used these direct and indirect digital marketing channels in 2016 to promote its event International Conference on Digital Libraries (ICDL) and connect with the potential participants.

About ICDL 2016

The International Conference on Digital Libraries (ICDL) is a brand event of TERI Knowledge resources Centre which they usually conduct in every two –three years gap. First event of ICDL was held in 2004, then 2006, 2010, 2013 and 2016.

In 2016, the International Conference on Digital Libraries (ICDL, 2016) was held from 13-16 December 2016 at the India Habitat Centre (IHC), Lodhi Road, New Delhi. Distinguished delegates working in areas of digital library, knowledge management, data and information science across the globe attended this event. The conference was inaugurated by Ms Donna Scheeder, Former President of International Federation of Library Associations and Institutions (IFLA), USA. In line with the theme of the conference, *Smart Future: Knowledge Trends that will Change the Future*, several government bodies, institutes, and companies announced their collaboration with TERI to embark on the digital journey.

The conference comprised 20 technical sessions, 13 special events, 4 tutorials, 3 thematic workshops and 3 plenaries (*Figure 1*).

The conference was live streamed to reach out to wider set of audience globally.

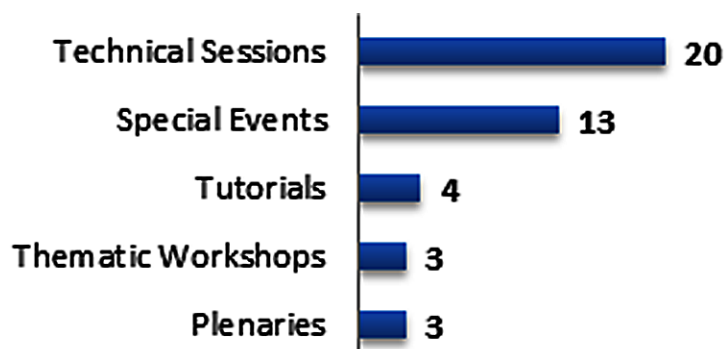
DIGITAL MARKETING STRATEGY FOR ICDL 2016

In case of ICDL 2016 digital marketing strategy is divided into two parts:

1. Promotion for visibility

Figure 1. Conference Programme

Source: ICDL 2016 report



2. Marketing to get maximum number of paid participants.

As part of ICDL 2016 marketing strategy a wide range of digital marketing channels were used to promote the conference and catch the attention of various stakeholders. This included channels like social media marketing, web marketing using web mailer, marketing through mobile, website updates and contents will be shared through blogs, cross posting, LinkedIn, TERI social media platform etc.,

A separate budget was planned for ICDL 2016 paid marketing through various social media channels. Further it was also decided to use TERI free Google ad account for ICDL 2016 marketing and an animation movie was also prepared for YouTube.

TRAFFIC CHANNELS USED IN ICDL 2016

The event was marketed through different digital marketing channels like website, social media, emails, and organic as well as paid search. Following are the various digital marketing channels used for marketing of this event.

Website

A robust website of ICDL 2016 <<http://www.teriin.org/events/icdl>> was developed which included every details about the conference programme, speakers, sponsorship, registration, paper submission, committees, and all other useful information. Website was the main and one of the most popular gateways to have all the latest ICDL event updates and updated on minute to minute basis during the event.

Following are the web analytics of ICDL 2016 website for the period October to December 2016.

ICDL 2016 Traffic Analysis

A session is the period time a user is actively engaged with your website.

- 13 December 671 sessions

Figure 2. Website of ICDL 2016 conference

Source: <https://www.teriin.org/events/icdl/icdl2016/>



Figure 3. Sessions overview (Oct 20, 2016-Dec 31, 2016)

Source: ICDL 2016, <https://analytics.google.com>

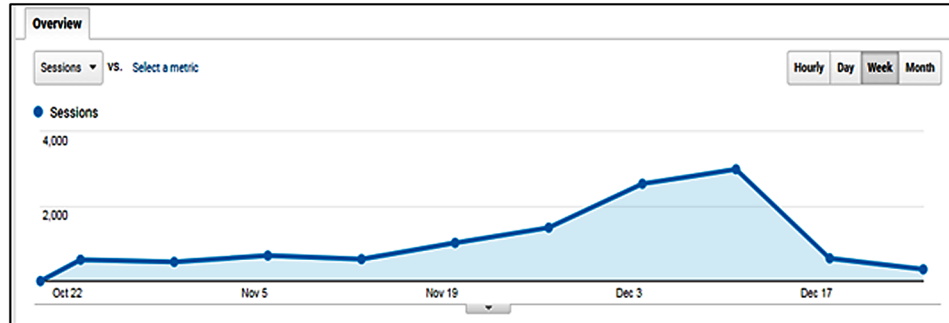
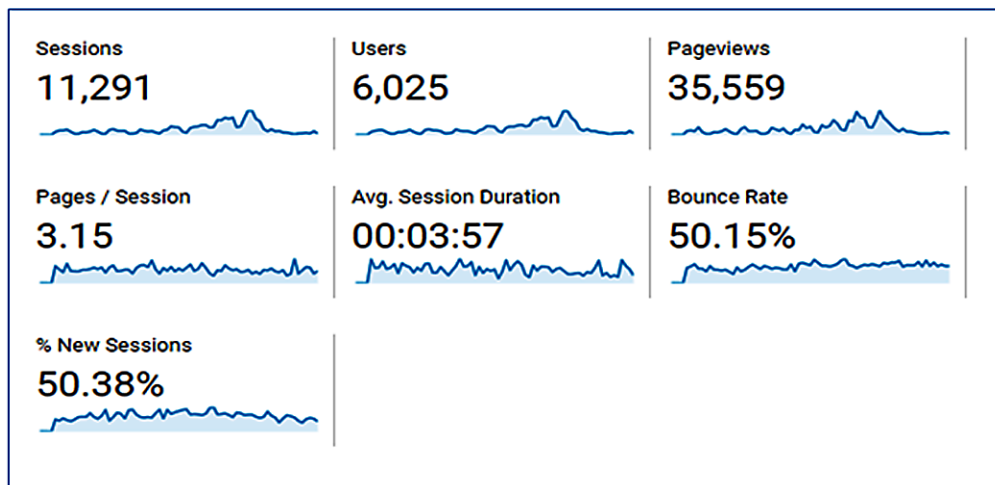


Figure 4. Traffic overview (Oct 20, 2016-Dec 31, 2016)

Source: ICDL 2016, <https://analytics.google.com>



- 14 December 656 sessions
- 15 December 433 sessions
- 16 December 373 sessions

Figure 3 shows that users were highly engaged during the conference dates (13-16 December) with the website.

- **Users**-who have initiated at least one session during the date range.
- **Pageviews**- is the total number of pages viewed. Repeated views of a single page are counted.
- **Bounce Rate**- The percentage of single-page sessions in which there was no interaction with the page. A bounced session has duration of 0 seconds.

Statistics also shows here the users visited from top 10 countries during Oct 20, 2016-Dec 31, 2016. Highest numbers of sessions were from India which is almost 72%.

Figure 5. Sessions by country (Oct 20, 2016-Dec 31, 2016)

Source: ICDL 2016, <https://analytics.google.com>

	Country	Sessions	% Sessions
1.	 India	8,103	 71.77%
2.	 Bangladesh	448	 3.97%
3.	 United States	295	 2.61%
4.	 Egypt	266	 2.36%
5.	 Nepal	224	 1.98%
6.	 Iran	134	 1.19%
7.	 United Kingdom	123	 1.09%
8.	 Pakistan	104	 0.92%
9.	 Sudan	66	 0.58%
10.	 Sri Lanka	64	 0.57%

Other Top Channels

- **Organic search:** In case of ICDL 2016, Organic search where visitors land on your website as a result of unpaid search via SEO (Search Engine Optimization) occupy the top position. Around 42% users visited the website through organic traffic.
- **Direct:** Around 20% users visited the website directly by using its url without going through any search engine database.
- **Paid search:** It works on pay- per-click (PPC) model and companies pay for it. The two main differences between SEO or paid search are-(i) paid ads appear at the top of the page, above the organic listings.(ii) traffic from organic is free, whereas traffic from paid search has a cost for each click. From paid search ICDL 2016event got around 15% of traffic.
- **Email marketing.** This is an effective way to get good traffic to your contentsbecause it not only build and retainconnection with potential participants and maintain relationships with existing participants. TERI has a big Contact Management System (CMS) in place and used to send a weekly email to keep this event top-of-mind, . From this channel ICDL 2016 event were able to get 18 percent of traffic.
- From **Referral and Display**, we were able to generate 8.3% of traffic which involved designing graphical ads and placing them next to content on websites, emails and other digital formats. This method was used to market the ICDL 2016 event through text, images, video clips which include animation or other interactive content.

An animated movie for YouTube channel were produced to market the event at global level . This movie can be found in the additional readings.

Figure 6. Top social media channels
Source: ICDL 2016 report

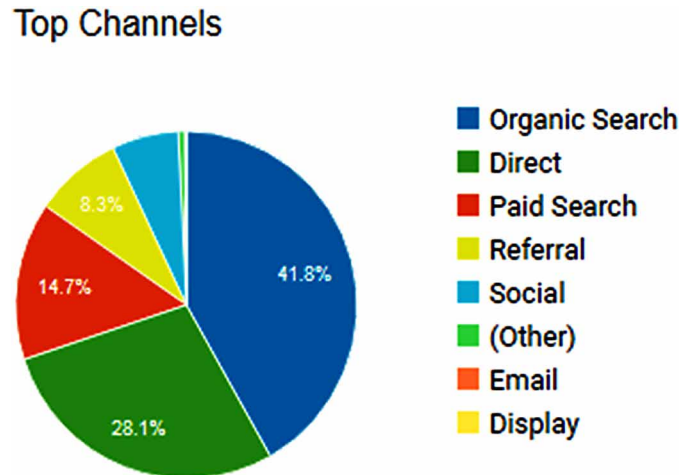
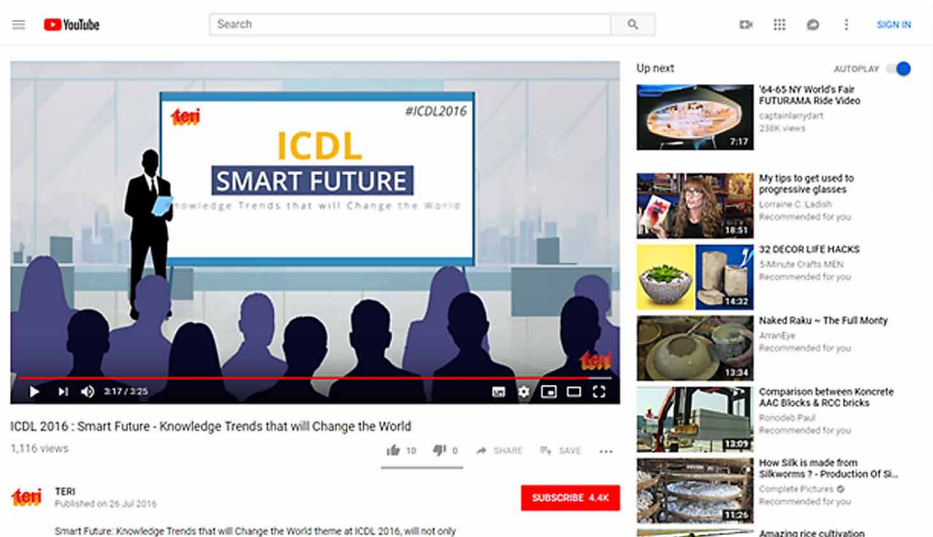


Figure 7. YouTube animation video prepared during ICDL 2016
Source: YouTube 2016, https://www.youtube.com/watch?v=P_74HAGlhKY



SOCIAL MEDIA MARKETING (SMM)

Social media is definitely one of the most phenomenal things to happen in the digital arena that business owners and digital marketers can leverage on to create brand awareness for their products and services. The social media also played a crucial role in disseminating the deliberations at ICDL 2016. The live updates of ICDL 2016 were posted on various platforms which has received a very good response all over the world. From social media we were able to get only 6.3% (711 sessions)

Impact of Digital Marketing on ICDL 2016 Event Promotion

Figure 8. Social media traffic breakdown

Source: ICDL 2016,

Social Network ?	Acquisition			Behavior	
	Sessions ? ↓	% New Sessions ?	New Users ?	Bounce Rate ?	Avg. Session Duration ?
	711 % of Total: 6.30% (11,291)	64.14% Avg for View: 50.38% (27.31%)	456 % of Total: 8.02% (5,688)	73.28% Avg for View: 50.15% (46.10%)	00:01:56 Avg for View: 00:03:57 (-51.04%)
1. Facebook	585 (82.28%)	67.69%	396 (86.84%)	74.87%	00:01:37
2. Twitter	99 (13.92%)	42.42%	42 (9.21%)	67.68%	00:03:53
3. LinkedIn	24 (3.38%)	62.50%	15 (3.29%)	54.17%	00:01:57
4. bittly	1 (0.14%)	100.00%	1 (0.22%)	100.00%	00:00:00
5. Blogger	1 (0.14%)	100.00%	1 (0.22%)	100.00%	00:00:00
6. Google+	1 (0.14%)	100.00%	1 (0.22%)	100.00%	00:00:00

Some of the statistics obtained from different social media channels on ICDL 2016 event Traffic are also shown in Figure 8.

Figure 8 shows the facebook is the top channel in keeping the highest number of users engaged followed by twitter and LinkedIn.

KEY SOCIAL MEDIA UPDATES ON FACEBOOK

As part of its marketing strategy Facebook is extensively used for ICDL 2016 social media marketing.

Following are some of the updates during the conference

- 17 December 2016
- Reached 2,273 people reached
- 17 Likes
- 13 December 2016
- Reached 4211 users
- 58 Likes
- 11 Shares

TWITTER UPDATES ANALYSIS (13-16 DECEMBER 2016)

Twitter had reached to 50.2 K people over the course of 4 days of the event which is also shown in the Figure 11.

Figure 9. ICDL 2016 Facebook updates

Source: Facebook



- During this 4 day period, we earned 12.6K impressions per day.
- Impressions:- Number of times a user has viewed the tweet

Figure 12 shows some of the top tweets during ICDL 2016 events top tweets.

LINKEDIN UPDATES ANALYSIS

Linkedin was also used as one of the medium to reach the relevant audience and is has also achieved good impressions (Figure 13).

Impact of Digital Marketing on ICDL 2016 Event Promotion

Figure 10. ICDL 2016 Facebook updates
Source: Facebook

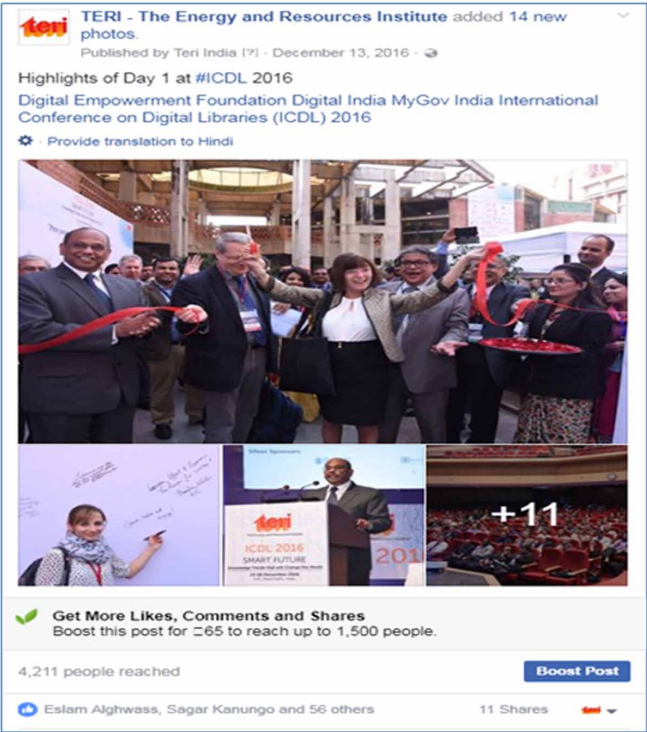


Figure 11. Twitter updates
Source: Twitter

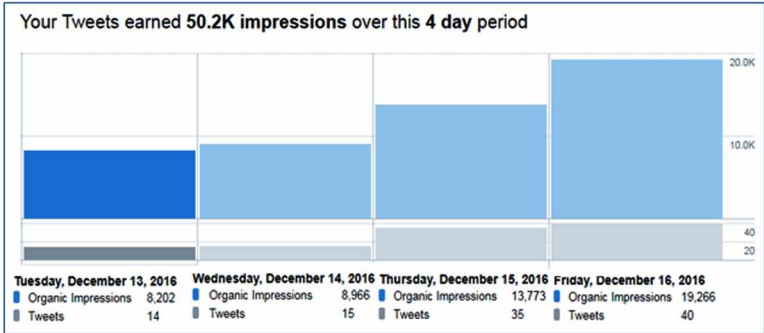


Figure 12. ICDL 2016 top tweets

Source: <https://twitter.com/teriin>

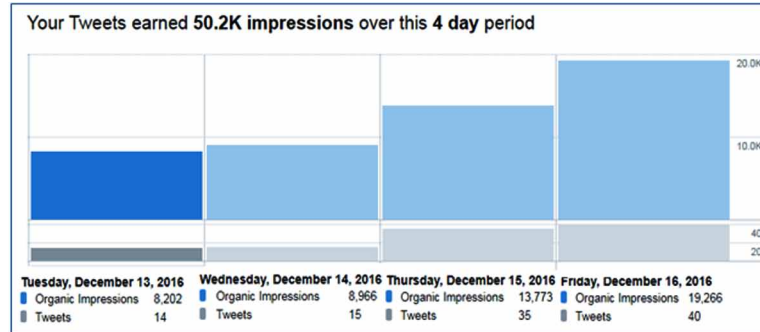


Figure 13. ICDL 2016 updates on LinkedIn

Source: <https://www.linkedin.com/company/teriin>



OTHER TRAFFIC SOURCES

Live Streaming

All the sessions of ICDL 2016 including the special events and thematic workshops were live streamed across the globe to reach to stakeholders who are unable to physically attend the conference. Viewers could actively interact with the speakers and able to establish two way communication. Questions raised by the viewers were addressed by the chairs and co-chairs of the respective sessions. The conference was viewed by over 6000 stakeholders from different countries including India.

For better and seamless view, it was streamed on CDN server (content delivery network). The streaming was organized simultaneously for all the four sessions over high speed connectivity.

The summary of viewers' statistics for the four days of the conference is given in Table 1.

Impact of Digital Marketing on ICDL 2016 Event Promotion

Figure 14. ICDL 2016: engagement through live streaming

Source: ICDL 2016 report



Table 1. ICDL 2016: live streaming viewers' statistics

	13 December 2016	14 December 2016	15 December 2016	16 December 2016
Page views	685	2551	1691	1360
Unique page views	295	827	608	500

Source: ICDL 2016

ICDL 2016 Mobile App

The conference Mobile App was developed to disseminate all information related to the conference programme, speakers and other useful information. The App could be downloaded at Google and Apple play stores. The app was downloaded and accessed by 200 stakeholders. During the conference, ICDL 2016 mobile app helped the delegates to check the schedule and minute to minute updates of the sessions.

Mobile app is also used to conduct the Opinion during the sessions to ascertain the views of the participants on topical issues. The participants, including online viewers who participated in the conference through live streaming also took part in the opinion polls.

Example of Opinion Poll After Session 1

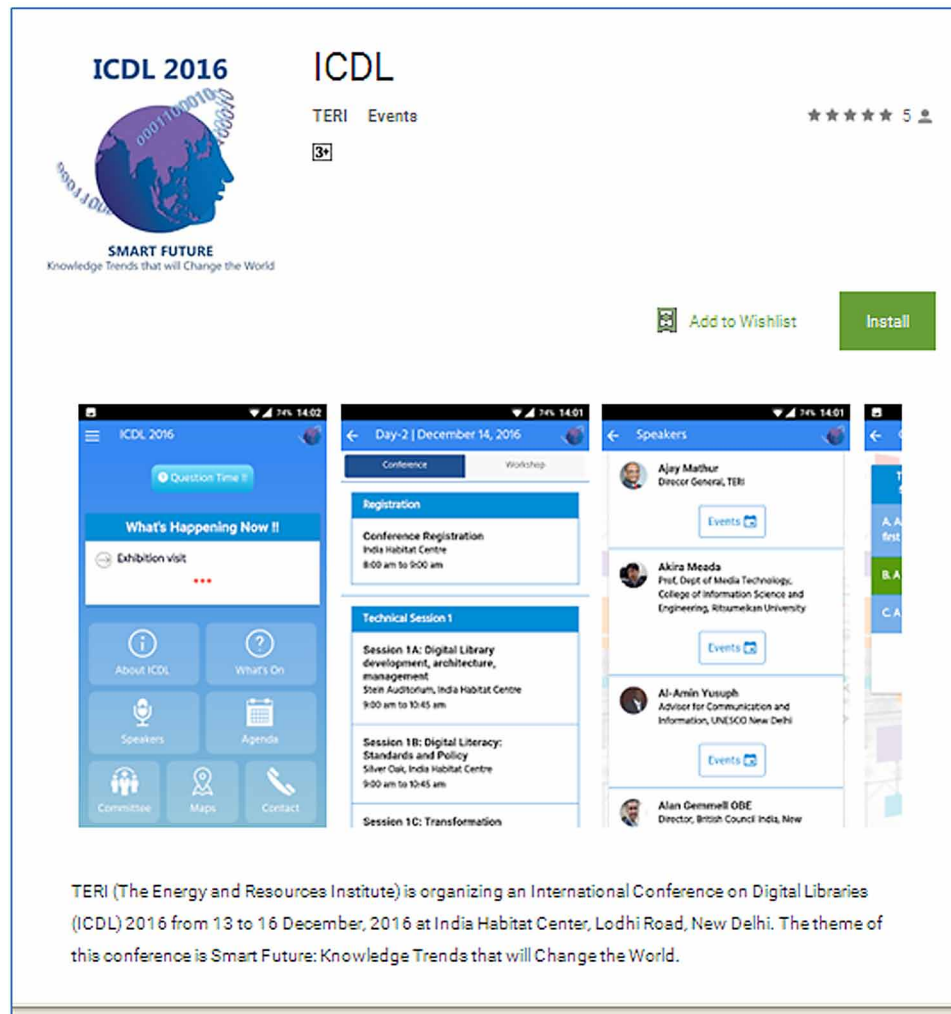
Opinion Poll I: *The central factor and guideline that governs the overall concept of the Smart Future Initiatives is:*

The options were:

1. Keep the Technology in the Loop
2. Keep the Human in the Loop
3. Keep the Innovation in the Loop

Figure 15. Screenshot of ICDL 2016 mobile app

Source: Author



The voting pattern of all participants (including the online viewers) reveals that keeping humans (workforce) and innovation in the loop are the central factors that govern the concept of Smart Future Initiatives with 34.8% of the respondents voting in favour of each options B and C (Figure 16).

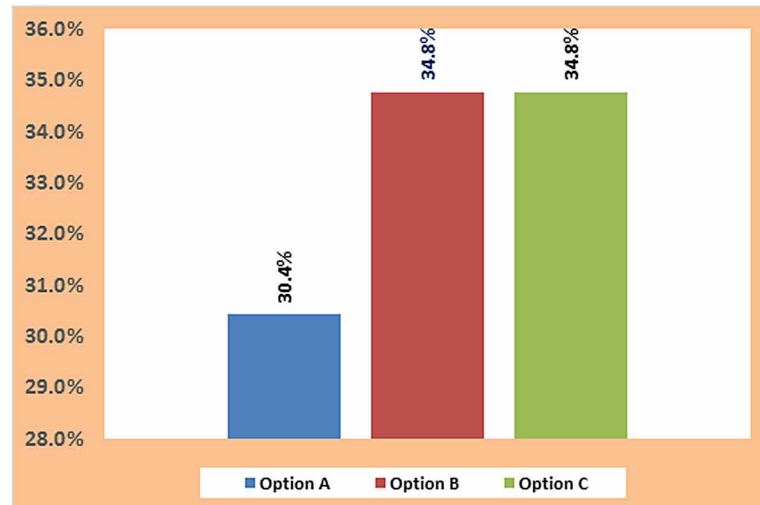
CONSTRAINED FACED

Digital marketing faces few constraints as well, such as the key ability to reach to your potential audience. Promotions and your contents must appeal to the end users while precisely reflecting the benefit of services and products which you are selling. Misinterpreting your demographic or pricing strategy could result in significant constraints to your deals.

Impact of Digital Marketing on ICDL 2016 Event Promotion

Figure 16. Opinion poll voting results during one of the session

Source: ICDL 2016 report



There were also few constrained which we had faced while doing digital marketing of our mega event ICDL 2016. Which are following?

- Lack of digital marketing expertise
- Trained manpower in emerging trends in library domain
- Creating eye catchy content
- Implementation of monitoring feedback due to less time availability

However, with the correct planning and application of various digital media channels, we were able to protect our social media campaign from failing and going wasted.

CONCLUSION

Digital Technology had played an important role in making ICDL event more successful and establishing connections with the more and more digital connected users. Like its theme smart future, this event smartly used all the available smart digital technology to not only penetrate but to establish its name in the digitally smart world. ICDL is a brand now because it not only preaches but also believes in implementing these technologies which is very evident from this three day event. Also it was felt that a separate cell or agency could have done this exercise more efficiently as social media blast and Facebook/Linkedin and other social platforms require regular promotion and timely content creation and updation.

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Chapter 17

Electronic Resource Management and Digitisation: Library System of the University of Calcutta

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ABSTRACT

Electronic resource management (ERM) is the system and technique used by library professionals to track the selection, acquisition, access, maintenance, usage, evaluation of a library's electronic resources. The innovation of ERM conducted in the University Library, University of Calcutta has been discussed. It provides innovative insights into how technology transfer has operated in the University Library for digitising the documents. E-resources are a vital reference source for different types of library users. The main focus is on how ERM is done through the digitisation of resources in the digital library of the University of Calcutta. Digital libraries have been set up in all the campuses by the University Library System so that users can download e-resources from any campus. The University Library maintains an online catalogue for information search and retrieval. Theses have been digitised, and full texts are available. Through the innovation of the Digital Library System of the University, it would enhance the University's education and research value.

INTRODUCTION

Electronic Resource Management(ERM) is the system and techniques used by library professionals to monitor the selection, acquisition, access, maintenance, licensing, usage and evaluations, of a library's electronic information resources. These resources include electronic journals, electronic books, streaming media, databases, CD-ROMs, and computer software.

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Due to the rapid growth of e-resources in libraries, the maintenance of these resources has become more complex. So the libraries have to develop strategies to manage and deliver e-resources conveniently to the users keeping in mind the 'five laws' of Dr S.R. Ranganathan. Therefore, Electronic Resource Management (ERM) has become a challenge among library professionals. To meet these challenges, library professionals and vendors of e-resources decided to develop electronic resource management systems (ERMS) for the management of e-resources in a more systematic way. Breeding (2004) defined two facets of managing electronic resources: firstly, the details of delivery of the content to library users and secondly, staff management related to acquisition, payment and licensing. The adoption of ERM leads to systematic management and thus optimum access to library resources.

ERM calls for the formulation of library policies for collection development of e-resources that would ensure uniformity in approach, the relevance of e-resources requirements and assessing economic feasibility. There are different ERM software available, both commercial and open source. Some of these ERMS are Ex Libris's Verde ERM, Interface's Innovative ERM, MIT's VERA, OCLC's Web-Share License Manager, SemperTool's SMDB, TDNet ERM Solutions, University of Notre Dame's CORAL, and others.

In the Indian scenario, from amongst the Management schools/institutes, Indian Institute of Management like Indian Institute of Management (IIM), Ahmedabad is using the Integrated Library Management Software "KOHA" for automation. Indian Institute of Management (IIM), Bangalore uses "VTLS-Virtua" for library management. The library system is run by the library automation software "Libsys" in Indian Institute of Management (IIM), Calcutta. Xavier Labour Relation Institute (XLRI), Jamshedpur uses library automation software "Alice for windows" of Softlink Asia. The library has introduced the integrated library management software 'Libsys' in Indian Institute of Management (IIM), Lucknow. "VTLSVirtue" has been implemented in Indian School of Business (ISB), Hyderabad. Management Development Institute (MDI), Gurgaon uses fully automated "Libsys" software. Indian Institute of Technology (IIT) Library, Delhi and IIT Kharagpur use LIBSYS as Library Automation software. IIT Madras uses Library Automation software VTLS. The Library resource management software used by the University of Calcutta is SOUL developed by INFLIBNET.

The objective of this chapter is to study the innovation of Electronic Resource Management conducted in the University Library, University of Calcutta. It provides innovative insights into how technology transfer has operated in the University Library. The project of Electronic Resource Management has been supervised by the University Librarian and other library personnel.

BACKGROUND

A Brief History of the University Library

The University of Calcutta was formally launched in 1857. The University was authorised initially to hold examinations and award degrees. In the fundamental stages the University library, museum and other common facilities did not receive much attention. In 1872 attempts were made for the establishment of a library.

Only the Resident Fellows used the University Library originally. Afterwards, rules for managing the library were revised and allowed Resident Registered Graduates, Scholars and University Teachers as well to use the library.

According to the National Institute of Ranking Framework (NIRF), MHRD, GOI the University of Calcutta has secured the 5th position in India Rankings 2019 among the Universities in India.

Libraries of Calcutta University will be thrown open to the public, a rare opportunity which is offered by not many Universities of India. Anyone giving entrance exams or competitive test can visit the library for preparations. They can access English and Bengali literature books, novels and poetry books, film-related books. Women studies corner, Anglo Indian and sports corner will also be there. The general public will also be able to access reading sections and digital libraries in all campuses, including the central library at College Street Campus (main campus), for reading purpose free of cost. Libraries can be accessed by students, people from various professions and of various ages. University hostels can access the libraries through Wi-Fi connections.

The University of Calcutta Library system comprises of the Central Library, 5 Campus libraries, 39 Departmental libraries and 4 libraries of the Centres of Advanced Studies. The libraries have 8 major campuses.

Presently, the University Library has a collection of more than 12 lakh books. Besides books, the 8 campuses of the University together hold a collection of more than 2 lakh documents, including bound journals, CDRoms, manuscripts, maps, PhD theses, patents, proceedings of conferences, reports, standards. The central, campus and departmental libraries serve the entire University system.

The University libraries provide access to over 3 lakh electronic books and more than 14 thousand electronic journals for all its users in all the campuses. Our students can download the e-contents from any of these campuses through the University Library website:-<https://www.caluniv.ac.in/libraries/library.html>

Figure 1. University library website



The library website acts as a platform to provide information on library resources. A library website made up of multiple pages offers better provision for ERM. A dynamic website is maintained for the University Library which facilitates easy content updating, searching and user participation. There is a positive correlation between having a dynamic website and better e-resources management.

LITERATURE REVIEW

According to Busha and Harter(1980) “a literature search is an attempt to identify, locate and synthesize completed research reports, articles, books and other materials about the specific problems of a research topic “.

The expanding growth of various electronic resources in the present digital environment opens up new techniques and systems related to the access, availability of information in different formats, copyright issues, collection assessment, preservation and resource sharing.

There is vast literature available on this subject of management of electronic resources.

As a result of electronic transformation, major changes have taken place in University libraries with an impact on the operation of traditional libraries. There is a modification in how the libraries select, collect, organize and disseminate/ retrieve information through electronic resource management. Hence they have developed new models to operate in the digital atmosphere. Observations of some of the authors on ERMS are summarised below.

Electronic resources have created more prospects to redevelop and re-evaluate the collection development and management activities in academic libraries.

According to Gessesse (2000), there has to be an equilibrium between print and electronic resources and in providing access to them.

Fecko (1997) said that libraries in the future will provide more importance to the in-depth collections and not the volumes of the selected research fields. There should be broader network access to collections of the libraries whatever maybe the format and their existence.

Mc Carthy (1996) stated that the scenario of the library’s operations and services will change in the electronic era. Some libraries might not have the scope to provide electronic service. But most of the efforts and funds will be dedicated to providing electronic access to information resources by some of the libraries.

The following changes due to the introduction of electronic resources in libraries have been pointed out by Marcum (2000). There has been a transformation in acquisition, organization and retrieval of information from the library, modification in the relationship between an institution’s library and its information technology division, change in the methods how collections are acquired, stored, organised and delivered.

Simmonds and Andaleeb (2001) also pointed out the role of electronic information resources on collection management in academic libraries. He said that the introduction of electronic information resources created new methods of access to information and document delivery. With the application of the internet and the use of new information technologies the range of services provided by academic libraries increased intensively. He also stressed that users can access the library resources without coming to the library building. Further, they can also access other library resources like online catalogues and freely available databases from any place outside the library.

Goehner (1992) compared the costs incurred in the acquisition of printed document and their corresponding counterpart in electronic form. He said that there is a huge cost involved in the installation of hardware and software to get full advantage of e-resources. But in the long run, the benefits of these resources would be more effective.

The collection development in the digital environment was also analysed by Vignau and Quesada (2006). He stated about developing digital collections by inserting information technologies in organizations.

Level & Myers (2003) stated that collection development in any library is an important and continuous process. Digitisation of paper documents is growing rapidly. The usage of the web and the internet in the collection development has led to the increase in the level of efficiency and accessibility in many ways through the integration of forms, procedures, policies and websites of library organisations.

Raj (2017) remarked that e-resources have played a significant role to assist academic and research personnel. More of core e-journals should be incorporated in the ERMS of the library of the University of Calcutta.

It can be concluded from the above that digitisation, e-resources and networks, has enabled and expedited access to information beyond geographical frontiers. There has been a huge transformation in collection development and management compared to the last decade. Some authors have stated that the future of libraries is going to be more specialised and complex. Hence the nature of the collection development of university libraries has to take into account the present and future impact of electronic resources and equip them accordingly.

MAIN FOCUS OF THE CHAPTER

Digital Library System of the University of Calcutta

The University Library has setup digital libraries in all the 8 campuses so that users can access and download e-resources from any campus.

In the project of Digitisation, the University Library has a Digital Repository Section and a Digital Braille Library as depicted in the figures 2 and 3.

Figure 2. Digital repository

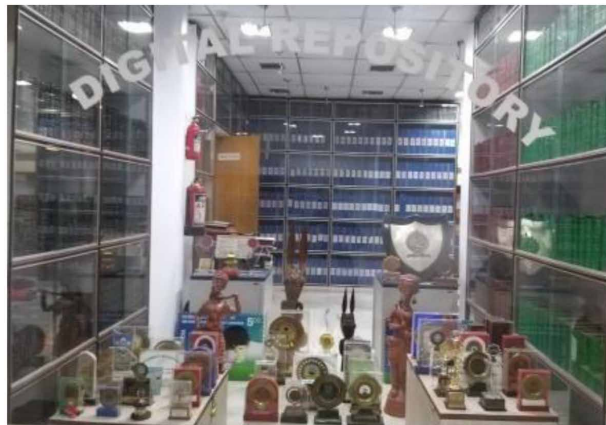


Figure 3. Digital Braille library



The Central Library of the University has a large collection of rare books published from the 16th century onwards. The University has preserved this collection of old documents. Steps have been taken to digitise rare books through outsourcing under the supervision of library personnel.

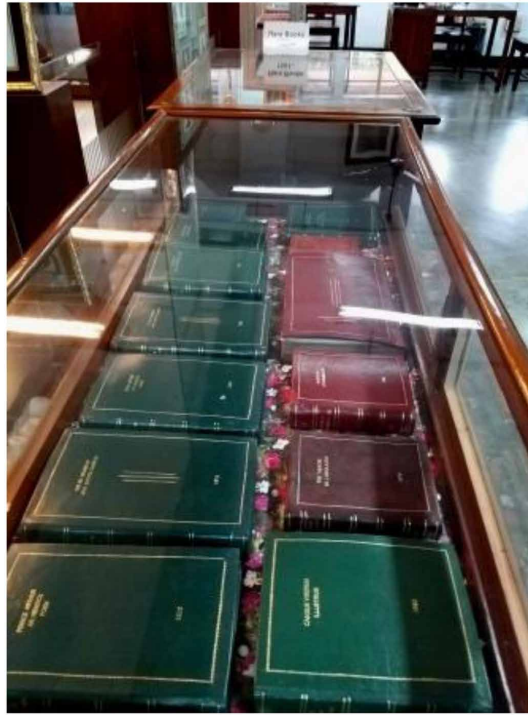
The figures 4 and 5 show some of the rare books in the University library collection which have been digitised.

Library as a Learning Resource

1. University Library collection has a large number of books and journals with support of adequate budget allocation.
2. The library e-resources are used effectively and significantly with user-friendly library operations.
3. University has adequate computer facilities for faculty and students. While the central library is computerised with all facilities, the campus and departmental libraries are yet to be computerised and networked with the central library.
4. A dynamic website is maintained by the University which is also updated regularly.
5. There is an appreciable INFLIBNET facility.

IT infrastructure plays a crucial role in the management of a library's e-resources. Different IT infrastructure necessary for the management of e-resources in libraries includes communication technology, hardware and software such as computers, servers, library software, websites and internet access. University library has other facilities in the infrastructural development and learning resources:

Figure 4. Rare books



1. The Braille facilities are available for Physically challenged students from the Universities and Colleges.
2. A proper-functioning and well managed administrative staff college.
3. Preservation of rare documents, manuscripts and other heritage documents by the library.
4. Better ERM with expertise in the area of IT.

Selection of E-Resources for the Digital Library

The following factors which affect the renewal/cancellation of e-resources and play an important role are:

- The ranking of databases by obtaining usage statistics, the significance of research work and the curriculum, budget factors, cost-benefit analysis, committee recommendations, the uniqueness for avoiding duplication.
- The selection of the e-resources is done by University Librarian along with suggestions invited from Faculties and Scholars of the University.
- The subscription of a particular e-resource might be discontinued if found to be not in use for a long time or if there is no further requirement for it. The decision for selection and cancellation is taken solely by the Library Authority.
- A librarian (or e-resources manager) has to analyse the entire e-collection for duplication of titles, usefulness, cost-effectiveness and other criteria like handling administrative jobs, IP registration, renewal, generating reports on different technical issues, license reviewing and notification servic-

Figure 5. Images of the title pages of a selected few rare books after digitisation



es. Also, library personnel and users need to have information on permissions and restrictions on the usage of e-resources. Before subscribing to e-resources, the librarian (or e-resources manager) have to review each point of the license agreement properly.

List of Electronic Resources That Can Be Accessed From the Digital Library:

Database of American Chemical Society, Database of American Institute of Physics, Database of American Physical Society, Annual Reviews, Record of Cambridge University Press, Economic & Political Weekly, Emerald Univ Collection (133 titles), JGate Plus (JCCC), Institute for Studies in Industrial Development

(ISID) Database, Database Institute of Physics, JSTOR, MathSciNet, Nature, Oxford University Press, Portland Press, Project Euclid Prime, Project Muse, Database of Royal Society of Chemistry, Database of Science Direct, SciFinder Scholar Database, SIAM, Springer Link, Database of Web of Science, Wiley Blackwell Publishing, Supreme Court Cases (SCC) Online for Legal Research, NDL e-Resources like - World e-Book Library, Springer E-books, Oxford E-Books and Oxford Scholarship Online, Oxford Scholarly Editions, Foreign Office Files for India, Pakistan and Afghanistan, Sage E-books, McGraw-Hill E-Books, Wiley Books Online, Cambridge E-books, Taylor Francis & CRC E-books, ProQuest Dissertations and Theses Database, South Asia Archive, IEEE Journals/IET Online, Online Early English Books, Documents related to House of Commons Parliament and House of Lords, E-brary Academic Complete, ProQuest History Vault, Documents on British Policy Overseas.

E-Journals subscribed to by the University Library covers Subjects like -

- Accounting and Finance, Agricultural Science, Anthropology, Archaeology, Architecture, Area Studies of different continents, Arts, Astronomy and Astrophysics
- Biological Science and its related discipline, Business and Management
- Chemistry and its related discipline, Communication, Computer Science,
- Criminology
- Defence Studies, Demography
- Ecology, Economics, Education, Engineering and its related discipline, Ergonomics
- Food Science
- Geography, Geology, Gerontology
- Health Care, History, Humanities
- Language and Linguistics, Law, Library and Information Science, Literature
- Marine Science, Mass Communication, Materials Science, Mathematics, Medical Science, Meteorology, Museum and Archives, Music
- Performing Arts, Philosophy, Physics and its related discipline, Political Science, Psychology and its related discipline, Public Administration
- Religion and Theology
- Social Science, Sociology, Sports and Games, Statistics and its related discipline
- Transport and Tourism
- Veterinary Science
- Women's Studies
- Zoology and its related discipline

Figure 6 and 7 shows the Full-Text Databases under the Publishers .

Searching by Publishers Gateway is done through:-

1. FULL-TEXT DATABASES:
 - a. American Chemical Society (ACS) Database
 - b. American Institute of Physics (AIP) Database
 - c. American Physical Society (APS) Database
 - d. Annual Reviews
 - e. Economic & Political Weekly
 - f. IEEE-IET Online

Figure 6. E-Journals database of AIP

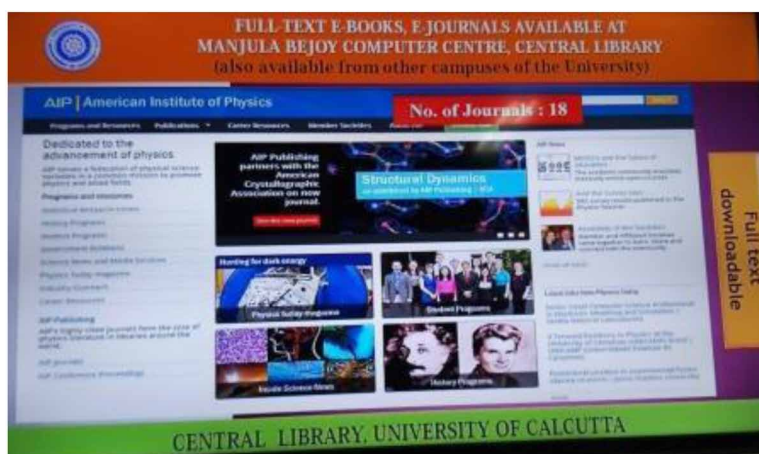
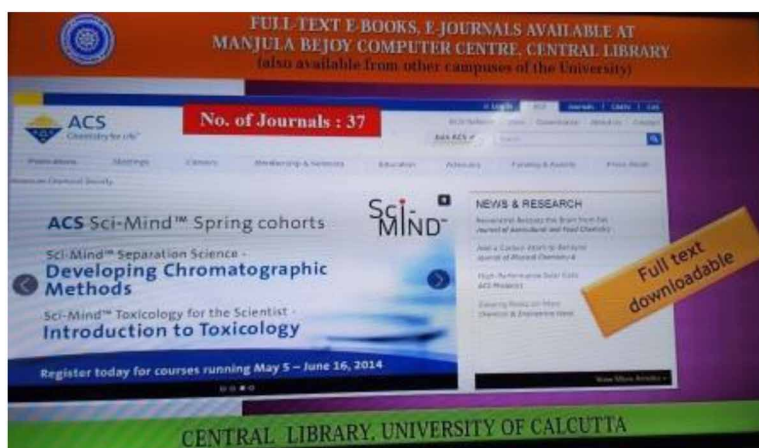


Figure 7. E-Journals database of ACS



- g. JSTOR
- h. Oxford University Press
- i. Project Muse
- j. Springer Link 1700 Collection + Nature Journal
- k. Taylor and Francis
2. BIBLIOGRAPHIC DATABASES:
 - a. ISID
 - b. MathSciNet Database
 - c. J-Gate@UGC-INFONET
 - d. Web of Science

The following ways are considered as better to manage e-resources:

Access to e-resources through website and discovery/federated search, organized e-resources via an A to Z list, access through the OPAC, subject-wise or via content types on the website; e-resources managed by the library's automation software; e-resources managed by the library's digital software, and CD networking software.

Development of Electronic Resource Collection

The following E-Resources have been procured for the University Library -

- **Springer E-books Subjects** - Behavioural Science, Biomedical & Life Sciences, Business & Economics, Chemistry, Computer Science, Design & Arts, Engineering, Environmental Science, Material Science, Mathematics & Statistics, Physics & Astronomy.
- **Oxford E-Books/Oxford Scholarship Online Subjects** - Business Management, Finance & Economics, History, International Relations, Law, Linguistics, Literature, Philosophy, Political Science, Psychology, Sociology.
- **Oxford Scholarly Editions**– Shakespeare collection.
- **Foreign Office Files for India, Pakistan and Afghanistan** - Section I: Independence, Partition and the Nehru Era, 1947-1964.
- **Sage E-books Subjects** - Biosciences, Chemistry, Counseling, Criminology, Education, Engineering, Environmental Science, Geography, Health care, History, Management, Mathematics, Media studies, Philosophy, Physics, Political Science, Psychology, Research Methods, Sociology.
- **McGraw-Hill E-Books Subjects** - Computer Science, Electronics, students study aids.
- **Wiley Books Online** – Covers a wide range of subjects in the fields of Arts, Humanities, Social Sciences, Economics, Finance, Computer Science, General Science and Technology
- **Cambridge E-books Subjects** - Economics, Environmental Science, Life sciences, Linguistics, Literature, Management, Mathematics, Physics, Politics.
- **Taylor Francis & CRC E-books Subjects** – Agriculture, Area studies, Arts, Audiology, Engineering, Behavioural Sciences, Bioscience, Communication Studies, Computer Science, Development Studies, Economics, Education, Environment, Events, Finance, Food Science, Geography, HealthCare, Humanities, Industry, Information Science, International relations, Language, Law, Literature, Management, Mathematics, Museum Studies, Physical Sciences, Social Sciences, Social Work, Sports, Statistics, Tourism, Urban Studies.
- **ProQuest Dissertations and Theses Database** - ProQuest Dissertations & Theses Database contains a comprehensive collection of dissertations and theses from around the world from 1743 to the present day and providing full texts along with citations for graduate works from 1997.
- **South Asia Archive** - This is a wide-spread resource for the Humanities and Social Sciences scholars.
- **IEEE Journals/IET Online** - Comprises of core journals in the field of Biotechnology, Computing, Electrical Engineering, Telecommunications, and other related technologies.
- **Early English Books Online**- Early English Books Online (EEBO) incorporates first book printed in English by William Caxton, through the age of Spenser and Shakespeare and gives an account of the English Civil War. It contains over 125 thousand titles listed in Pollard and Redgrave's Short-Title Catalogue (1475-1640), Wing's Short-Title Catalogue (1641-1700), the Thomason

Tracts (1640-1661), and the Early English Tract Supplement - all in full digital facsimile from the Early English Books microfilm collection.

- **House of Commons Parliamentary Papers** - This database includes over 200 thousand papers from 1715 to the present.
- **House of Lords Parliamentary Papers** - Gives an account of the working of the UK Parliament during the 19th century. The research value is of international significance, representing statistical data, verbal evidence, letters and business papers associated with Britain and many other parts of the world that were under British influence.
- **E-brary Academic Complete** - E-brary Academic Complete contains 134 thousand titles and is a collection of intellectual e-books from well-known publishers covering academic subject areas like Arts, Business, Education, History, Law, Language, Literature, Medicine, Philosophy, Religion, Science & Technology, Social Sciences.
- **ProQuest History Vault has 2 modules** - Module 1 covers the Vietnam War and American Foreign Policy from 1960-1975. Module 2 covers Office of Strategic Services (OSS) – State Department, Intelligence and Research Reports from 1941-1961.

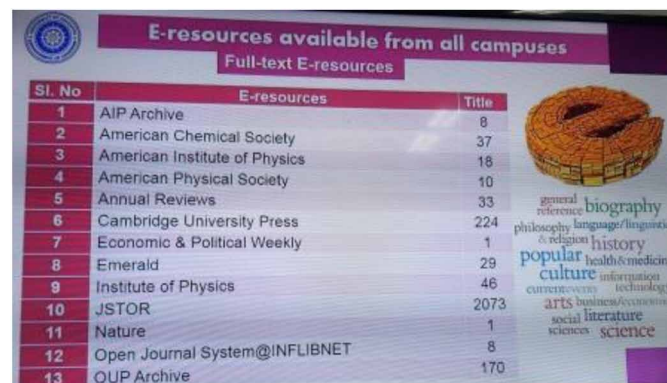
Documents on British Policy Overseas

The figures 8, 9, 10, 11 and 12 shows a view of the E-resources database on the University Library website.

Institutional Repositories (IR)

An IR is a digital collection of an institute's scholarly output. It provides a web-based mechanism for researchers to store (self-archive) and access their research publications. The IR of the University of Calcutta collects, preserves and makes available in digital format the scholarly output of the University which comprises faculty, employees and students. The archive for the IR includes materials such as research journal articles and digital versions of theses and dissertations. It also includes other digital assets like administrative documents, course notes, or learning materials. The interface of the IR provides for easy self-archiving by faculty and organises the documents in a logical and easily retrievable

Figure 8. E-Resources



Sl. No	E-resources	Title
1	AIP Archive	8
2	American Chemical Society	37
3	American Institute of Physics	18
4	American Physical Society	10
5	Annual Reviews	33
6	Cambridge University Press	224
7	Economic & Political Weekly	1
8	Emerald	29
9	Institute of Physics	46
10	JSTOR	2073
11	Nature	1
12	Open Journal System@INFLIBNET	8
13	OUP Archive	170

Electronic Resource Management and Digitisation

Figure 9. E-Resources

E-resources available from all campuses		
Full-text E-resources		
Sl. No	E-resources	Title
14	Oxford University Press	206
15	Portland Press	9
16	Project Euclid	35
17	Project Muse	493
18	Royal Society of Chemistry	29
19	RSC Archive	70
20	Science Direct (10 Subject Collection)	1036
21	Science Direct Archive (Basic Sc. Collection)	260
22	SIAM	14
23	SIAM Locus (Archive)	17
24	Springer Link	1763
25	Taylor and Francis	1173
26	Wiley Blackwell Publishing	908

Figure 10. ProQuest database

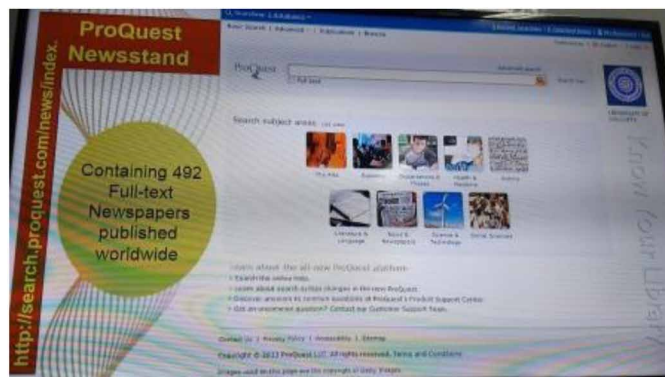


Figure 11. The figure above demonstrates how to search Journal articles in Sage journals database

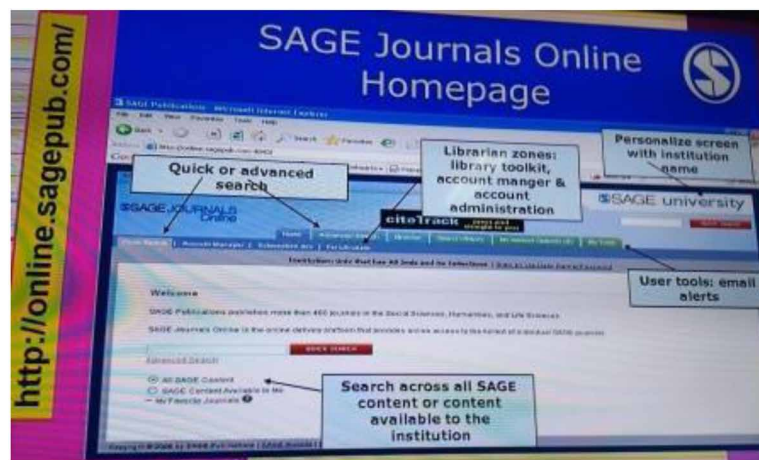
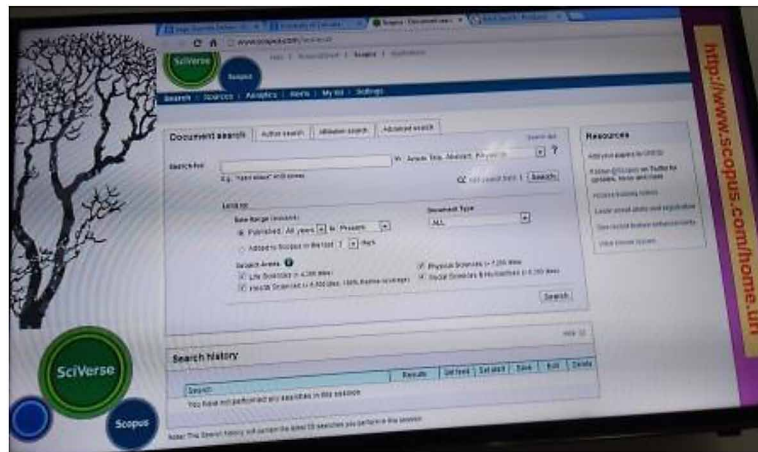


Figure 12. This figure demonstrates how to search the 'SciVerse' database



method. Thus an Institutional Repository is like a digital archive with a network-accessible server that holds scholarly material and electronic resources.

In the Indian scenario, the launch of IR ensures that their national research output contributes to the global knowledge stream. The high quality research and development work by leading Indian scientific research institutions, such as Indian Institute of Science (IISc), Indian Institutes of Technology (IITs), Indian Statistical Institute (ISI), laboratories under the Council of Scientific and Industrial Research (CSIR), Indian Council of Medical Research (ICMR), Indian Council Agricultural Research (ICAR), Indian Space Research Organisation (ISRO), Department of Atomic Energy (DAE), traditional universities, deemed universities and Corporate R & Ds have contributed towards national development through national and international journals and conferences. Access to this important research is easily not available because of the increasing cost of publishing which can be solved through the establishment of the institutional repository (IR).

The main objectives for having an institutional repository are:

- To create global availability for an institution's scholarly research output
- To collect content in a single platform
- To provide open access to institutional research output by self-archiving it
- To store and preserve other institutional digital assets, including unpublished or easily lost literature (e.g., theses or technical reports)

Advantage of Institutional Repository (IR) is having a digital archive of research publications that will be accessible anywhere through the Internet. It also Improves citation of research publications and also helps in preservation and control of one's publications.

IR software used by Calcutta University Library is DSpace.

IIT Kharagpur and IIT Madras use IR software DSpace. IIT Delhi uses ePrint as IR software.

Librarian's Digital Library (LDL) of Documentation Research and Training Centre (DRTC), Bangalore is an example of a subject-specific repository for the library and information professionals. Another

subject-specific repository established in India is OpenMed@NIC, maintained by National Informatics Centre, New Delhi.

Indian Institute of Science has open access repository of IISc research publications, theses and dissertations. Indira Gandhi National Open University, (IGNOU) uses eGyankosh. INFLIBNET uses DSpace.

Requirements and Methods for Digitisation of Resources for the Digital Library System of the University

Techniques and Tools Used

High-resolution Scanner and Optical Character Recognition (OCR) are used for digitisation of documents. The scanners are customized and used as per the requirement of the size of the documents. The resolution of the scanned documents is 300 dpi.

Optical character recognition (OCR) software works with the scanner to convert printed characters into digital text, allowing one to search for or edit the document in a word processing program.

There are different types of scanners like Document scanners and Book scanners which are specifically used in Libraries. Other types of scanners are Art scanners, Automatic scanners, Object/herbarium scanners, X-ray/MRI film scanners, wide format scanners, large flatbed scanners, Film/photo/TP scanners.

Scanners usually come with software, such as Adobe's Photoshop product, that lets you resize and otherwise modify a captured image. Scanners usually attach to your personal computer with a Small Computer System Interface (SCSI). An application such as Photoshop uses the TWAIN program to read in the image.

Figures 13a-16 are showing the Document and Book scanners used in the Library of Calcutta University.

Process of Scanning

The document or book to be scanned is placed in the scanner in flat or folder mode as required and then the resolution (dpi) is selected from Menu button of the scanner and then Scan mode button is pressed.

This scanning process is illustrated in the figures 17a, 17b and 18a, 18b, 18c.

The yellowish old colour of the book or document can be removed totally so that it can be clearly read. After pressing the scan mode button a laser beam scans the page displayed and sends the image to the monitor screen. After that colour enhancement is applied and a clear final image is obtained.

Figure 13a. Book scanner with a book in flat mode



Figure 13b. Book scanner with a book in 'V' or folder mode



Figure 14. a) Document and book scanner; b) Document and book scanner – features

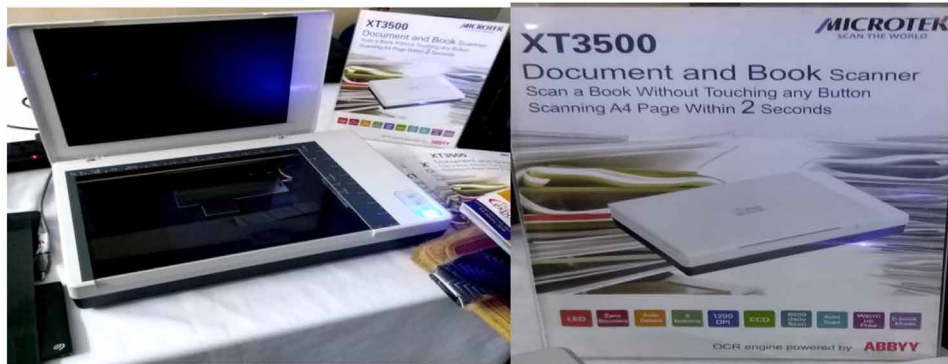


Figure 15. Scanners used for digitisation in the library



After scanning the image is processed through OCR to obtain the final text.

In the process of digitisation at first conservation of the document is to be done, then preservation and finally digitization of that document.

Approximately 500 to 1000 scans is the actual output and 1000 images can be obtained in 10 hours.

The various types of digitisation software available in the market are –Silverfast Ai Studio 8, Book Capturing Software, News Clip Software, Csoft Raster to Vector, EDMS-Archiflow and Indian Language OCR.

Figure 19 shows the workflow of the Digitisation process.

Figure 20 represents how metadata/XML is created.

Figure 21 is an example of a metadata file in XML format for a PhD Thesis.

The flowchart in Figure 22 represents how metadata is edited in DSpace and then added to the Institutional Repository.

Figure 16. Library scanners available in the market

Library Book Scanners

MICROTEK A4  XT 3300 ▶ High Speed <3 seconds ▶ Scan upto 2500 A4 size pages per day ▶ Scan Searchable PDF XT 3500 ▶ Scan Automatically ▶ High Speed <2 seconds ▶ Scan upto 8000 pages per day Scan without Unbinding 1800 dpi, 2ch, Auto Rotate, Auto Detect, Auto Focus	FUJITSU A3  ScanSnap SV600 FB6280E A3 Bookedge Scanner	Avision A vision of your office  FB6280E A3 Bookedge Scanner
Image Access A3+  Bookeye 4 A3+ Desktop, Compact, 15.3"x18.9". Top Selling, Face up. ▶ Overhead, Colour, Gray, B/W, Bitonal - Bulk Book Scanning, WiFi Ready ▶ Cradle - V-Shape, Flat & Folder Mode ▶ UV/IR Free LED, Wi-Fi, Network, upto 6000 Pages/Day ▶ 400 dpi & 600 dpi with V Glass Plate Kit Rare Manuscripts, Files, Books, Thesis, Herbarium...	Image Access A2+  Bookeye 4 A2+ Desktop, Large 18" x 24.4" BPO Favorite ▶ Same features as Bookeye A3+ ▶ Auto Format, Auto Scan, Auto Focus, Auto Crop ▶ Book Fold Correction, Thumb Removal ▶ Built in Processing, Preview Monitor ▶ Tri Linear CCD, Touch Panel, 1 GB Ethernet ▶ Network Ready Land Registration Projects, Archive, Production	Image Access A1+  Bookeye 4 A1+ 25" x 33.5", Two Pages Newspaper. ▶ Self Opening Flat Glass Plate, 600 dpi ▶ Motorized Book Cradle with lift up to 10 cm ▶ All Bookeye : Exceed PADGI guidelines, ISO 19264-1 ▶ Scan2Print, Scan2Network, Scan2Pad@ - Smart Phones Archives : Old, Fragile, Rare Books, Manuscripts...
Image Access A2+  Bookeye 4 A2+ Semi-Automatic 18" x 24.4", Large Library. ▶ Motor Driven V-Shaped Glass Plate : Perfect Scans ▶ 120 - 180 Degrees, Integrated ICC Profile ▶ All Bookeye : PDF, PDF/A, JPEG, TIFF, PNM, Multipage PDF, TIFF, and many more ▶ Auto Scan / Manual Page Turning Law & Medical Archives : Large & Similar Volumes	Image Access A1+  Bookeye 4 A1+ Thick Fragile Books upto 35 G 50 cms. ▶ Automatic Self Adjustable Book Cradle ▶ Self Opening & Adjustable Flat Glass Plate ▶ Features Similar to A1+ as above ▶ Standalone Model with Stand Old & Fragile, Rare Thick Books, Manuscripts, Newspaper	Wicks and Wilson A3  Crowley ODS Overhead Document Scanner A3+ ▶ 20.4" x 16.5", Capture 0.5 Sec. ▶ LED, CMOS 18MP, 200-2400 dpi, Auto Capture ▶ Scan to USB, email, cloud, network, printer ▶ Historical Record Digitisation. Office Documents, Graphics, Magazines, Photographs
TRISCENTUS  ScanRobot 2.6 MDS Automatic Books/Answer Booklets ▶ 12.6" x 12.6", 2500 Pages/Hour, Vacuum/Air Flow Driven ▶ Adjustable Angle 60 - 100, 300 & 400 dpi ▶ Mass Digitisation System, No Curvature ▶ Superb Imaging/Scanning Software, Includes Flatbed Scans Old Fragile Thick Books : Very GENTLY	Portable Scanners Book/Document/Visual Presenter ▶ Multiple Options ▶ 5 to 20 MP, HD Camera / CMOS ▶ Exclusive image processing software ▶ USB, Scan button, Multiple Document ▶ Auto Focus & Many more features Front Desk, Reception, Desktop, Accounting...	

Figure 17a. Scanning of the book kept in flat mode

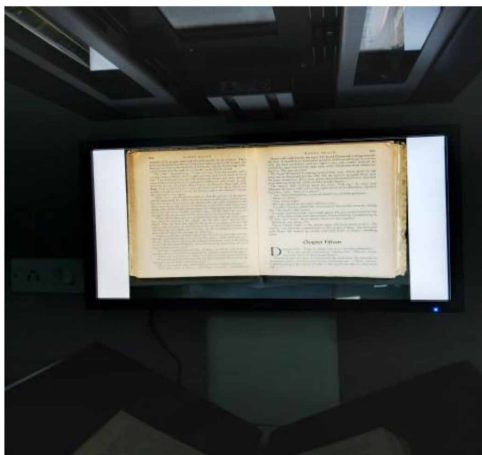


Figure 17b. Scanning of the book kept in 'V' mode

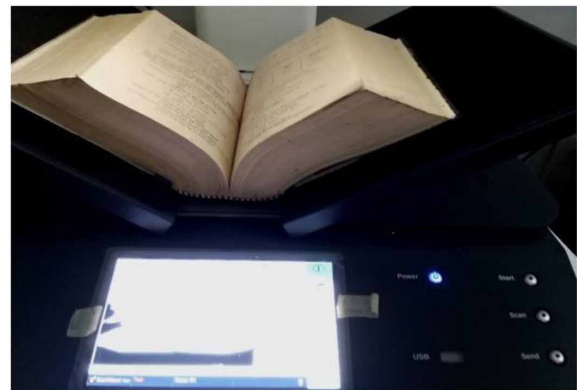


Figure 18a. Scanned preview showing on-screen

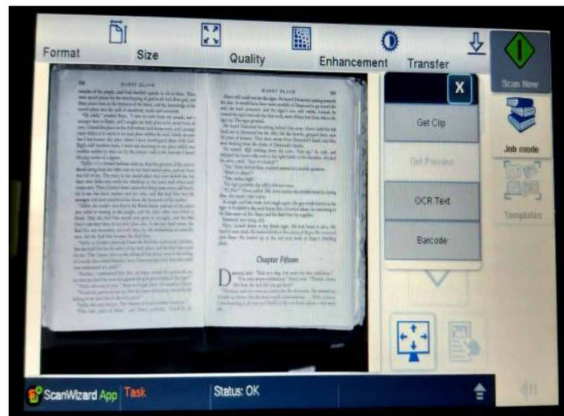


Figure 18b. Formatting and enhancement of the Scanned image of the book

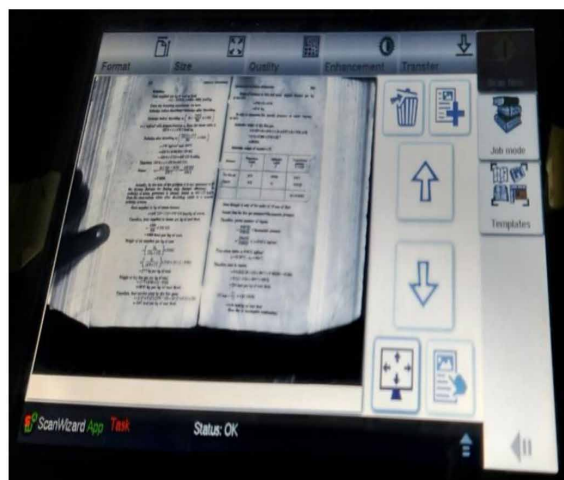


Figure 18c. Colour quality selection and scan mode

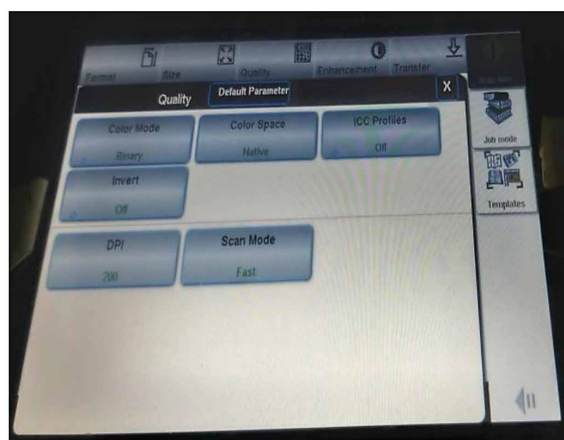


Figure 19. The workflow of digitisation process

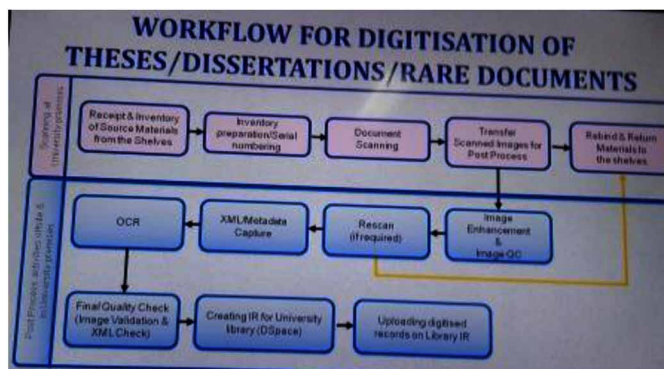


Figure 20. Metadata/XML creation technique

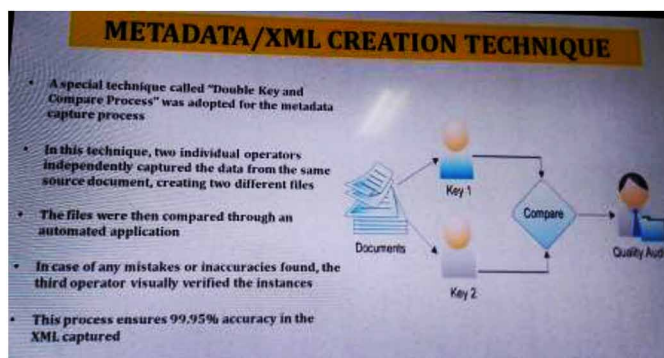


Figure 21. Metadata file in XML format

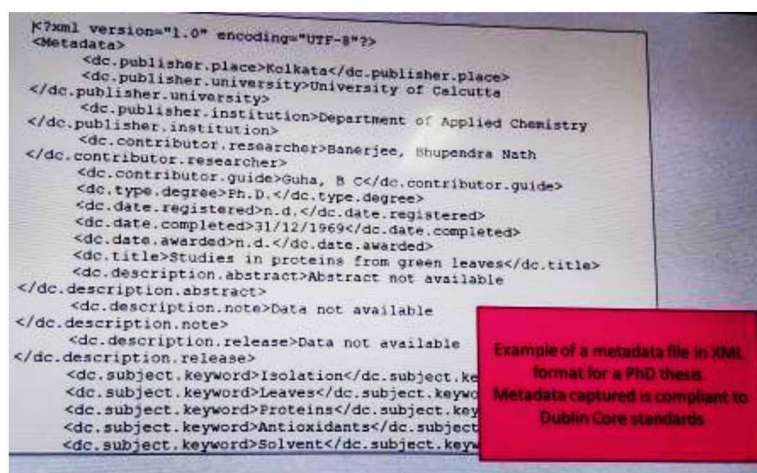


Figure 22. Flowchart of metadata editing

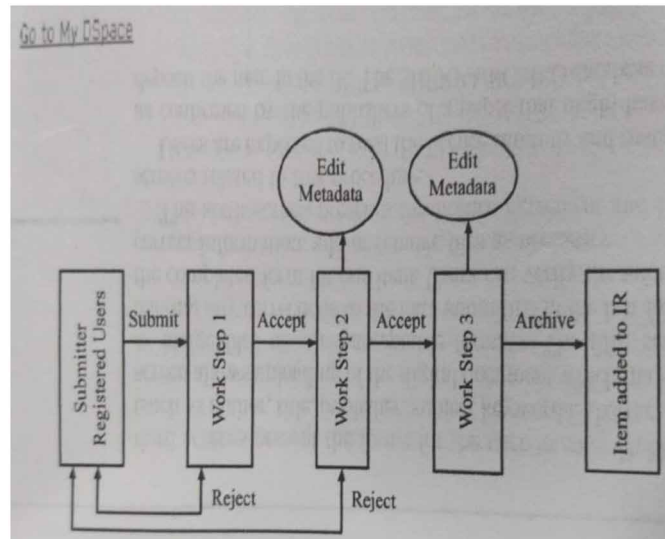


Figure 23a. Image scanning of theses / dissertations



Figure 23b. Image scanning of theses

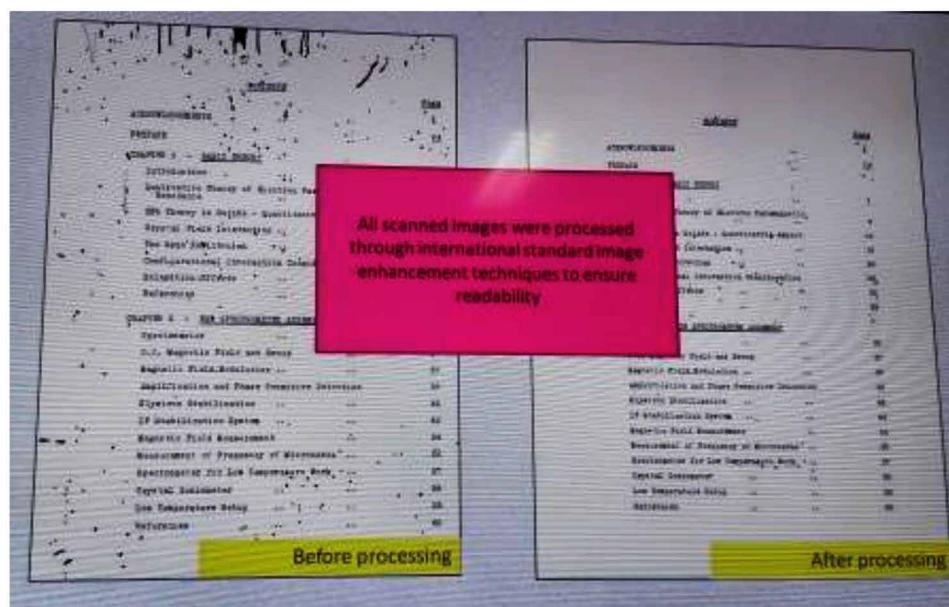


Figure 24. Before and after scanned images



Figure 23a shows the ‘Before & After Scanned’ images of Theses / Dissertations.

The figures 23a, 23b & 24 shows how the image of the document looks like ‘Before processing’ and ‘After Processing’ with the Scanner.

International Standard Image enhancement techniques were adopted to process scanned images, such as image clean up, border removal, cropping, orientation, de-skewing, de-speckling, white levelling and image QC etc.

Figure 25 and 26 show how the image looks like after scanning.

Software Used

Abbyy is used for OCR and Adobe Acrobat Reader for PDFs.

ABBYY FineReader OCR technology allows replicating natural or human-like character recognition of printed texts.

OCR is a technology that enables the Abbyy software to convert different types of documents, such as scanned paper documents, PDF files or images captured by a digital camera into editable and searchable data.

FineReader OCR program recognises the text. First, the program analyzes the structure of the document image. It divides the page into elements such as blocks of texts, tables, images. The lines are divided into words and then - into characters. Once the characters have been singled out, the program compares them with a set of pattern images. The programme forms several hypotheses about what this character is. Based on these hypotheses the programme examines different variants of breakage of lines into words and words into characters. After processing a huge number of such hypotheses, the program finally takes a decision and presents to the user with recognised text.

The operating system used for ERM is Linux.

Figure 25. Image scanning

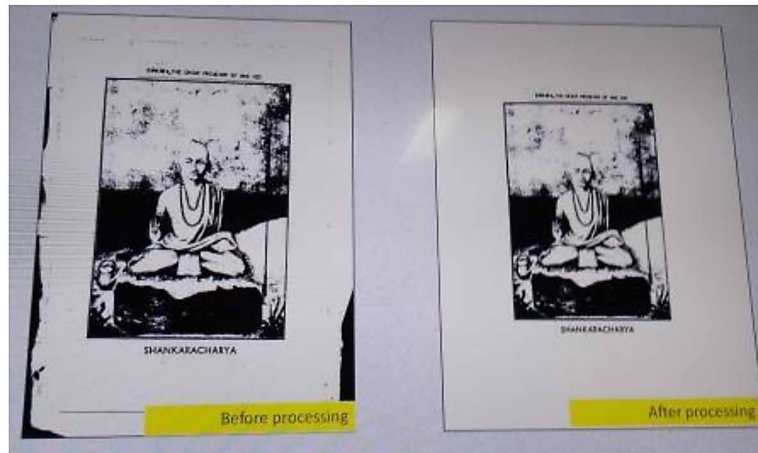
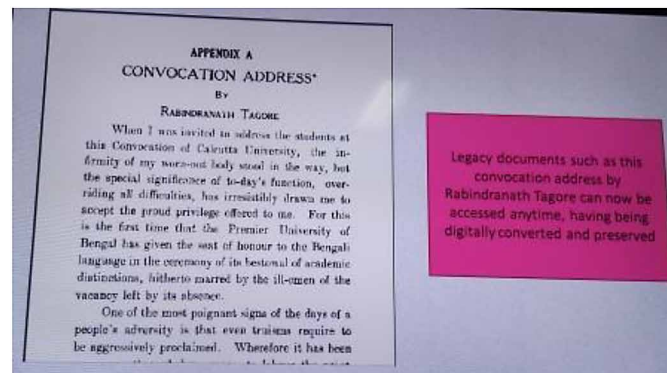


Figure 26. An image of old document digitised



D-Space

D-Space is used for the service and Electronic Resource Management. It is used as Institutional Repository software. Library uses D-Space version 5.0. D-Space preserves the digital content and enables easy and open access to various types of content including text, images, moving images, mpegs (an international standard for encoding and compressing video images) and data sets.

D-Space helps to create, index and retrieve various types of digital content which includes research articles, theses, grey literature, 3D digital scans of objects, educational materials, scientific datasets, photographs, films, audio/videos, institutional records, and other forms of content. DSpace was established to capture, preserve and communicate the intellectual output of an institution's faculty and researcher through a central platform.

DSpace by default supports uploading the following file formats in DSpace repository: Adobe PDF, AIFF, audio/basic, BMP, CSS, FMP3, GIF, HTML, image/png, JPEG, Latex, MARC, Mathematica, Microsoft Excel, Microsoft PowerPoint, Microsoft Project, Microsoft Visio, Microsoft Word, MPEG, MPEG Audio, PhotoCD, Photoshop, PostScript, Real Audio, RTF, SGML, Tex, Tex DVI, Text, TIFF,

Video, QuickTime, Wav, Word Perfect and XML. This software supports uploading normal-sized digital objects as well as compressed digital objects. DSpace has a content/metadata import feature. If data has to be imported from another DSpace repository, then the software requires collection, identification and source files all in XML formats.

DSpace does not require the separate support of a Librarians' Interface. All tasks in DSpace are carried out through the Web User Interface.

The software verifies the listed file formats supported by the software, and it only allows users to upload a particular file into the repository. If the users submit files which are not supported by DSpace, then DSpace will upload that file into the repository but will not consider that file for long digital preservation.

Network connection for Electronic Resource Management used is through Local Area Network (LAN). The library has a local network connection with a server and terminals in all the campus and departmental libraries.

The University Library maintains an Online Catalogue for Information Search and Retrieval. One can browse the collection by Author/Contributor, or Title of the document/Title of the book/Title of the article, as shown in figures 27 and 28.

The Library Management system software is SOUL (version 1.0) for the University Library and it is developed and maintained by INFLIBNET (Information and Library Network). At present web version of SOUL 2.0 is available.

Online Public Access Catalogue (OPAC) provides the record of books, journals, theses, CD-ROMs and microfilms of the library. An on-line catalogue of the University Library has been posted in the University Website which consists of records of books, PhD theses, medical dissertations, BNCC Collection, Peace Studies Collection and others. Computerisation and networking of the University Library System have been carried out under the INFLIBNET programme of the UGC. The automation of the University Library has been done with a user-friendly software SOUL which is developed by INFLIBNET Centre. Now the users from all over the world can access information on the collection and resources of the University Library.

The figures 29 and 30 show the E-Book Catalogue on the University website.

PDF formats are used for E-books and are generally tied to a particular dimension and layout.

The University Website has the database links shown in Figures 31 and 32 which can be accessed at any of the University Campuses.

Theses

Almost 11,533 theses have been digitised and the full text is available.

The Shodhganga@INFLIBNET Centre is like a platform for research students to deposit their PhD theses and make them accessible to the worldwide academic community. Shodhganga is a digital open-access repository of Indian ETDs (Electronic Theses and Dissertations) which has been set-up by the INFLIBNET Centre. All the records which are available in ShodhGanga are also available in IndCat's Thesis database. The IndCat's thesis database has a link for the full-text thesis and the users will be redirected to the ShodhGanga for full-text access. The repository can capture, index, store, disseminate and preserve ETDs (Electronic Theses and Dissertations) submitted by the researchers.

The University of Calcutta has contributed digitised theses to Shodhganga.

'Shodhganga' can be browsed by names of Researcher/Guide, Title of Thesis and Keywords as shown in Figures 33-35.

Figure 27. Online catalogue search

Online Catalogue

Search in
Books

Basic search
Title

Contains
Search here search

Free-text search (Title or Author or Subject heading Contains)
Search here search

Boolean search
Title

Contains
Search here

And
And

Boolean search
Title

Figure 28. Online catalogue

Welcome to the University Library Online Catalogue

Online Catalogue

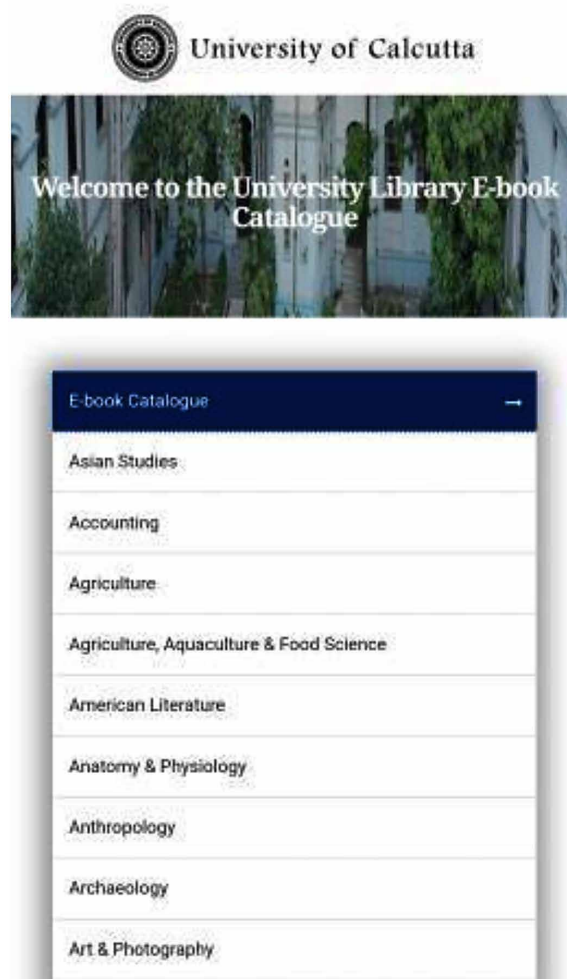
Search in
Books

Basic search
Title

Contains
Search here search

Sidebar:
Books
Medical Dissertations
Peace Studies Collection
A.P.Mitra Collection
CAS - History

Figure 29. E-book catalogue



Based on figures 34 and 35 the bar chart in Figure 36 shows the number of PhD theses digitised from the years 1932 to 2017.

For the last few years, University of Calcutta, Central Library has digitised some of their resources, including the following:

List of Digitised Documents –

- Annual Reports (1951 - 2005)
- Bengali Journals
- Convocation Address
- CU Commission Reports (1917 - 1919)
- Doctoral Theses / Full-text PhD Theses
- Financial Reports (1925 - 2006)
- Hundred years of University of Calcutta
- Journal of the Asiatic Society of Bengal (1835 - 1934)

Figure 30. E-book catalogue search

https://www.caluniv.ac.in

Student Study Aids

Zoology & Animal Science

E-book Catalogue

Subject

Publisher

Title

Author

[Search](#) [Refresh](#)

Title	Author	Subject
Computer Forensics InfoSec Pro Guide	Cowen, David	Engineerli and Computin
Information Security The	Rhodes-Ousley, Mark	Engineerli and

Figure 31. Database links in the university website



Figure 32. Thesis section of the university library



Figure 33. Thesis database of the University of Calcutta in Shodhganga

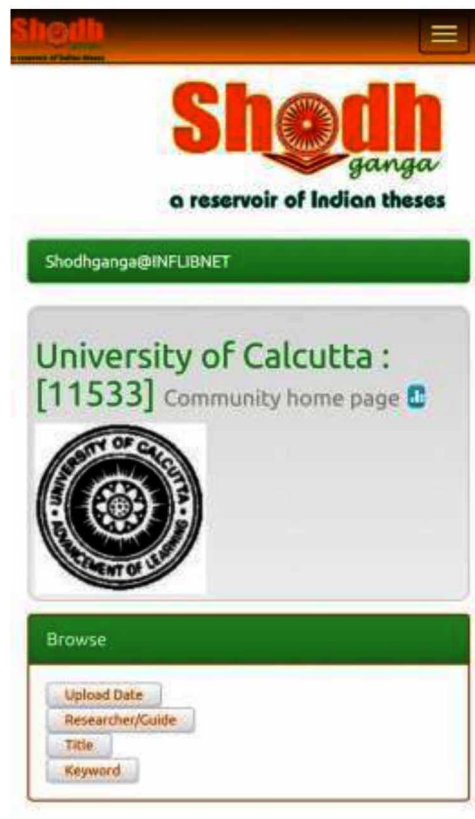


Figure 34. Thesis database of the University of Calcutta in Shodhganga



Figure 35. Thesis database of the University of Calcutta in Shodhganga



Figure 36. A graphical representation of PhD theses digitised from the years 1932 to 2017

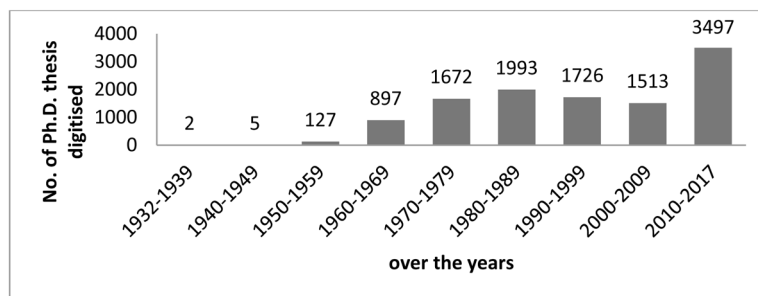
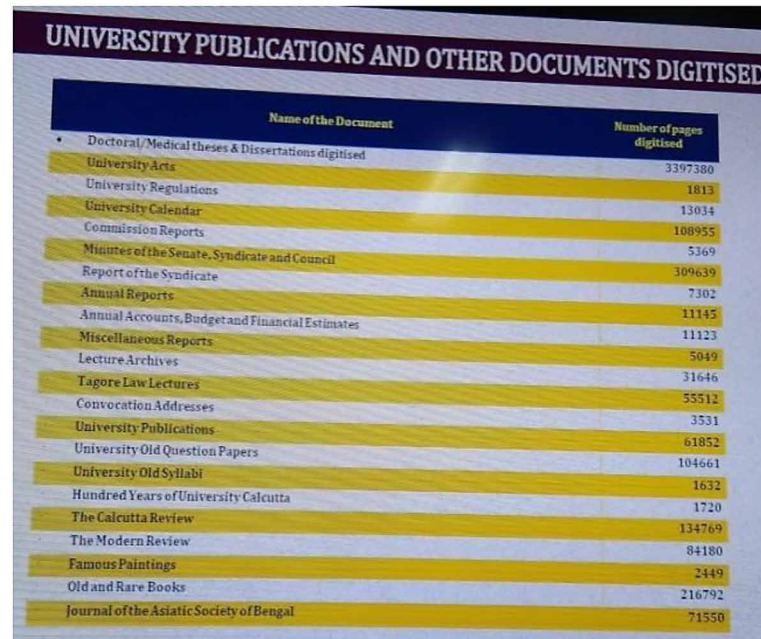


Figure 37. This chart provides a brief overview of the contents of documents digitised



Name of the Document	Number of pages digitised
• Doctoral/Medical theses & Dissertations digitised	3397380
University Acts	1813
University Regulations	13034
University Calendar	108955
Commission Reports	5369
Minutes of the Senate, Syndicate and Council	309639
Report of the Syndicate	7302
Annual Reports	11145
Annual Accounts, Budget and Financial Estimates	11123
Miscellaneous Reports	5049
Lecture Archives	31646
Tagore Law Lectures	55512
Convocation Addresses	3531
University Publications	61852
University Old Question Papers	104661
University Old Syllabi	1632
Hundred Years of University Calcutta	1720
The Calcutta Review	134769
The Modern Review	84180
Famous Paintings	2449
Old and Rare Books	216792
Journal of the Asiatic Society of Bengal	71550

- Lecture Archives (1815 - 2003)
- Medical Dissertations
- Minutes of Senate, Syndicate and Council (1857 - 2014)
- Minutes of the Syndicate (1920 - 1943)
- Miscellaneous Reports (1918 - 2001)
- Old and rare books (1561 - 1870)
- Old Syllabus (1955 - 1977)
- Rare/Famous paintings (1795 - 1921)
- Tagore Law Lectures (1870 - 1986)
- The Calcutta Review (1845 - 2007)
- The Modern Review (1907 - 1987)
- University Publications (1907 - 2008)
- University Acts (1942 - 1979)
- University Calendar (1858 - 1965)
- University Old Question Papers (1891 - 1980)
- University Regulations (1912 - 1966)

Manpower Used for Digitisation

Digitisation is done by IT professionals. Outsourcing is done by Proquest and Informetrics. The University Library personnel also take part in this process. Managers supervise the project and bring in specialist knowledge and expertise.

Implementation of ERM requires skilled professionals. Therefore, training on an ERMS for library professionals is offered on a regular basis. All departmental libraries of the University have a librarian who acts as an e-resources manager to handle the tasks involved with ERM.

Training for the library personnel and handling equipment like High-resolution Scanner and Optical Character Recognition (OCR) are also provided.

Objectives

The main objective of the digital library is the digitisation of old journals, rare books, and theses.

Digitisation of the back issues of journals is in process.

The main focus is on how electronic resource management is done through the digitisation of resources in the digital library of the University of Calcutta and making them accessible to the users.

The purpose of digitisation is to serve the students and research scholars in their field of study and help them to retrieve information faster and easier from the e-resources repository. Thus, electronic resources can be used effectively in the context of Dr S.R. Ranganathan's Fourth Law of Library Science "Save the time of user" for many purposes. Also taking into view Dr Ranganathan's Fifth Law of Library Science "Library is a growing organism", the digitisation and use of e-resources save the space of the library.

The Digital Library programmes help in providing electronic access to the university students and researchers to bring about a qualitative change in academic infrastructure, especially for higher education.

The digitised documents can be accessed within the University Campuses only.

Benefits of Digitisation

The Digitisation of the Library is providing some benefits to the users while accessing e-resources, which are as follows–

- It allows remote access of E-Resources round the clock.
- It can be used by multiple users simultaneously anywhere.
- Provide timely and quick access to the documents.
- It allows interaction between authors/publishers and users.
- Support different searching options.
- It can support multi-media applications.
- Requires less storage space.
- Eco-friendly
- Saves the cost of printing and postage
- It can be easily merged with alerting service given by publishers
- It provides full-text searching.
- Problems of missing issues can be solved easily.
- Login / Password or IP based access can prevent illegal access.
- Easy to get translated into many languages
- Do not require physical processing for access.

It is available as soon as the print version is uploaded on the Internet. The Electronic version is cheaper and user-friendly than the print version. Journal articles can be searched through search methods by titles, author, subject keywords, free-text search, Boolean search etc. It does not require physical processing and handling. Economical maintenance of archival files can be done in the form of CD-ROM and hard disk drive. Library users are allowed to give online feedback on the articles to the author through e-mail. Those articles which are not freely available can be obtained from the author directly by sending an e-mail. E-Contents have copyright protection and authenticity of the content is preserved. Taking into view the 5th Law of Library Science as stated by Dr S.R. Ranganathan, E-resources save the library space and allow more accommodation of digital as well as print resources.

E-resources are a vital reference source for library managers, education administrators, researchers, academicians, professionals, and graduate-level students.

With e-books and e-journals, users can browse through titles online, and then select and order titles. The selected e-book can be sent to them online or the user can download the e-book.

Various digital library usage orientation programmes are arranged to train the library personnel in using online resources. The library professionals help and guide the students and researchers in the procedure of searching online resources and other digitised documents. The students and researchers are given user orientation by the library personnel how to access a particular online journal with the help of keywords, titles, subjects and publishers. Students are guided and explained which full-text journals are subscribed by the University library and can be accessed. The students, as well as the research scholars, are benefitted in getting their respective field related information from the resources provided by the digitised database set up by the University Library.

The research scholars are guided in their work of thesis and dissertations while searching for a particular article or information related to their topic of research. The library personnel suggest them a few articles or ebooks in PDF format which they can download and access for their work.

Another benefit provided to the Professors of the University is by considering and including their suggestions for subscribing to particular Ejournals and Ebooks according to their requirements.

There is a Webmail service provided to Professors and Research scholars through which they can communicate directly about this matter.

Document delivery service and providing Information service of the E-Resources is given to any visitors from other Organisations on request. Knowledge sharing is done by transfer of electronic file via e-mail, messengers and other media.

The main reasons for library users to select e-books online are possibly lower prices, increased comfort (as they can read from home or on their mobile devices after downloading), and a larger selection of titles.

Challenges and Issues Faced by Electronic Resource Management (ERM)

The Electronic Resource Management is fully dependent on hardware, software and network system. Due to malfunctioning of hardware, software and failure of network system the services of the Electronic Resource Management system will be suspended and access to E-resources will be inoperative. This is a common issue faced by any organisation.

The funding may not be fulfilled by the organisation according to the requirements of the system. This might lead to the inadequacy of the types of equipment required to run the system.

Properly trained technical manpower to handle the system might not always be available. This would result in inadequate delivery of the E-resources service to the target audience.

The development of the ERM system through in-house knowledge and commercial product is a crucial innovation in the field of library management which meets the challenges of digitisation. ERM system is mainly a device for libraries to benefit the target-users. It is a solution for accessing and managing e-resources through specific standards and compatibility.

Target Audience

The digital library is used by students, research scholars, teachers, LIS professionals, Knowledge management professionals and visitors from other institutes or organisations.

An average of 100 to 150 users comes to the library for accessing e-resources daily. At present, on an average basis, one thousand users use the Digital Library facilities daily through the internet within the campus of the University. Now users from all over the world can get information on the University Library collection. Number of users through online remote access is 2 lakhs daily.

Most of the heavily used e-resources include Science Direct, Springer Link, SciFinder Scholar, IEEE, MathSciNet, APS/AIP Journals, Scopus, Web of Science, ACM Digital Library, and Nature Journal.

The increase in usage has been fluctuating with a marginal decline for some e-resources. The Library personnel examine for all e-resources particularly those with large subscription costs and poor usage over a period of time for their continuity in future after obtaining the feedback from users.

SOLUTIONS AND RECOMMENDATIONS

Suggestions for Improvement of Electronic Resource Management

- Regular and proper maintenance of hardware should be done along with setting up of latest hardware system.
- Latest and updated software should be installed.
- Latest LAN fibre cables should be used.
- Proper inspection of the Servers should be done.
- Internet speed should be improved to help the users to access the E-resource database faster.
- Renewal of the subscription of the E-resources should be done on time.
- Old issues of Journals and the remaining theses should be digitised and incorporated in the Electronic Resource Database of the Library.
- A smart app for the Digital Library should be developed for immediate access by the users.
- A cloud-based ERM should be implemented for virtual Web-based service, cost-effectiveness, more storage capacity, high-end computer infrastructure and convenient accessibility.
- RFID tools should be introduced to prevent theft of digital resources like CD-ROM etc.

With the rapid change of technologies, all library professionals need to keep in view the latest developments, emerging trends and techniques in the area of Electronic Resource Management (ERM) in libraries.

In order to follow the innovative trends in the library system, information professionals must try to apply new techniques to access e-resources, with more user-friendly methods to library users. These new techniques, such as library 2.0 tools, include blogs, wikis, social networking and bookmarking, chat services, multimedia, RSS feeds, commercial search services and gamification techniques through

apps and games. In the library system, gamification can be used as a tool to keep the users engaged and continue to use e-resources. Browser tools should be designed to improve the browsing experience of the links provided to research resources. For example, bookmarks, context objects in spans (COinS), Ajax are some applications of browser tools. Software tools which can be used such as federated search, discovery, a system known as Wizard, is designed by using artificial intelligence software.

While following the innovative trends in the University Library importance should be given to library ecosystem also. A library ecosystem is formed by all types of libraries like school, academic and a public library that supports and provides lifelong learning. Under this vision of a library ecosystem, all types of libraries are interrelated and work together to deliver learning opportunities for people of all ages. However, a threat to one part of the library ecosystem stresses the entire system. The library ecosystem offers a lot to the members of library communities and so the library system has to get their attention, engage them through other innovations like gamification that is online game apps or Virtual Reality (VR) apps of library system, and then demonstrate to them how the services and resources can add value in the lives of users in the library ecosystem. Approaches should be developed with parity between decision-makers and policymakers to sustain and strengthen our innovation efforts on behalf of all libraries for the functioning of the library ecosystem.

A “Networked Knowledge Service Support System” should be targeted by the Library Professionals.

The scattered knowledge resources over the internet should be harnessed through Networked Knowledge Service Support System enabled by a powerful search engine.

Through the existence of a library ecosystem and a Networked Knowledge Service Support System (NKSSS) the University Library along with the help of other libraries can achieve its purpose of delivering the required information and knowledge through the digital environment. Due to the development of ERM and NKSSS libraries will offer incredible lifelong learning opportunities.

CONCLUSION

The Digital Library System of the University of Calcutta has been enhancing the University’s education and research value. It motivates the students in their educational training period. There has been substantial growth in e-resources over the years. More e-resources are being added to the Institutional Repository. The Digital Library is used as a platform to motivate students to learn new paradigms. Innovation is a key focus of this ERM project, which involves technology transfer in one form or another. The University recruits and employs suitably qualified IT professionals, who then work with new technical skills, specialised expertise and knowledge of digitisation to transfer the document resources into electronic form and manage in handling these E-resources.

The huge database of e-resources can be easily managed through the ERM system set up in the Library. However better management of e-resources depends on the facilities of IT infrastructures available in the library and properly trained staff.

Managers have to understand and be able to apply innovative techniques to better manage their human resources in the process of ERM. Despite the significant changes and additions to the University library, the purpose and the intended audience for the electronic resources remain the same. Major challenges are faced by the photocopy section of the library. Here, it can be mentioned about ‘disruptive innovation’, a term of art coined by Clayton Christensen, which refers to the introduction of a product (e-resources) or service into an established industry (the library) that performs better and, generally, at a lower cost

than existing offerings, thereby displacing the market leaders in that particular market space of printed copies and photocopies section and transforming the library. The library users prefer e-resources over photocopying the documents. In the context of technology disruption in the education sector, libraries have been in flux with fast-paced changes all around us. Under the able guidance of University Librarian and with the proactive attitude of the library staff members, the library usage of University digital library has been steadily growing. Here lies the success of the University Digital Library.

On that note, it can be concluded that libraries are support centres for education. A vibrant library atmosphere is needed for the students. Physical space of the library is still required because the students need this space for collaboration and interaction. In spite of having a digital setup in the Library ecosystem printed documents still have importance and have a high demand. Print resources are strongly embedded in the education world.

Library of the University of Calcutta was highly appreciated by NAAC peer team in December 2016 in terms of quality of services rendered and variety of facilities provided.

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KEY TERMS AND DEFINITIONS

D-Space: An open source repository software package typically used for creating open access repositories for scholarly and/or published digital content.

Digital Library: A collection of documents in organized electronic form which is available on the Internet or on CD-ROM disks. A user may be able to electronically access documents including journal articles, books, papers, images, sound files, and videos from a library.

E-Books: They are electronic books (i.e., a book publication made available in digital form), that consist of text, images, or both. E-books are readable on computers or other electronic devices, like smartphones, kindles or laptops.

E-Journals: They are also known as electronic journals and electronic serials, are scholarly journals or intellectual magazines that can be accessed via electronic transmission.

Electronic Resources: They are materials in digital format that are accessible electronically. They are also known as e-resources. Examples of e-resources include electronic journals (e-journal), electronic books (e-books), online databases in varied digital formats, Adobe Acrobat documents (.PDFs), and webpages (.htm, .html, .asp, etc.).

Institutional Repository (IR): IR is an archive for collecting, preserving, and disseminating digital copies of the intellectual output of an institution.

OCR (Optical Character Recognition): OCR is the mechanical or electronic conversion of images of typed, handwritten or printed text into machine-encoded text, whether from a scanned document or a photo of a document.

Online Catalogue: It is an electronic bibliographic database that describes the books, videotapes, periodicals and other documents possessed by a particular library.

PDF (Portable Document Format): It is a file format that captures all the elements of a printed document as an electronic image that we can view, navigate, print, or forward to someone else. PDF files are created using Adobe Acrobat or Acrobat Capture, among other programmes.

Scanner: It is a device that captures images from photographic prints, posters and any document pages for computer editing and display.

Chapter 18

LMS for Information Science Students in an Open Distance E-Learning Institution in South Africa

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ABSTRACT

In an open distance e-learning (ODEL) environment, the lack of infrastructure causes certain obstacles that result in students not utilising the learning management systems (LMS). The aim of this study was to examine the usability and reliability of myUnisa as the LMS used for teaching Information Science at the University of South Africa (UNISA). In the particular context, a quantitative research approach was followed, and a questionnaire was designed and distributed as a web survey in an attempt to reach scattered respondents. The research findings show that the majority of students appreciate myUnisa as being reliable in for information science students. Also, students find learning on myUnisa more convenient than face-to-face instruction, as it offers more flexibility. This study recommends all students being provided with the internet as an access tool as well as the provision of free internet access or lower charges in data bundles to all registered UNISA students.

INTRODUCTION AND BACKGROUND

The rapid growth of new resulted in the need of transformation between higher education institutions and students interact. As citadels of tertiary education, universities are expected to play a prominent role in transforming higher education so that becomes relevant to modern societies. In order to keep up with these developments and demands, higher education institutions in both developed and developing countries have to strategise on how to match the emerging technologies with pedagogical intentions and students' diverse needs. Higher education institutions need to implement and apply strategies that are flexible and responsive to the changing needs of students. One of these strategies is the adaptation and use of Learning Management Systems (LMS) in universities.

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The use of LMS in higher education has been promoted as a means of modernising learning material; improving learning outcomes; and enhancing student engagement (Grant-Smith, Donnet, Macaulay & Chapman, 2019). The social demand for improved utilisation of and access to higher education has stimulated the rapid growth of LMS and e-learning adoption (Oh & Yoon 2014).

The LMS is used in conjunction with e-learning systems. The two technologies are used by academic institutions to reduce cost; attract more students; and meet the educational needs of students (Arpaci, 2015). Universities have different teaching and learning strategies as part of promoting e-learning as a pedagogically-driven initiative that enhances traditional learning experiences. Higher education institutions have a mandate to identify, recruit, employ and develop skilled human capital capable of teaching online courses as well as ensuring that students acquire the knowledge and skills to use LMS.

This research was conducted at the University of South Africa (UNISA), which is currently classified as an Open Distance e-Learning (ODEL) university (Ngubane-Mokiwa, 2017). The transition from distance learning to an ODeL at UNISA has created numerous opportunities for teaching, learning, research and reaching out to dispersed students (Kunene & Barnes, 2017).

The distance education mode, made discussion classes compulsory, even though more emphasis was placed on written assignments. The tuition was done through written instructions in the form of tutorial letters, workbooks and course outlines. The distance education mode has limitations in terms of course delivery. Lecturers and instructors are limited to teach the content in the in the prescribed tutorial letter. The lecturers' teaching and assessment by the course outline .

The ODeL philosophy caters for innovative tuition strategies and it promotes the blended learning mode (Tarhini, Mohammed & Maqableh, 2016; Ossiannilsson, 2018),. This mode combines traditional and online learning (Arinto, 2016; Buyuk, Kocdar & Bozkurt, 2017; Ossiannilsson, 2018). The blended learning mode opens opportunities to large numbers of students to enrol in higher education to acquire formal qualifications (Manwaring, Larsen, Graham, Henrie & Halverson, 2017). The blended learning mode accommodates students irrespective of their technological competencies.

ODEL has been further investigated as a framework that is premised on the assumption that every student involved in learning should be supported by emerging electronic technologies and other digital facilities (Mncube, Dube & Ngulube, 2017; Ngubane-Mokiwa, 2017). At UNISA, tuition is offered through the LMS through myUnisa whereby learning material are accessed by students (UNISA Policy, 2011). The study recognises that, in an ODeL environment, academics and administrators have no right to prescribe a particular mode of study for student.

UNISA offers a diverse choice of study fields at various levels ranging from certificates to degrees and post graduate studies to more than 400 000 students from across South Africa, Africa and other parts of the world. UNISA is made up of the following nine colleges: Accounting Sciences, Agriculture & Environmental Sciences, Economic & Management Sciences, Education, Graduate Studies, Human Sciences, Law, Science; Engineering & Technology and the School for Business Leadership (SBL) (UNISA Web, 2018).

Furthermore, this study focused on one department at UNISA namely: the Department of Information Science. The purpose of the Department is to produce Library and Information Science (LIS) professionals, who are responsible for transforming the societal, technological, political and economic challenges affecting information users and institutions (Rubin, 2017; Hislop, Bosua, & Helms, 2018). In addition, the work of LIS professionals involves knowledge creation, acquisition, organisation, dissemination and the utilisation of information (Sinkula, Baker & Noordewier, 1997; Rowley, 1999; Nonaka, Toyama & Konno, 2000; Darroch, 2005; Fari & Ocholla, 2015; Frega, Ferraresi, Quandt & da Veiga, 2018). The multidisciplinary nature of LIS theory and practice necessitates an investigation into the way in which

Information Science students are responding to the delivery of tuition via a LMS. The study will investigate how LIS students are coping with the transformation and provision of tuition. The study will generate knowledge that will contribute to the field of library theory and practices.

The search for appropriate answers relating to ODeL for LIS practice was guided by the following research objectives, namely to:

- Determine students' knowledge when interacting with the LMS (myUnisa) in the learning process;
- Determine which infrastructures, e.g. hardware devices, play a role in access to information for tuition on myUnisa; and
- Establish the usability and reliability of the LMS for the tuition of Information Science students.

Positionality of the Students Concerning Learning Management Systems

The study focussed on the requisite knowledge and skills of students in utilising the e-learning platform at UNISA. The study will explore the e-learning concepts before establishing LMS utilisation at UNISA. Knowledge and skills of using e-learning systems varies from student to student depending on their cognitive and perceptive levels. The variation in the levels of knowledge and skills of e-learning systems has been investigated from different angles. For example, Owen (2014), investigated the knowledge of e-learning systems in military training, foreign language learning and religious credentialing, The author established that globally the rising demand for "cheap high-quality online education" to satiate a seemingly infinite appetite for convenient and flexible learning and knowledge continues to vary. The following investigations focussed on the sense of users' variation has also been identified: the training of student nurses (Lahti, Hätönen & Välimäki, (2014), alcohol e-learning program (Evers, Hahn & Metzenthin, 2018) and systems knowledge (Lara, Lizcano, Martínez, Pazos & Riera, 2014). The afore-mentioned variations have spurred the researcher to investigate the critical factors that should be considered when researching on e-learning knowledge; particularly in a developing country like South African.

An investigation of knowledge required for e-learning should considered the following factors:

- Students from rural communities, where there is a lack of infrastructures and resources (Gcora, Gopeni, Tuswa, Lwoga & Chigona, 2015; Paul, Piterman, Shaw, Kirby, Forshaw, Robinson, & Sanson-Fisher, 2017; Ackerman, 2018);
- Students from resource endowed urban environments (del Rosal, Ware & Montgomery, 2018; Braxton, 2018); the digital divide (Arden, 2017);
- The varying levels of computer literacy knowledge among students (Mastellos, Tran, Dharmayat, Cecil, Lee, Wong & Chirambo, 2018);
- Gender variation (Lwoga & Chigona, 2017);
- Demographic variation in terms of age groups, e.g. school leavers (recently graduated from high school) and adult students (Castillo-Merino & Serradell-López, 2014; Hainey, Connolly, Boyle, Wilson & Razak, 2016; Willis, 2017; Vance, Lasofsky, Ozer & Buckelew, 2018; Weber & Hamlaoui, 2018);
- Employability status and prior knowledge of computer literacy (exposed in the particular knowledge they are studying for qualification improvement) and being unemployed (Felea, Albăstroi, Vasiliu, & Georgescu, 2018; Seabra, Henriques, Cardoso, Barros & de Fátima Goulão, 2018; Weber & Hamlaoui, 2018), etc.

Despite all the afore-mentioned factors that hinders e-learning positionality, success depends on the individual students' willingness to overcome the technological challenges. Virtual Studies.Net (2005) reveals that online students can contribute to successful learning and preparation through the following factors: awareness, orientation, discipline and motivation, organisation and self-direction. *Awareness*: the student should evaluate the expectations; assess the appropriate length of time needed to complete the work; and understand the value of the learning. They should also have the ability to assess personal, technical and study skills. *Orientation*: contrary to the learner in the traditional classroom, an e-learner goes through several stages of preparation before engaging the content. These stages includes a series of interconnected factors, for example, the virtual classroom, software, the instructor and, finally, the content. Different students enter a course at different levels of preparedness and in online courses, the instructor should be able to accommodate a student at any level. *Discipline and motivation*: the student should be disciplined and motivated to follow course schedules and complete assignments. *Organisation*: the student has to be organised enough to schedule study time and online time to ensure that all course obligations are met. *Self-direction*: the student must be self-motivated and ask for help when needed".

ICT Infrastructures and Resources

ICT infrastructures facilitates access to and utilisation of resources on the LMS. (Lawrence & Tar, 2018) argued that the definition of a viable e-learning infrastructure transcends beyond hardware, software or system. Saay and Norta, (2018) suggest that the heterogeneous nature of infrastructures for e-learning presents challenges for system design, data integrity and interoperability (Saay & Norta, 2018). They authors viewed ICT infrastructure as a distinct architecture for e-learning. ICT infrastructure cannot be identified by a singular entity since it is a combination of various physical components of hardware, software, and platforms, such as LMS involved in delivering tuition. Therefore, it is important for any higher education institutions to consider and verify the suitability of compatibility of ICT infrastructure before introducing e-learning platforms.

The common and most infrastructure required for e-learning include computers and Internet connectivity. ICT infrastructure encompasses the personal computers, laptops, handheld wireless devices, etc., that add new dimensions to the teaching and learning process (Kong & Ko, 2017). The British Educational Communications and Technology Agency (BECTA 2005) reveals that an adequate level of access to the ICT infrastructure enables a college or university's to deliver e-learning effectively. There are a number of questions that an institution should ask before procuring ICT utilities, for example, how many desktop computers are in the institution— how many do they have; where are they located; and how many additional computers can be purchased (Nortel Certified Technology Expert (NCTE) 2013). Therefore, there is no doubt that computers, whether desktop or portable, are key pieces of equipment in any institution useful for e-learning. As part of the implementation, institutions should think about how and where the computers are going to be used. The technological dimension of the e-learning framework encompass technology infrastructure in e-learning environments (Rhema & Miliszewska 2010). This includes infrastructure planning, hardware and software (Khan 2003).

Once all the relevant hardware and software infrastructures are in place, the issue of bandwidth accessibility arises and this an issue that affects the entire African continent (*Internet World Stats* 2017). Access to the Internet and bandwidth has the potential to transform societies through democratising access to education. In fact, the benefits of the Internet permeate every aspect of modern society (Nyirenda-Jere & Biru, 2015). In the African context, the Internet remains an issue, because not all students can afford

the Internet connectivity costs. It is confirmed that the higher costs to basic broadband connection is a challenge in Africa than in any other regions around the world (Mamabolo, 2017). This becomes a critical issue, because students enrolling in an ODeL are mostly home-based and they require connectivity in their households, but the majority of them cannot afford Internet connectivity. Even those households that can actually afford connectivity experience the hindrances of physical connectivity, because wireless Internet access is still not accessible in all corners of Africa. This leads to the low percentage of penetration of Internet for the purposes of e-learning. The *Internet World Stats* (2017) affirms the overall Internet usage in Africa stands at 35.2% and this is a very low percentage compared to that in first world countries.

The services provided by the World Wide Web (WWW) and the Internet offer significant benefits for students and other users (Bermingham & Prendergast, 2018). Internet connectivity infrastructure for ICT development includes the availability of intranet (LAN networks) and extranet (WAN) and these are biggest challenges in the implementation of e-learning in higher education institutions; particularly in developing countries (Fares 2007; Hadullo, Oboko & Omwenga, 2018; Khouja, Rodriguez, Halima & Moalla, 2018; Ganesan, Ignatius & Neppolian, 2018). The foregoing infrastructure and connectivity challenges impact on the e-learning environment and the usability of the LMS in ODeL institutions.

Usability of Learning Management Systems

Apart from serving as the primary storage devices for educational material, learning management systems also promote collaboration among lecturers and students in higher education (Cantabella, López, Caballero & Muñoz, 2018). Each institution subscribes to its own preferred LMS platform/s. The development of these online platforms (LMS) enhances access to resources in those institutions that subscribe to e-learning (Jordan & Duckett, 2018). Even those that are not ODeL institutions are gradually taking cognizance of LMS for blended learning mode purposes (Cantabella, López, Caballero & Muñoz, 2018). It is important for higher education institutions to subscribe to new learning technologies, expose students to technology and increase access to massive educational resources.

The level of usability of LMS varies among institutions because of subscriptions to different platforms. The user-friendliness of LMS is attractive to many students (Ahmad, Beyene & Giannoumis, 2018; Farid, Ahmad, Alam, Akbar & Chang, 2018). Students prefer LMS platforms that are useable, because they are not time consuming; the graphic user interface is clear; and the social media is embedded. It is particularly important for ODeL universities, such as UNISA, to continuously improve their LMS, because of heavy reliance on e-learning and blended mode teaching and learning (De Metz & Bezuidenhout, 2018).

In the field of Information Science, there are modules that still demand the physical interaction between students and lecturers because of their practicality – in particular cataloguing and classification catalogues and work integrated learning (WIL). Cataloguing and classification are the core modules of the Library and Information Science profession, in that they provide knowledge and skills to retrieve online library catalogues effectively (Wang, 2018). The LMS is currently not well equipped to teach these module; particularly in an ODeL institution. WIL is mandatory for all Information Science students. The module equips students with practical experience in practical library and information science work. ODeL institutions should consider adapting LMS that accommodate Information Science students.

Although an LMS transforms all spheres of education, it should not be overlooked that one of its major impact is the degree of computer anxiety influencing the way in which students perceive ease of use of a LMS (Valverde, Torres & Motaghi, 2018). Computer anxiety is an undeniable reality: not all students feel equally comfortable when interacting with a computer. This anxiety, results in students be-

ing hesitant to use a computer thus creating hindrances LMS usage. Computer anxiety may be traced to students' geographical backgrounds, e.g. numerous students in developing countries complete secondary education without acquiring the necessary computer literacy skills (Oyedemi & Mogano, 2018). Their first encounter with a computer occurs at university level and this becomes a challenge because they need to be computer literate before mastering the subject content. Apart from affecting the pass rate, this may also be one of the reasons for the decline in LMS usability.

PROBLEM STATEMENT

The gradual introduction of Information communication technologies (ICTs) has been characterised by the enhancement of tuition and research in higher education (Collins & Halverson, 2018; Paul, Bhuimali, Aithal & Bhowmick, 2018; Khouja, Rodriguez, IHalima & Moalla, 2018). The revolutionisation of higher education is creating a continuous change in pedagogical methods and how tuition is provided South Africa is a developing county and not all communities have access to ICT infrastructures (Keinänen-Toivola, Savela, Koivisto, Järvenpää, Salahub, Olenius & Pulkkinen, 2018; Babaci-Wilhite & Geo-JaJa, 2018). The lack of access to ICTs is a major problem in an ODeL environment like Unisa. Students have not yet overcome the obstacles in learning, such as the lack of ICT infrastructure in certain geographic areas. This results in students not using relevant technologies, which, in turn, impacts on the utilisation of LMSs (Ncube, Dube & Ngulube, 2014).

The focus of the current study is to establish the students' satisfaction with the usability of myUnisa as a LMS, it should be noted the Department of Information Science offers students work integrated learning. There is need to conduct a thorough research study on the extent to which how ODeL institutions are doing justice to the provision of the Information Science content and work integrated learning in the LMS.

METHODOLOGY

The study opted for the quantitative approach, because it involves the use of controlled questionnaires in which the response options are coded. The quantitative approach also allows for the involvement of large numbers of respondents. Another consideration was that UNISA students are scattered almost all over the world (UNISA Website, 2018) and the quantitative approach made it possible to distribute online questionnaire to all participants. The study targeted students who registered for the Bachelor in Information Science in the year 2014. The study was particularly interested in students who registered for the module *Information and Communication Technologies for Information Science* (INS2701). The target population was chosen, because the researcher believed that students who are registered for INS2701 may have a great input on e-learning and that they are ICT students. All students who are registered for this module are expected to *"have the competence to apply their knowledge of information and communication technologies in different contexts in the library and information sector; and the purpose of the learning is to interpret, evaluate and apply the concepts, principles of operation, uses and latest trends of information and communication technologies, and indicate its influence on society"* (INS2701 Only study guide 2011:3). This module is compulsory for all students who are registered for the Bachelor in

Information Science. Based on the statistics retrieved from myUnisa (i.e. the LMS used at UNISA for tuition and content management), 125 students were registered for this module in 2014. All registered students were expected to participate in the study and there was no need of sampling, given the fact that population was sufficient.

RESULTS

In order to present the results of this chapter on the usability of LMS, it was important to firstly establish the students' knowledge of myUnisa, followed by the reasons of using myUnisa; necessary ICT infrastructures, such as devices, used for access; usability and reliability of myUnisa; and any other crucial factors such as frequency of use of myUnisa(i.e. time spent on myUnisa per week)and challenges encountered by students when using LMS.

The results are based on the 125 targeted respondents drawn from students enrolled for Bachelor of Information Science in 2014. Out of all registered students only 52 managed to respond to the distributed online survey. In conversion rate to percentage, this means that the collected and analysed results were based on 42% response rate. Based on the number of factors associated with the online surveys, this kind of response regarded as adequate for data interpretation and presentation. The evidence elicited from various quantitative studies who opted for online survey for data collection and lower response rates such as Wouters, Maesschalck, Peeters and Roosen (2013) had a response rate of 36.4% and Doerfling, Kopec, Liang and Esdaile (2010) had a response rate of 25.6% (*u may think of infusing the recent study*). In view of this information, the 42% response rate considered to be adequate for analysis. In this study, trying to increase the response rate the researcher despatched more than three reminders to the respondents' and follow up telephone calls were made to encourage participation. Therefore, the presentation of results is based on the total of 52 responded and in all themes the respondents were free to select more than one answer (they were allowed to select all their favourable answers). Based on the low response the results there was no need to convert figures into percentage.

Students' Knowledge of MyUnisaas a Learning Management System

The respondents were asked to demonstrate their understanding of the LMS myUnisa used at the University of South Africa. The results show that the majority 41 respondents have knowledge of myUnisa. The total of 19 (n=%),interpreted and understand myUnisaas a web-based learning; 15 respondents referred the LMS as a tool for an ODeL institution. The LMS was regarded as negative by 11 respondents and, as such, their responses do not carry any significance. Based on the findings, myUnisa can, generally, be defined as an online learning platform utilised for web-based tuition in an ODeL institution (Ncube, 2015). This affirms that there is no common term to describe LMS fore-learning, although its functions and usability are similar in all institutions that provide e-learning services(Organisation for Economic Co-operation and Development (OECD), 2012; Davidson-Shivers, Rasmussen & Lowenthal, 2018). The variation of answers clearly indicates that there is no uniform term to describe online course/e-learning, although this may create more confusion among students who are not IT oriented because of varying definitions of LMS for e-learning.

Table 1. The usage of myUnisa (N=52)

Variable	Number of Response
For submitting assignments	44
Use it to interact with other students	38
To access study resources	35
To check announcements posted by the lecturers	10
To engage and participate in discussion forums	10
All of the above	14
Other: e-commerce	1

The Main Purposes of MyUnisa

The respondents were asked to indicate the purpose for which they used myUnisa. Seven options were given, so that they could select more than one option. These options were: to submit assignments; to interact with other students; to engage and participate in discussion forums; to check announcements posted by the lecturers or tutors; to access study resources; all of the above and, the last option, any other reason, which they had to specify. Respondents predominantly appeared to use myUnisa to submit their assignments. The table 1 illustrate the usage of myUisa and its purposes for learning Information Science.

The results, show a high response total of 44, for the option of submitting assignments; total of 38 responses are for those who are interacting with other students; and 35 are for accessing study resources. In general, students used myUnisa for all of the above-mentioned purposes. This aligns with the findings of the study in *The writers' handbook*(2012), which established that technology was reshaping current learning systems by offering students and lecturers' innovative ways of tuition. This is an indication that myUnisa supports the idea of *socialising*, where students are encouraged to communicate with other students and lecturers; *managing* the setting of time lines; *technical awareness* of network systems and software and *pedagogical* learning, where lecturers provide insight and students are encouraged to respond (Berge, 2006).

Although checking announcements and accessing resources are important to students, the response rate to this option was very low, with less than 10 of students accessing myUnisa for this purpose, which indicates that students do not engage seriously with e-learning (myUnisa). Despite this, there is reason to believe that students are embracing myUnisa for academic purposes with regards to essential activities of learning, teaching and research. Furthermore, the literature affirms that e-learning may be used for the purposes of modernising and integrating comprehensive learning material, experiments including alternative students services such as use of Web, 2.0 applications, for example, blogs, wikis, Facebook, twitter and any others (University of Freiburg 2014). This may impact positively or negatively on the learning context, because, if Web 2.0 is involved (embedded) in e-learning platforms, it may also create cases of cyber bullying, where students are swearing or use vulgar language, particularly if they are not properly monitored. The positive impact would be that teaching and learning, including teaching material becomes shareable, . It is well known that many students spend a lot of time in Web 2.0 activities for general communication.

The Devices Used by Students to Access myUnisa

The respondents were asked to identify which information technology (IT) devices they used to access and interact with myUnisa. From the given sample studied, 30 respondent indicated that they accessed myUnisa by using desktop computers; 30 use laptops; 29 use smart phones; and 13 (26%) indicated that they use tablets or iPads. The findings concur with the literature in terms of the devices used to access myUnisa, confirming that the most popular devices used are desktop computers, laptops and cell phones (Kong & Ko, 2017). It is encouraging to note that the use of cell phones as a study gadget matches the use of laptops and desktop computers – i.e. 30 response rate. This is in line with the findings by BECTA (2005), who states that adequate level of access to the ICT infrastructure is the foundation of a university's ability to deliver e-learning effectively. It is notable that only a small percentage of students access the internet through the use of iPads/tablets, although this study did not determine the reason or reasons for this trend.

Noe (2014) cautions that e-learning may be costly, since it requires reliable internet connectivity, as well as electronic devices with appropriate software and settings. This is an indication that electronic devices that can be used for myUnisa and any other learning platform as part of e-learning are not limited to cell phones, tablets, desktops and laptops.

Usability of myUnisa

Usability is more associated with e-learning course design and characterises simplicity of students using LMS to access online course content. LMS and its interface, together with application tools, must be user-friendly (Ahmad, Beyene & Giannoumis, 2018; Farid, Ahmad, Alam, Akbar & Chang, 2018). To determine the usability of myUnisa as a LMS, the study formulated questions to gain more information about the following: usability of myUnisa as an e-learning platform; the reliability of myUnisa as an e-learning platform; the tools which are most frequently used for e-learning; support available for students; use of technology to have access to e-learning; the time spent on the Internet and the time spent on myUnisa; and the environment where students access study resources.

As the findings in Table2 reflects, the highest number of 40 who indicated that using myUnisa platform could improve their learning performance. These findings confirm that UNISA has an e-learning platform that is beneficiary to students. This concurs with Huda, Maseleno, Atmotiyoso, Siregar, Ahmad, Jasmi and Muhamad (2018:33), as they allude that LMS “contribute to improve the learning environment and

Table 2. Usability of myUnisa as a learning management system (N=52)

Variable for Usability of LMS	Number of Respondents
Learning to operate the e-learning service is easy for me.	33
It is easy for me to become skilful in using the e-learning service.	36
Using the e-learning service can improve my learning performance.	40
Using the e-learning service can simplify the learning process.	28
Using the e-learning services fits well with the way I learn.	21
The setup of e-learning service is compatible with the way I learn.	21

achievement by enhancing students learning processes to provide online resources in higher education environment”. This also confirms that learning in an LMS environment is not as limiting as it would be at a contact university, where students have a limited number of contact hours a day.

Significantly, the results indicate that, through interaction with the various e-learning tools, students are also learning new skills. In this regard, 36 respondents indicate that it is easy to become skilful when using the myUnisa services. Based on the findings, it seems most of the respondents’ support the axiom that “practice makes perfect”. In other words, they have learned that every time they use the e-learning platform, they discover or gain new skills. Furthermore, 33 respondents indicated that learning to operate the e-learning services has been easy for them. This shows that students are comfortable with the different LMS services offered. The LMS tools that support e-learning cover a wide range of different applications, including discussion forums, chats, file sharing, wikis and web-blogs (Ahmed, 2018). These tools have proved to be popular in education and are considered to be very useful for many students who are engaged in ODeL.

A total of 28 respondents indicated that using myUnisa simplified learning experiences. This result aligns with the findings by Armstrong (2011), who mentions that course organisation is central to student and learning success. Additionally, 21 respondents indicated the myUnisa services fit in well with the way they learn and another 21 also mentioned that the setup of the e-learning service was compatible with the way they learn. The overall findings confirm the positive response of students to myUnisa tools. The overall LMS usability shows that students found web-based learning more convenient than face-to-face instruction, as it offers more flexibility and allows for a certain degree of self-paced study or independent learning (Watson, Yu & Watson, 2018).

Table 3 gives an overview of the findings on the reliability of myUnisa as an e-learning portal. A total number of 41 respondents found the layout and user interface design on the myUnisa website very user-friendly. The information on myUnisa is organised in such a way that the graphics are clear, readable, usable and learnable, as suggested by Gutierrez (2014).

The significant impact would be that this type of e-learning system may reduce frustrations to students. Another high total of 39 respondents indicated that it is particularly easy to navigate the myUnisa website. These findings imply that a clear graphic user-interface is an important consideration in the design of an e-learning course, because it makes it easier for students and lecturers to navigate. An e-learning course should meet the objectives of the content and, by so doing, there is a need to develop a clear and student-friendly course. Furthermore, Pappas (2015) suggests that e-learning course navigation needs to be effective in order for students to be successful in absorbing the information without getting

Table 3. Reliability of myUnisa as an e-learning platform (N=52)

Variable for Reliability of LMS	Number of Respondents
The user interface LMS is user-friendly and reliable.	41
It is easy to navigate the myUnisa website.	39
I feel comfortable using the functions and its services.	39
myUnisa provides services needed by students	36
myUnisa website provides extensive information, which is easy to comprehend.	25
myUnisa website provides complete information.	23

confused or lost. Therefore, the easy navigation may impact positively on empowering students with an easy-to-use, web-based curriculum that optimises their success and improves their completion rates.

Based on these results, it can be concluded that myUnisa is a reliable LMS for e-learning. MyUnisa has been carefully designed to provide the most comprehensive, interactive and flexible learning experience for students.

Contexts and Workstations Used by Students to Access the LMS

It is mentioned at the beginning of the chapter that the teaching and learning in an ODeL universities does not occur through contact session like any other traditional universities. The researcher sought to determine the setting used by students to gain access for learning as there are no lecture halls provided instead they rely on the systems and platform. In order to establish the contexts used by students to access study resources, four locations of access to devices, so that they could select those that were most relevant to them. Therefore there were four context of access such as computer laboratory (can be institution or community laboratory); UNISA regional office; home computer and office workstation. The findings show that 54 respondents use office computers; 23 home computer; 32 use a computer laboratory; and 25% use the UNISA regional offices.

Access to information has been identified as one of the main reasons for students going online. There is a growing preference for accessing information for official and personal correspondence, if one is studying in an ODeL context. It is known that myUnisa is the most commonly used platform used by students to access information and tuition material at UNISA. Young and Norgard (2006) report that students find online courses offered an advantage over courses that are presented through contact sessions i.e. face-to-face. In this case, students are not limited to certain platforms or devices, in order to access information.

Based on these findings, it can be concluded that the majority of respondents 54 use their home computers to access study resources. Accessing information from the home computer requires the Internet access and proper network connectivity. Another 54 indicated that they access information from their office computers. These results confirm that many Information Science students are working while studying towards attaining degree qualifications. The respondents indicated that they access information by using the computer laboratory in the library. This may be an indication that these students are not working and have access to UNISA facilities. It is encouraging to note that even those students, who are not employed, do have places where they can access information for their studies.

Hindrances for Accessing Learning Management Systems

Access and usability of virtual technologies such as LMS come with its own hindrances and opportunities as well. Therefore, the study established the challenges encountered by students 'in engaging or interacting with LMS for their studies. The majority of students complained about the high cost of data bundles. In South Africa, this becomes a significant hindrance for accessing and using any web-based study-related system, including LMS. Bisimwa, Brown and Johnston(2018), allude that South Africa is the leading African country in terms of high cost of data bundles. Neo (2014) also affirm that e-learning is costly, in that it requires the availability of the Internet to access information. As part of Internet and network connectivity, respondents also revealed that, in some of their geographic locations, it is hard to locate the wireless signal for Internet connection.

The second problem encountered by students is the issue of devices or computer ownership. Those who do not own computers are expected to travel a long distance to reach UNISA regional offices in order to access facilities. This confirms the findings of the literature review that developing countries face challenges in affording students with relevant devices for educational purposes (Welsh, Park, France, Mauchline & Whalley, 2018). Contrary to the African and South African situation, other countries in the Global North capacitate students with laptops and tablets for their studies (Mora, Escardíbul & Di Pietro, 2018). They also provide facilities for students to connect their own devices (CYOD) and bring your own device (BOYD).

As stated in the introduction, ODeL students are scattered over different geographic areas. One of the challenges requiring attention is that there are still students residing in remote geographic locations where there is lack of electricity infrastructure. Apart from being limited in terms of access to electrical power, these students cannot connect their computers to a power supply – that is if they actually have computers or devices. Yet, these students are still expected to perform like all other students, who do have the necessary infrastructure to study at an ODeL institution.

CONCLUSION

Learning management systems have different features for the teaching and/or learning relating to specific modules (Sonmez & Koc, 2018). These platforms provide students with multitudes of opportunities to interact on a global scale (tuition platforms).

This research concludes that the investigation of usability has shown that students' understanding of e-learning differs depending on cognitive and perceptive levels. The study concludes that students access LMS and that they use different devices, including mobile phones, desktops, laptops and tablets, etc. The study affirms the positive aspects in using LMS, as students evidenced by student's satisfaction with submitting their assignments; interacting with other students through participating in discussion forums; checking announcements that are usually posted by lecturers and tutors; and accessing study resources on the LMS.

The e-learning and LMS is beneficial for students, as it reduces the cost of training by enabling them to participate in courses at any time and from anywhere. It promotes the web-based classroom, which means that there are no traditional classroom engagements, where students have to spend transport money, in order to reach lecture halls. Therefore, this research has identified the following benefits of e-learning: ease of access to information; providing a safe digital environment for students to submit their assignments; and enabling students to work at their own pace. The results also confirm the following successes and usefulness of LMS: ODeL students considered LMS as a flexible teaching and studying method, because it is not bound to a particular time and place; a LMS promotes ease of use and the sharing of educational material happens quickly; it promotes collaboration and greater interaction among students; promotes access to higher education; and it provides the opportunity for quick feedback and creates confidence and safety in learning.

There has been a concern from lecturers that students are sometimes not pro-active when engaging with the LMS at ODeL universities (Liaw, 2008; Ncube, Dube & Ngulube, 2014; Wingo, Ivankova & Moss, 2017; Virtanen, Haavisto, Liikanen & Kääriäinen, 2018). Therefore, investigating the usability of LMS used by Information Science students in an ODeL environment became a point of interest. One of the main concerns involved in the study was the fact that there are modules in the Information Science

field, such as cataloguing and classification, which are considered as critical – some institutions regard them as high risk modules that need to be delivered in a face-to-face classroom environment. However, because UNISA is an ODeL institution and is shifting from blended learning to a fully online mode, students are struggling to complete these modules – i.e. without contact lectures. Overall, students seem to enjoy the learning of Information Science in an ODeL environment.

THE STUDY RECOMMENDATION

It has been observed by researchers that not all secondary high school graduates have adapted and implemented acquired computer literacy policies to upgrade the skills of students. Therefore, there is a serious call for all universities, including ODeL institutions, not to ignore the provision of basic computer literacy to all newly enrolled students. In addition to that, UNISA computer laboratories based in the regions or education centres, should recruit an IT Specialist or International Computers Drivers Licence (ICDL) Trainer to provide computer literacy skills. This resource person will assist first-year students, where such help is needed, and will be responsible for ensuring that all students, who come to the regional offices for the first time, acquire the necessary computer literacy training. In this way, all students will experience the advantages associated with an ODeL university. If this initiative is considered, students should increase their level of engagement in the LMS.

ODeL institutions have to be creative and invent new strategies to connect, continents, countries, regions and villages by providing reliable Internet access and hotspots. The literature review confirms that ODeL students institutions are not accommodated in one particular setting and, therefore, they are affected by different challenges, one of which is the lack of Internet access and connectivity (Burbules, 2018).

AREAS FOR FURTHER STUDY

This study recommends a thorough investigation into all modules offered in Information Science, so as to establish their level of suitability for teaching in an ODeL environment. The Structuration Theory of Giddens (1984) will be a suitable theory for further investigation and may provide appropriate knowledge and suggestions on how to improve the teaching of Information Science in the ODeL environment. Furthermore, an interrogation into the systems design is recommended, in order to establish the extent to which the current LMS caters for practical modules. Lastly, although work integrated learning (WIL) is a requirement in the field of Information Science, there seems to be limited answers as to how the practicum is to be conducted and facilitated through an LMS in a ODeL institution.

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Chapter 19

Utilisation of Resources and Services Available in Selected Engineering Colleges in Chennai District: A User Survey

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ABSTRACT

The Purpose of this study is to investigate the current state of utilisation of resources and services available in selected engineering colleges in Chennai District. Questionnaire followed with the personal interview is the method chosen for data collection in this study. Out of the total of nine institutions, six are selected as sample for the purpose of the present study, representing almost 66% of the total institutions in Chennai District. From each institution, 100 respondents are selected as sample; the researchers have adopted a stratification method. To test the hypothesis, Chi-square test and ANOVA two-way model are applied. This study is the first of its kind on engineering college libraries of Chennai District. It relies not only on data supplied by respondents but also on verification by actual observation. It throws light on the current status of the use of ICT facilities and level of information literacy in the users of these libraries and tries to find the reasons behind their dissatisfaction.

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INTRODUCTION

The present study aims to utilization of library Resources and Services available in selected engineering colleges in and surrounding location of Chennai only. The advancement an ICT the play an important role library and information centre's an opportunity to improve the information services to the patrons in more effective way. The growth of internet has made significant revolution in the areas of use pattern of information among academics of the Faculty Members, researchers and students. It is collecting the information through internet for Information Scientists and Information specialists are using the engineering and technology field. The challenges for using the library resource of online resource and ICT related technologies learning and applying the library routine activities are to ready for the library professionals. The wake up the library professionals for right time using the right information to right place of users.

The study reveals the trace out the type of users, their frequently of utilizing library network services, backup periodicity, backup device used etc. These factors could be analyzed with a view to analyze library use behaviors in engineering colleges. The analysis of extent of availability and accessibility of library services is one of the aspects of the present study. It could be noted that due technology revolution the library environment rapidly changes to electronic environment. The physical and hand volumes of books and journals are slowly being replacement to electronic media like floppy disks, magnetic tapes, CD-ROMs etc. The development of ICT is changing from static text based to graphic, hypertext, audio, and video and now has reached interactive multimedia. The rapid development in computer and data networking technology to support those needs and an explosion in the variety of equipment's and networking available in the market. Hence, the status of network training to library users could be analyzed from the focus of the present study.

REVIEW OF LITERATURE

Murugan (2015) carried out a survey using questionnaire method and found that among the 80 respondents, 62.50 percent of students and 37.50% of faculty members were assessing E-resources. It is concluded that 14(54.00%) respondents E-journals are using faculty, 16(50.00%) are using students.

Anwar (2007) critical reviewed the unpublished fourteen research projects of students produced on information needs topics in University of Punjab during the period of 1975-1982 and suggested to the library and information science professionals to conduct the research on the critical topics connected to various areas.

Al-Shanbari, H & Meadows (1995) conducted a survey of five hundred scientists and engineers who were working in four different universities in Saudi Arabia for examining their communication and information handling practices.

Satheesha and Vaddankere (2018) through a survey analysed the library resources and services of the selected engineering college of Karnataka. This study further discussed the collection development, library membership, staff position, working hours, services offered and e-resources subscribed by the libraries.

Kumbar and Lohar (2002) analyzed the use of library facilities and information resources in Sahyadri Colleges, Shimoga (Karnataka). In this survey, 91 teachers from both the Sahyadri Arts & Commerce College and the Sahyadri Science College were participated.. The analysis of the collected data covered that the use of library resources, classification and catalogue, library services and physical facilities. Concludes that the chief intention for the use of libraries has been the academic interest of the users.

OBJECTIVES OF THE STUDY

The following objectives of the study are framed as follows:-

- To study analyze the frequency of library visit and average span of time utilization in library in the engineering colleges in Chennai District.
- To investigate an extent of academic motivation and purposes of library visit in the engineering colleges
- To study the Sources of Bibliographic Information.
- To identify an extent of dependence on formal and informal sources of library information.

HYPOTHESES

The following hypotheses are formulated as per the present study mentioned as below:-

- There is a significance variation with respect to frequency of library visit and their average span of time utilization in library in the engineering colleges in Chennai District.
- There is a significant variation with respect and extent of academic motivation and purposes of library visit in the engineering colleges in Chennai District.
- The significance on different in their Sources of Bibliographic Information.
- There is a significant variation with their extent of dependence on formal and informal sources of library information.

METHODOLOGY AND SAMPLING

The questionnaire survey method was used for conducting this study. The questionnaires were distributed in nine Engineering colleges surrounding geographical area of Chennai. Totally nine engineering college have selected and six engineering colleges were responded. The sample collected from the six institution of have 600 questionnaires were responded in this survey. The respondents were working in engineering college Senior Professors, Professors, Associate Professors, Assistant Professors and Students. The Sampling of the study is Stratified Random sampling method. The data collected from the targeted users was analyzed and tabulated by using a statistical tool in simple percentage. The hypotheses was tested by using chi-square test and ANOVA two-way model test.

LIMITATIONS

This study is confined to the selected engineering colleges available in Chennai district only.

Table 1. Designation wise respondents' frequency of library visit

Designation	Every Day	Thrice in a Week	Twice in a Week	Once in a Week	Total
Senior Professors	29	26	22	32	109
	(26.61)	(23.85)	(20.18)	(29.36)	(18.17)
Professors	16	27	22	25	90
	(17.78)	(30.00)	(24.44)	(27.78)	(15)
Associate Professors	29	29	39	37	134
	(21.64)	(21.64)	(29.10)	(27.61)	(22.33)
Assistant Professors	18	27	33	22	99
	(17.17)	(27.27)	(33.33)	(22.22)	(16.50)
Students	10	77	48	34	168
	(5.95)	(45.83)	(27.98)	(20.24)	(28)
Total	101	186	163	150	600
	(16.83)	(31.00)	(27.17)	(25.00)	(100.00)

Source computed Figures in parenthesis denote percentages

Table 2. Chi Square summary result

Chi Square Calculated Value	Degrees of Freedom	Chi Square Tabulate Value
137.2	12	21

DATA ANALYSIS AND INTERPRETATION

In table (1) in indicates the designation wise respondents' frequency of library visits. Out of 600, the Senior Professors level, Frequency of Library Visit are "Every day" (26.61%) followed by thrice in a week (23.85%), twice in a week (20.18%) and once in a week (29.36%). The Professors level, Frequency of Library Visit are "Every day" (17.78%) followed by Thrice in a week (30%), Twice in a week (24.44%) and once in a week (27.78%). An Associate Professors level, Frequency of Library Visit are "Every day and Thrice in a week" (21.64%) followed by twice in a week (29.10%) and once in a week (27.61%). An Assistant Professors level, Frequency of Library Visit are "Every day" (17.17%) followed by Thrice in a week (27.27%), twice in a week (33.33%) and once in a week (22.22%). The Students level, Frequency of Library Visit are "Every day" (5.95%) followed by thrice in a week (45.83%), twice in a week (27.98%) and once in a week (20.94%).

The chi square test is applied for further discussion. The computed chi square value is 137.2 is greater than its tabulated value at 5% level of significance. Hence the difference in designation background is statistically identified as significant with respect to respondents' frequency of library visit in search of research information.

It could be seen clearly from the above discussion that the majority of the senior professors' library visit of once in a fortnight (29.36%), Professor category thrice in a week (30%), Associate Professor

Table 3. Designation wise respondents average span of time utilization in library

Designation	½ to 1 Hour per Visit	1-2 Hours per Visit	2-4 Hours per Visit	4-6 Hours per Visit	Total
Senior Professors	46	17	24	22	109
	(42.20)	(15.60)	(22.02)	(20.18)	
Professors	19	16	37	18	90
	(21.11)	(17.78)	(41.11)	(20.00)	
Associate Professors	26	29	37	42	134
	(14.18)	(11.94)	(27.61)	(13.43)	
Assistant Professors	12	29	32	26	99
	(12.12)	(29.29)	(32.32)	(26.26)	
Students	3	80	42	43	168
	(15.48)	(17.26)	(22.02)	(25.00)	
Total	106	171	172	151	600
	(17.67)	(28.50)	(28.67)	(25.17)	

Source computed Figures in parenthesis denote percentages

Table 4. Chi Square summary result

Chi Square Calculated Value	Degrees of Freedom	Chi Square Tabulate Value
327.9	12	21

and Assistant Professor Category thrice in a week (29.10%) and students category are thrice in a week (45.83%) and over all respondents in the five category Thrice in a week are using the majority level.

It is seen from the table (3) explains that the designation wise respondents' an average span of time utilization in library. Out of 600, the Senior Professors level, an average span of time utilization in library are "½ to 1 hour per visit" (42.20%) followed by 1-2 hours per visit (15.60%), 2-4 hours per visit (22.02%) and 4-6 hours per visit (20.18%). the Professors level, an average span of time utilization in library are "½ to 1 hour per visit" (21.11%) followed by 1-2 hours per visit (17.78%), 2-4 hours per visit (41.11%) and 4-6 hours per visit (20%). An Associate Professors level, an average span of time utilization in library are "½ to 1 hour per visit" (14.18%) followed by 1-2 hours per visit (11.94%), 2-4 hours per visit (27.61%) and 4-6 hours per visit (13.43%). An Assistant Professors level, an average span of time utilization in library are "½ to 1 hour per visit" (12.12%) followed by 1-2 hours per visit (29.29%), 2-4 hours per visit (32.32%) and 4-6 hours per visit (26.26%). Students level, an average span of time utilization in library are "½ to 1 hour per visit" (15.48%) followed by 1-2 hours per visit (17.26%), 2-4 hours per visit (22.02%) and 4-6 hours per visit (25%).

A study of data in table 4.2 in indicates the designation wise respondents' average span of time utilization in library. It could be noted that Senior Professors occupy the first position (42.20%) with respect to their average time utilization in the range of 1/2 to 1 hour per library visit in connection with collecting

Figure 1.

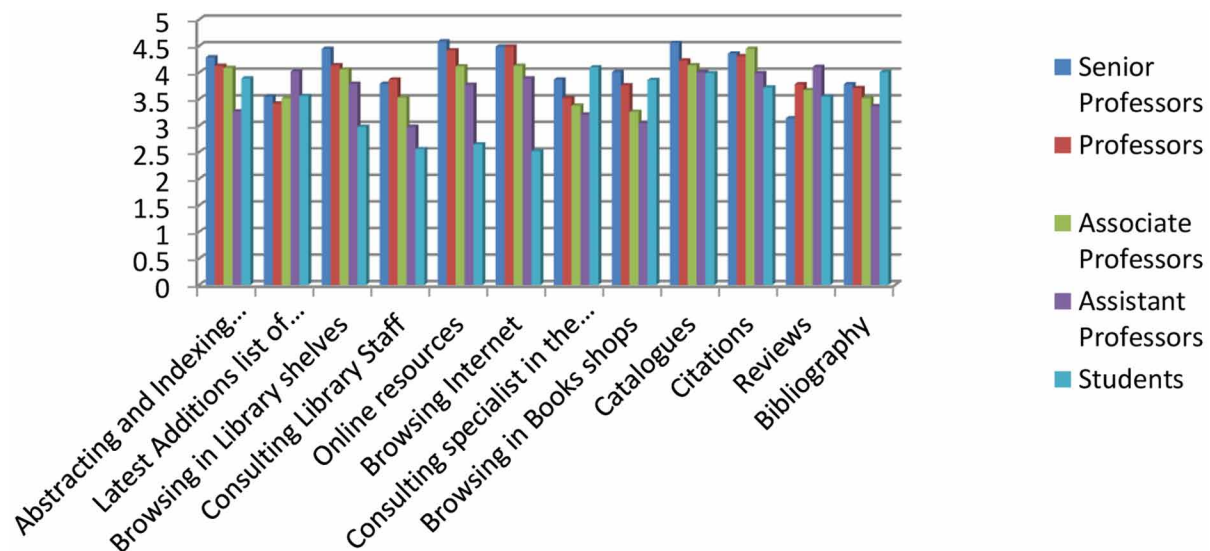


Table 5. Designation wise respondents' sources of bibliographic information

ANOVA					
Source of Variation	SS	df	MS	F	F crit
Rows	3.432473	11	0.312043	2.769945	2.014048
Columns	3.150877	4	0.787719	4.468036	2.583668
Error	7.757243	44	0.176301		
Total	14.34059	59			

library resources. Majority of the Professors (41.11%) and Assistant Professors (32.32%) make use of 2 to 4 hours in collection of library resources per library visit.

The chi square test is applied for further discussion. The computed chi square value is 327.9 is greater than its tabulated value at 5% level of significance. Hence the difference in designation status is statistically identified as significant with respect to respondents' average span of time utilization in library per visit.

It could be seen clearly from the above discussion that the majority of the senior professors' average span of time utilization in library ½ to 1 hour per visit (42.20%), Professor category 2-4 hours per visit (41.11%), Associate Professor category 2-4 hours per visit (27.61%), Assistant Professor Category 2-4 hours per visit (32.32%) and student's category are 4-6 hours per visit (25%) and over all respondents in the five category Thrice in a week are using the majority level.

Table (5) indicates the designation wise respondents' sources of bibliographic information. An ANOVA Two ways model is applied for further discussion. At one point, the computed ANOVA value 2.76 is greater than its tabulated value at 5 per cent level of significance. Hence, there is a significant variation among the chosen designation groups with respect to respondents' overall sources of bibliographic information. At another point, the computed ANOVA value 4.46 is greater than its tabulated

Figure 2.

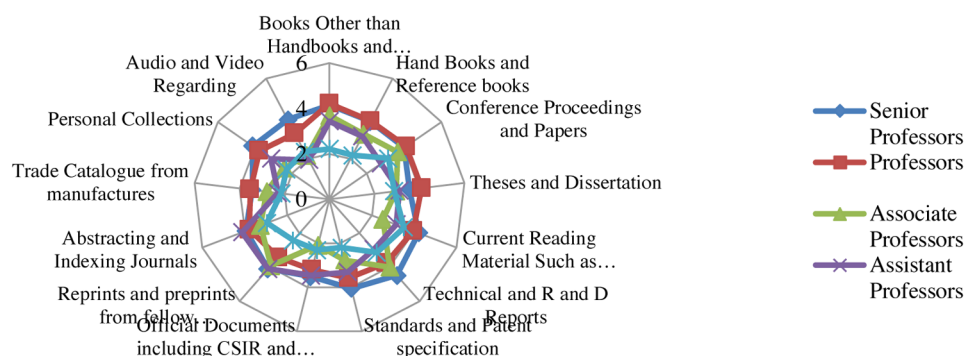


Table 6. Designation wise respondents extent of dependence on formal sources of library information

ANOVA					
Source of Variation	SS	df	MS	F-Value	F crit
Rows	5.876982	12	0.489748	2.76717	1.960121
Columns	15.66214	4	3.915536	22.12351	2.565244
Error	8.495295	48	0.176985		
Total	30.03442	64			

value at 5 per cent level of significance. Hence, variation among the attributes relating to respondents' overall sources of bibliographic information is statistically identified as significant.

It could be seen clearly from the above discussion that Senior Professors take the first position are occupied with respect to their overall dependence on sources of bibliographic information, Professors the second, Associate Professors the third, Assistant Professors the fourth, students are decrease level.

Table (6) indicates the designation wise respondents' extent of dependence on formal sources of library information. The ANOVA two way model is applied for further discussion. At one point, the computed ANOVA value 2.76 is greater than its tabulated value at 5 per cent level of significance. Hence, there is a significant variation among the chosen designation groups with respect to respondents' overall

Figure 3.

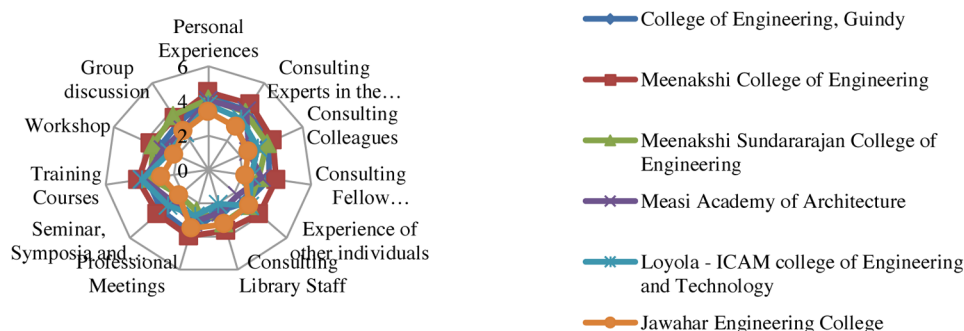


Table 7. Institution wise respondents extent of dependence on informal sources of library information

ANOVA					
Source of Variation	SS	df	MS	F-Value	F crit
Rows	8.774748	10	0.877475	5.289622	2.026141
Columns	9.852644	5	1.970529	11.8788	2.400412
Error	8.294306	50	0.165886		
Total	26.9217	65			

dependence on all formal sources of library information. At another point, the computed ANOVA value 22.12 is greater than its tabulated value at 5 per cent level of significance. Hence, variation among the attributes relating to respondents' overall dependence on all formal sources of library information is statistically identified as significant.

It could be seen clearly from the above discussion that the Senior Professors take the first position with respect to their overall dependence on all formal sources of library information, Professors the second, Assistant Professors the third, Associate Professors the fourth, and student respondents the last.

Table (7) shows that the institution wise respondents' extent of dependence on informal sources of library information. The ANOVA Two ways model is applied for further discussion. At one point, the computed ANOVA value 3.16 is greater than its tabulated value at 5 per cent level of significance. Hence, there is a significant variation among the chosen designation with respect to respondents' overall dependence on all informal source of library information. At another point, the computed ANOVA value 1.16 is lesser than its tabulated value at 5 per cent level of significance. Hence, variation among the attributes relating to respondents' overall dependence on all informal source of library information is statistically identified as insignificant.

It could be seen clearly from the above discussion that the student respondents take the first position occupied with respect to their overall dependence on all informal source of library information, Professor Respondents the second, Senior Professors respondents the third, Associate Professors the fourth, and Assistant Professors at the end level.

FINDINGS AND CONCLUSION

The findings of the present study are the following findings:

The findings of the Frequency of Library visit are majority of the senior professors' library visit of once in a fortnight (29.36%), Professor category thrice in a week (30%), Associate Professor and Assistant Professor Category thrice in a week (29.10%) and students category are thrice in a week (45.83%) and over all respondents in the five category Thrice in a week are using the majority level.

The majority of the senior professors' average span of time utilization in library ½ to 1 hour per visit (42.20%), Professor category 2-4 hours per visit (41.11%), Associate Professor category 2-4 hours per visit (27.61%), Assistant Professor Category 2-4 hours per visit (32.32%) and student's category are 4-6 hours per visit (25%) and over all respondents in the five category Thrice in a week are using the majority level.

The designation analysis wise Extent of Academic Motivation. It could be seen clearly from the above discussion that there is an association between designation status of the respondents and their overall academic motivation scores. It could be noted that higher the designation status and higher the overall academic motivation score.

The designation analysis wise sources of bibliographic information. That Senior Professors take the first position with respect to their overall dependence on sources of bibliographic information, Professors the second, Associate Professors the third, Assistant Professors the fourth, students the last.

The findings of the Extent of dependence on formal and informal sources of library information reveal the following facts. That respondents have high level dependence on formal sources of library of information relating to technical research reports, reprints and preprints from fellow professionals, conference proceedings and papers, abstracting and indexing journals and reference books. The respondents of Meenakshi College of Engineering take the first position with respect to their overall dependence on all formal sources of library information.

That the respondents have high level dependence on informal sources of library of information relating to personal experience, consulting with experts in the field and training courses. The respondents have moderate level dependence on informal sources of library of information relating to consulting colleagues, professional meetings, group discussion, and experience of other individuals and consulting fellow professionals.

The respondents have low level dependence on informal sources of library of information relating to area pricing method, workshop, seminar, symposia and lecture, consulting library staff. The designation analysis wise Extent of Dependence on Informal Sources of Library Information, that the student respondents take the first position with respect to their overall dependence on all informal source of library information, Professor respondents the second, Senior Professors respondents the third, Associate Professors the fourth, and Assistant Professors the last.

SUGGESTIONS

The following suggestions made by the researcher on the basis of analysis of the data suggestions received from the users. It is suggested that the following suggestions will be helpful for the libraries, librarians and the users of the engineering colleges libraries to use its resources to be maximum extent. It will also help the user for conducting research.

- First all
- departments should have to create the digital library. If it is already having in these facilities, it should be updating the latest technology.
- Arrangement should be made to provide more internet access facilities to the users in the library for e-mail, browsing internet, accessing e-journals, Web OPAC and accessing as in other libraries to resource sharing.
- An Orientation program should be conduct in every year in each library.
- It is suggested that new arrival of books and Journals should be displayed in separate rack.
- It is suggested that more Book Bank Books may be purchased.
- Library hour should be increase.

- Faculty and research scholars are exposed to the internet search technique and online information retrieval.

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Chapter 20

Determining the Electronic Information Access Visibility Among the Faculty Members in the Engineering and Technology Institutions

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ABSTRACT

The study analyses faculty members from 39 engineering institutions where electronic information was accessed for their teaching and research in Coimbatore District. The study observed results that 176 (33.8%) of them are Masters in Engineering, 89 (17.1%) of them have done M.Sc. Engineering, 46 (8.8%) of them have completed M. Tech, and 87 (16.8%) of the respondents are Ph.D. holders. The majority of the respondents, 221 (42.5%), are assistant professors/lecturers/senior lecturers. Two hundred fifty-one (48.3%) respondents rated that information sought from e-books are “excellent” while 205 (39.4%) of the respondents rated them as “very good.” Two hundred eighty (53.8%) respondents “agree” that electronic journals save the time of the user while 219 (42.1%) of the respondents “strongly agree.” A miniscule number, 21 (4.0%), respondents “disagree.”

INTRODUCTION

The Research and Development in the field of Computers, Networking, Communication Technologies and Internet, in short it me called as Information and Communication Technologies (ICT). The adoption of these technologies has made the publishers as well as the librarians to provide faster, effective and

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efficient services to their patrons. Because of the fast pace of research all over the world, the contents in the traditional printed materials such as books and journals become redundant by the time they reach the scholars/patrons for use. This also prompted to adopt e-resources in libraries. Increase in the formation of new subjects impelled for producing more and more literature in all fields at an incredible rate and the users demand for fast access to such information anytime and from anywhere.

UGC: INFONET DIGITAL LIBRARY CONSORTIUM

The exorbitant subscription cost of e-journals makes it difficult even for the well-off universities/research institutions in India to afford. This caused the universities/research institutes to lag behind in this competitive world. At this time, emerged the INFLIBNET centre at Ahmedabad, the UGC – INFONET Digital Library Consortium. It was started in 2002. Since first April 2010 this has been renamed as UGC to interlink all the universities in the country with state-of-art technology. The main purpose of this is to provide full-text access to e-resources, e-databases and open access resources of various publishers that contain scholarly articles. Another primary objective of UGC is to develop interaction and cooperation among universities in India. There are more than 5000 e-journals published by about 24 publishers. In India, about 200 universities and 12 central universities have been covered under this programme and among them six universities are from Karnataka alone. The universities that come under this consortium can share the information, co-operate and co-ordinate amongst one another. The Restricted, Remote, Resource Access (R3) is a facility which is availed by the teaching fraternity. Here, the teachers can access the e-journals provided under “UGC-INFONET Digital Library Consortium” outside their campus. A separate software CD is given by the institution, which they can install in their home desktop or laptop. They can access these e-journals by just entering the User ID and Password.

REVIEW OF LITERATURE

Ferdig and Trammel(2004) argue that the immediacy and commentary based systems of blogging lead to reflection and analysis and contextualisation of learning via hyperlinks. They further contend that blogs are more successful in promoting interactivity that is conversational as opposed to other online discussion. Research also suggests that blogs allow a more creative response from students (Oravec, 2005) and that the open and interlinked nature of blogs connects learners to contexts beyond the classroom (Baim, 2004).The term MOOC has been around since 2008, but the concept began to generate significant media attention and debate in 2012 with the launch of MOOCs offered by or in association with prestigious US institutions through providers such as EdX, Coursera, and Udacity. In response to widespread media attention and debate, uptake of MOOCs has since spread globally. Coursera and EdX have partnered with elite institutions in Europe, Asia, and Australasia, and new MOOC platforms have been developed including Future Learn in the UK, OpenupEd, and iVersity in Europe and Open2Study in Australia. Joseph Jestin and Ally Sornam (2016) revealed that the use of e-resources in this era of information technology supports teaching, learning and research activities. It examines the faculty usage of E-Resources in Kerala Engineering Colleges and the usage of e-resources by the faculty members of engineering colleges in Kerala. Baskaran (2011) discussed user much more interest on using Internet

for accessing scientific information in which global level publications. This study reveals that faculty of science respondents secured maximum level due to keen search and obtained information by scientific journals and electronic publications. The maximum number of users are visited the library for preparing seminars, conferences and assignments. The Internet users prefer Yahoo search engine and Google is next position in this study.

Borrego and Anglada (2016) described how the transition from print to electronic scholarly communication has affected faculty's information behaviour and their perception of academic libraries. Journal articles are the most relevant information resource used for research and teaching purposes. Sohail and Ahmad (2017) examined that the effectiveness of electronic resources and services in select campuses of Fiji National University Library on the basis of users' satisfaction is evaluated. A survey method was employed to conduct this research. Ratanya (2017) revealed that majority of the academic staff at the Egerton University are still not aware of the existence of the IR. Staff also faced challenges in accessing and using the content available. Lladós-Masllorens et al. (2017) have revealed that a combination of personal and contextual factors such as cultural, social and subjective factors affects the use of Wikipedia as a tool for faculty in higher education institutions. Faculty perceptions and attitudes in two large Spanish universities were analysed. Baskaran (2018) described Distance education is the most renowned descriptor used when referencing distance learning. It often describes the effort of providing access to learning for those who are geographically distant. During the last two decades, the relevant literature shows that various authors and researchers use inconsistent definitions of distance education and distance learning. As computers became involved in the delivery of education, a proposed definition identifies the delivery of instructional materials, using both print and electronic media. Baskaran and Ramesh (2019) analysed that 76% of the respondents are male and 26% of them are female observed from the study. 31 (6%) respondents have completed Arts, Science and Management studies graduates by the faculty members, 91 (17.5%) have completed graduation in Engineering. highest number of respondents that about 409 6(33%) makes this sources for use of e-journals among the respondents. maximum number of 251 (48.3%) respondents rated that information sought from e-books are "Excellent." large number of 280 (53.8%) respondents "Agree" that electronic journals save the time of the user. majority of 337 (64.8%) of the respondents "Agree" that e-resources are help them to keep abreast of knowledge. Binu and Baskaran (2019) examined out of 421 respondents, 220 (52.3%) of them belong to Research scholar. majority of respondents 109 (25.9%) are post graduates and 75 (17.8%) are having PG with NET qualification. Mean value for 'To borrow books' was 3.86 and assigned the rank one. Majority of respondents 416 (98.8%) are searching for educational and research Information. The findings of the study could identify the various parameters while access Electronic resources by the academic community. The study would helpful to bring to access Electronic Information for momentum of gain research and academic ideas among the users. Prasad and Baskaran (2019) analysed that Out of 380 respondents, the male respondents are found 263(69.21%), the Ph.D. qualified respondents are found 285(75%). it is found that Madurai Kamaraj University and Alagappa University have respondents of each 130 (34.21%). it is found that all 380 (100%) respondents are aware of E-Resources available in the University Library. it is seen that 181 (47.66%) respondents are accessing the scholarly information via E-Resources on daily basis, 109 (28.68%) respondents are using once in two days.

OBJECTIVES OF THE STUDY

1. To find out the Qualification wise and designation wise Distribution of Respondents
2. To observe the Awareness of Electronic Resources among the respondents in the selected Institutions
3. To find out and access the types of Electronic Resources in the selected Institutions
4. To observe the Place of Access of Information/Electronic Resources in the selected Institutions
5. To examine the Level of Satisfaction in Using Electronic Resources and Seeking information through Various E-Resources

METHODOLOGY

The study was undertaken among the faculty members among the Engineering and Technology Institutions in Coimbatore District, Tamilnadu. There were distributed 550 questionnaires to the respondents and 520 filled data in the questionnaire received back from the respondents. Descriptive method is used in this research, because it utilizes scoring of the variables. The data collected from 39 engineering institutions contain quantitative data. Therefore, this investigation makes use of quantitative techniques for the analysis of data. Data analysis was carried out with the help of Statistical Package for Social Sciences (SPSS) for windows. In order to explain and summarize the properties of the mass of data collected from the respondents, descriptive statistics was used. Parametric statistics like chi-square test were used for comparison of the factors considered between different levels of variables.

ANALYSIS AND INTERPRETATIONS

The result of study drawn based on data analysed for the study among the faculty members accessing the Electronic Information among Engineering and Technology Institutions in Coimbatore District of Tamilnadu.

Table 1. Qualification wise distribution of respondents

Sl.No	Qualification	Frequency	%
1	M.A/M.Sc./MBA	31	6
2	BE and B Tech	91	17.5
3	ME	176	33.8
4	M.Sc. (Eng.)	89	17.1
5	M.Tech	46	8.8
6	Ph.D.	87	16.8
Total		520	100

QUALIFICATION-WISE DISTRIBUTION OF RESPONDENTS

Table 1 reveals qualification wise distribution of the respondents. It is understood that out of 520 respondents, 31 (6%) respondents have completed arts, science and management studies, 91 (17.5%) have completed graduation in engineering, 176 (33.8%) of them are masters in engineering, 89 (17.1%) of them have done M.Sc. Engineering, 46 (8.8%) of them have completed M. Tech and 87 (16.8%) of the respondents are Ph.D. holders. The study reinstates from fig. 1, the fact that majority of the respondents are post graduates in engineering.

DESIGNATION WISE DISTRIBUTION OF RESPONDENTS

Table 2 shows the designation wise distribution of the respondents in engineering institution. It indicates that majority of the respondents 221 (42.5%) are assistant professors/ lecturers/senior lecturers, and 195 (37.5%) of them are associate professors followed by 104 (20%) of the respondents are professors (fig.2).

AWARENESS OF ELECTRONIC RESOURCES

It is interesting to note fig. 2 that 492 (94.6%) of the respondents are quite aware of available electronic resources in the library whereas only 27 (5.4%) of them lack awareness.

Figure 1. Qualification wise distribution of respondents

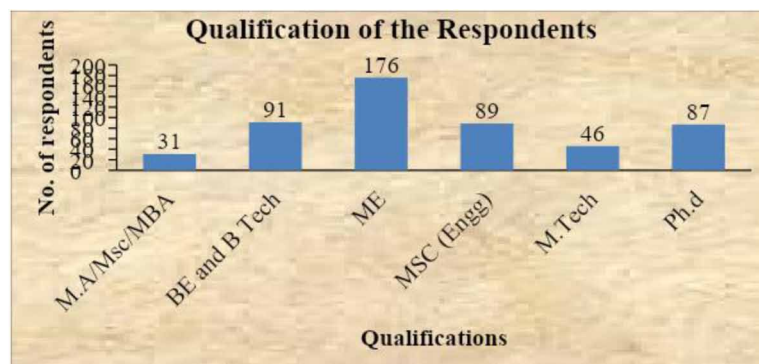


Table 2. Designation wise distribution of respondents

Sl.No	Designation	Frequency	%
1	Asst.Professor/Lecturer/Sr.Lecturer	221	42.5
2	Associate professor	104	20
3	Professor	195	37.5
Total		520	100

Determining the Electronic Information Access Visibility Among the Faculty Members

Figure 2. Designation wise distributions of respondents

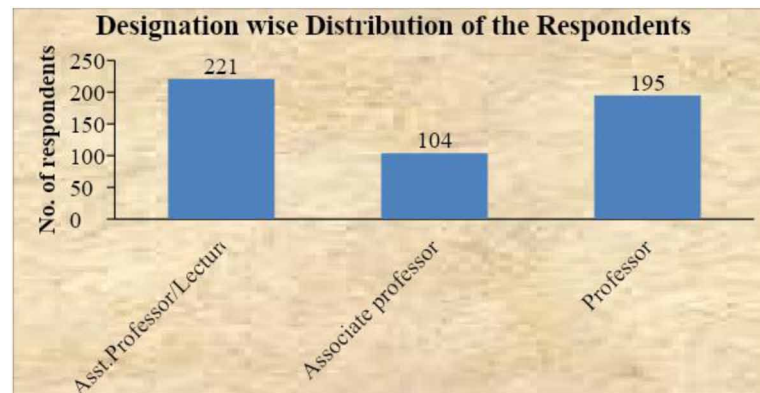
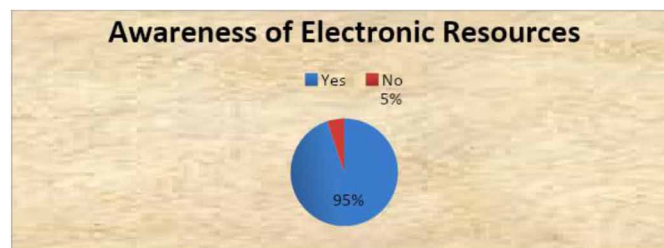


Figure 3. Awareness of electronic resources



TYPES OF ELECTRONIC RESOURCES

Table 3 shows that the highest number of respondents that is 409 (33%) makes use of e-journals. E-books are widely used by 331 (26.7%) of the respondents followed by the use of e-magazines by 182 (14.7%) respondents. The use of CD/DVD/E-databases is acknowledged by 162 (13.1%) of them which is closely followed by 154 (12.4%) of the respondents who use OPAC

PLACE OF ACCESS OF INFORMATION/ELECTRONIC RESOURCES

Table 4 shows that the 520 faculty members were asked to furnish details as to their place of access of e-resources, and interestingly the highest number of respondents 434 (53.8%) admitted that the institution library was an ideal choice. Around 122 (15.1%) of them gain access to e-resources at home, while 166 (20.6%) of them prefer to use their departments. On the contrary, 17 (2.1%) and 68 (8.4%) of the respondents use cybercafés and computer centres respectively.

Determining the Electronic Information Access Visibility Among the Faculty Members

Table 3. Types of electronic resources

Sl. No	Electronic Resources	Frequencies	%
1	E-journals	409	33.00%
2	E-books	331	26.70%
3	E-magazines	182	14.70%
4	CD/DVD/E-databases	162	13.10%
5	OPAC	154	12.40%
Total		1238	100.00%

Table 4. Place of access of information/electronic resources

Sl.No	Place	Frequency	%
1	Home	122	15.10%
2	Institution Library	434	53.80%
3	Department	166	20.60%
4	Cyber café	17	2.10%
5	Computer centre	68	8.40%
Total		807	100.00%

Table 5. Level of satisfaction in using electronic resources

Sl.No	Electronic Resources	Highly Satisfied	Satisfied	Less Satisfied	Not Satisfied	No Comments	Total
1.	Lecturing materials	263 (50.6)	257 (49.4)	00	00	00	520 (100)
2.	Publishing paper in journals	291 (56.0)	229 (44.0)	00	00	00	520 (100)
3.	Preparing articles for seminar/conference	194 (37.3)	326 (62.7)	00	00	00	520 (100)
4	Research and development	20 (3.8)	448 (86.2)	00	00	52 (10.0)	520 (100)
5.	Project works	143 (27.5)	290 (55.8)	46 (8.8)	00	47 (7.9)	520 (100)
6.	Writing of books	69 (13.3)	274 (52.7)	93 (17.9)	00	84 (15.8)	520 (100)
7.	Exchanging of ideas	223 (42.9)	174 (33.5)	41 (7.9)	00	82 (15.8)	520 (100)

LEVEL OF SATISFACTION IN USING ELECTRONIC RESOURCES

Lecturing Materials

The data shows that a large number of 263 (50.6%) of the respondents are “Highly Satisfied” with the lecturing materials followed by 257 (49.4%) of the respondents “Satisfied” with e-resources offering lecturing materials.

Publishing Paper in Journals

The data indicates that a maximum number of 291 (56.0%) of the respondents are “Highly Satisfied” in publishing paper in journals as against 229 (40.0%) of the respondents who are “Satisfied”.

Preparing Articles for Seminars/Conferences

The data reveals that a large number of respondents 326 (62.7%) are “Satisfied” in preparing articles for seminar/conference as against 194 (37.3%) of the respondent who are “Highly Satisfied”.

Research and Development

The interpreted data indicated that a large number of respondents 448 (86.2%) are “Satisfied” in research and development as against 52 (10.0%) of the respondents stating “No comments” followed by 20 respondents (3.8%) who expressed that they are “Highly Satisfied” in research and development.

Project Work

The data explicates that a maximum number of respondents 290 (55.8%) are “Satisfied” in project work, 143 (27.5%) of the respondents are “Highly satisfied” 46 (8.8%) of the respondents are “Less satisfied” and 47 (7.9%) of the respondents have “No Comments”.

Writing Books

The data explains that a large number of respondents 274 (52.7%) are “Satisfied” in writing books as against 93 (17.9%) of the respondents are “Less Satisfied”, 84 (16.2%) of the respondents stating “No Comments” and 69 (13.3%) of the respondents are “Highly Satisfied” in writing books.

Exchange of Ideas

The data shows that majority of the respondents 223 (42.9%) are “Highly Satisfied” in exchanging ideas as against 174 (33.9%) of the respondents who are “Satisfied”, 82 (15.8%) of the respondents have “No Comments” and 41 (7.9%) of the respondents are “Less Satisfied” in exchanging ideas.

Table 6. Level of satisfaction in using search engines

Sl.No	Search Engines	Highly Satisfied	Satisfied	Less Satisfied	Not Satisfied	No Comment	
1.	Google	406 (78.1)	114 (21.9)	00	00	00	520 (100)
2.	Yahoo	180 (34.6)	329 (63.3)	11 (2.1)	00	00	520 (100)
3.	Alta Vista	112 (21.5)	9 (1.7)	165 (31.7)	117 (22.5)	117 (22.5)	520 (100)
4.	Bink	112 (21.5)	00	41 (7.9)	60 (11.5)	307 (59.0)	520 (100)
5.	Ask	92 (17.7)	84 (16.2)	274 (52.7)	00	70 (13.5)	520 (100)
6.	MyWebSearch	112 (21.5)	176 (33.8)	171 (32.9)	00	61 (11.7)	520 (100)
7.	Dog pile	112 (21.5)	00	00	21 (4.0)	387 (74.4)	520 (100)
8.	Others	71 (13.7)	52 (10.0)	00	21 (4.0)	376 (72.3)	520 (100)

LEVEL OF SATISFACTION IN USING SEARCH ENGINES

Google

The data shows that a large number of 406 (78.1%) respondents are “Highly satisfied” in using Google as their search engine while 114 (21.9%) of the respondents are “satisfied”.

Yahoo

The data explains that a majority of 329 (63.3%) respondents are “Satisfied” in using Yahoo as against 180 (34.6) of the respondents who are “Highly Satisfied”. A minority 11 (2.1%) respondents are “less satisfied” in the using Yahoo search engines.

Alta Vista

The data reveals that a large number of 165 (31.7%) respondents are “Less Satisfied” as against 117 (22.5%) of the respondents are “Not Satisfied” and opted “No Comment”. It has also been noticed that 112 (21.5%) of the respondents are “Highly Satisfied” followed by 9 (1.7%) respondents who are “Satisfied”.

Bink

The data expounds that as many as 307 (59.0%) respondents opted “No Comment” as against 112 (21.5%) of the respondents who are “Highly Satisfied”. It has also been observed that 60 (11.5%) of the respondents are “Not Satisfied” followed by 41 (7.9%) of the respondents who are “Less Satisfied”.

Ask

The data shows that a large number of 274 (52.7%) of the respondents are “Less Satisfied” as against 92 (17.7%) of the respondents who are “Highly Satisfied” with Ask. It has also been noticed that 84 (16.2%) of the respondents are “Satisfied” followed by 70 (13.5%) of the respondents who opted “No Comment”

MyWeb Search

The data elucidates that as many as 176 (33.8%) of the respondents are “Satisfied” in using MyWeb-Search and almost an equal number of 171 (32.9%) respondents are “Less Satisfied”. There are 112 (21.5%) of the respondents who are ‘Highly Satisfied’ followed by 61 (71.7%) of the respondents who opted “No Comment”

Dog Pile

The data interpretation reveals that most of the respondents 387 (74.4%) opted “No Comment”. On the other hand, 112 (21.5%) of the respondents are “Highly Satisfied” followed by 21 (4.0%) of the respondents are ‘Not Satisfied’.

Others

The data shows that most of the respondents 376 (72.3%) opted “No Comment” as against 71 (13.7%) respondents who expressed “Highly Satisfied”. Furthermore, 52 (10.0%) of the respondents are “Satisfied” followed by 21 (4.0%) of the respondents who are “Not Satisfied”.

Table 7. Seeking information through various e-resources

Sl.No	Resources	Excellent	Very Good	Good	Very Poor	Poor	Total
1.	Electronic books	251 (48.3)	205 (39.4)	64 (12.3)	00	00	520 (100)
2.	Electronic journals	281 (54.0)	207 (39.8)	32 (6.2)	00	00	520 (100)
3.	Electronic databases	191 (36.7)	247 (47.5)	61 (11.7)	21 (4.0)	00	520 (100)
4.	Electronic newsletter	144 (27.7)	171 (32.9)	98 (18.8)	21 (4.0)	86 (16.5)	520 (100)
5.	Other types of e-resources	62 (11.9)	161 (31.0)	160 (30.8)	21 (4.0)	116 (22.3)	520 (100)

SEEKING INFORMATION THROUGH VARIOUS E-RESOURCES

Electronic Books

The data illustrates that a maximum number of 251 (48.3%) respondents rated that information sought from e-books are “Excellent” while 205 (39.4%) of the respondents rated them as “Very Good” followed by 64 (12.3%) of the respondents who rated them as “Good”.

Electronic Journals

The data reveals that a large number of 281 (54.0%) respondents rated that the information sought from e-journals is “Excellent” closely followed by 207 (39.8%) who rated them as “Very Good” and 32 (6.2%) of the respondents rated them as “Good”.

Electronic Database

The data shows that a majority of 247 (47.5%) respondents rated that the information sought from e-databases are “Very Good” while 191 (36.7%) of the respondents rated them as “Excellent”. It has also been noticed that 61 (11.7%) of the respondents rated them as “Good” followed by 21 (4.0%) of the respondents who rated them as “Very Poor”.

Electronic Newsletter

The data tells that a maximum number 171 (32.9%) of the respondents rated that the information sought from electronic newsletters as “Very Good” while 144 (27.7%) of them rated that as “Excellent”. It has also been noticed that 98 (18.8%) of the respondents rated them as “Good”, 86 (16.5%) of the respondents as “Poor” followed by 21 (4.0%) of the respondents who rated them as “Very Poor”

Other Types of E-Resources

The data shows that a majority of 161 (31.0%) respondents rated that the information sought from other e-resources are “Very Good” while 160 (30.8%) of them rated that as “Good”, a very few number of 116 (22.3%) respondents rated them as “Poor” and 62 (11.9%) of the respondents rated them as “Excellent” and 21 (4.0%) of the respondents rated that as “very poor.”

USE OF ELECTRONIC JOURNALS IN COMPARISON TO PRINTED JOURNALS

Saves Time of the User

The data elucidates that a large number of 280 (53.8%) respondents “Agree” that electronic journals save the time of the user while 219 (42.1%) of the respondents “Strongly Agree”. A miniscule number of 21 (4.0%) respondents “Disagree”.

Determining the Electronic Information Access Visibility Among the Faculty Members

Table 8. Use of electronic journals in comparison to printed journals

Sl.No	Sources	Strongly Agree	Agree	Disagree	Strongly Disagree	No Comment	Total
1.	Save time of the user	219 (42.1)	280 (53.8)	00	21 (4.0)	00	520 (100)
2.	Get variety of information resources	115 (22.1)	345 (66.3)	60 (11.5)	00	00	520 (100)
3.	Get scholarly electronic information resources	338 (65.0)	122 (23.5)	60 (11.5)	00	00	520 (100)
4.	Better management of information Resource	108 (20.8)	401 (77.1)	11 (2.1)	00	00	520 (100)
5.	Get latest electronic information resources	209 (40.2)	284 (54.6)	27 (5.2)	00	00	520 (100)

Get Variety of Information Resources

The data reveals that a maximum number of 345 (66.3%) respondents “Agree” that they get a variety of information resources as against 115 (22.1%) of the respondents who “Strongly Agree” followed by 60 (11.5%) of the respondents have recorded “Disagree”.

Get Scholarly Electronic Information Resources

The data explicates that the majority of 338 (65.0%) respondents “Strongly Agree” that they get scholarly electronic information resources while 122 (23.5%) of the respondents “Agree” to that. On the other hand, 60 (11.5%) of the respondents have opted “Disagree”.

Better Management of Information Resources

The statistics indicate that a large number of 401 (77.1%) respondents “Agree” to better management of information resources as against 108 (20.8%) of the respondents who “Strongly Agree”. However, there are 11 (2.1%) respondents who “Disagree”.

Get latest Electronic Information Resources

The data depicts that as many as 284 (54.6%) of the respondents “Agree” that they get latest electronic information resources while a fair number of 209 (40.2%) of the respondents “Strongly Agree”. A small number of 27 (5.2%) respondents “Disagree”.

Table 9. Rate of uniqueness of e-resources

Sl.No	Uniqueness of E-Resources	Strongly Agree	Agree	Disagree	Strongly Disagree	No Comment	Total
1.	To keep abreast of knowledge	165 (31.7)	337 (64.8)	18 (3.5)	00	00	520 (100)
2.	To find the relevant information	171 (32.9)	349 (67.1)	00	00	00	520 (100)
3.	To obtain teaching and research information	228 (43.8)	292 (56.2)	00	00	00	520 (100)
4.	To enhance career development	219 (42.1)	301 (57.9)	00	00	00	520 (100)

RATE OF UNIQUENESS OF E-RESOURCES

To Keep Abreast of Knowledge

The data displays that a majority of 337 (64.8%) of the respondents “Agree” that e-resources help them to keep abreast of knowledge; nonetheless, 165 (31.7%) of the respondents “Strongly Agree”. On the contrary, 18 (3.5%) of the respondents stated that they “Disagree” to it.

To Find Relevant Information

The statistics indicate that a greater number of 349 (67.1%) respondents “Agree” that they are able to find relevant information and 171 (32.9%) of the respondents “Strongly Agree” to the same.

To Obtain Teaching and Research Information

The data exemplifies that a maximum number of 292 (56.2%) of the respondents “Agree” that they obtain teaching and research information from e-resources while a fairly proportionate number of 228 (43.8%) of the respondents “Strongly Agree” to the same.

To Enhance Career Development

The data shows that a major number of 301 (57.9%) respondents “Agree” that e-resources enhance their career development. Furthermore, 219 (42.1%) of the respondents stated that they “Strongly Agree” to it.

Determining the Electronic Information Access Visibility Among the Faculty Members

Table 10. Influence of e-resources on teaching and research efficiency

Sl.No	Influence of e-Resources	Very Large Extent	Large Extent	Some Extent	Less Extent	No Comments	Total
1.	Expedite teaching research process	225 (43.3)	286 (55.0)	9 (1.7)	00	00	520 (100)
2.	Research competence	293 (56.3)	182 (35.0)	45 (8.7)	00	00	520 (100)
3.	Up to date information	186 (35.8)	245 (47.1)	89 (17.1)	00	00	520 (100)
4.	Range of information	201 (38.7)	169 (32.5)	150 (28.8)	00	00	520 (100)
5.	Easier and faster access	171 (32.9)	304 (58.5)	45 (8.7)	00	00	520 (100)

INFLUENCE OF E-RESOURCES ON TEACHING AND RESEARCH EFFICIENCY

Expedite the Teaching and Research Process

The data indicates that a large number of 286 (55.0%) respondents acknowledged that e-resources expedite their teaching and research process and rated as “Large Extent” while 225 (43.3%) of the respondents rated as “Very Large Extent” followed by 9 (1.7%) of the respondents who rated as “Some Extent”.

Improve the Teaching and Research Competence

The data specifies that a large number of 293 (56.3%) respondents rated that e-resources improve their teaching and research competence to a “Very Large Extent”, 182 (35.0%) of the respondents rated as “Large Extent” and 45 (8.7%) of the respondents rated as “Some Extent”.

Access Current and up to Date Information

The data illustrates that a maximum number of 245 (47.1%) of the respondents stated that e-resources help to gain access to current and up-to-date information to a “Large Extent” while 186 (35.8%) of the respondents stated as “Very Large Extent” followed by 89 (17.1%) respondent who stated as “Some Extent”.

Access Wider Range of Information

The data implies that a large number of 201 (38.7%) respondents are rated as “Very Large Extent” to access wider range of information as against 169 (32.5%) of the respondents who rated as “Large Extent” followed by 150 (28.8%) of the respondents who rated as “Some Extent”.

Easier and Faster Access to Information

The data signifies that a maximum number of 304 (58.5%) respondent felt that e-resources help to gain easier and faster access to information and rated as “Large Extent” while a number of 171 (32.9) respondent rated as “Very Large Extent” followed by 45 (8.7%) of the respondents who rated as “Some Extent”.

FINDINGS

1. 176 (33.8%) of them are masters in engineering, 89 (17.1%) of them have done M.Sc. Engineering, 46 (8.8%) of them have completed M. Tech and 87 (16.8%) of the respondents are Ph.D. holders.
2. Majority of the respondents 221 (42.5%) are assistant professors/ lecturers/senior lecturers.
3. 409 (33%) makes use of e-journals. E-books are widely used by 331 (26.7%) of the respondents followed by the use of e-magazines by 182 (14.7%) respondents.
4. 434 (53.8%) admitted that the institution library was an ideal choice. Around 122 (15.1%) of them gain access to e-resources at home, while 166 (20.6%) of them prefer to use their departments.
5. Large number of 263 (50.6%) of the respondents are “Highly Satisfied” with the lecturing materials followed by 257 (49.4%) of the respondents “Satisfied” with e-resources offering lecturing materials.
6. The data shows that a large number of 406 (78.1%) respondents are “Highly satisfied” in using Google as their search engine while 114 (21.9%) of the respondents are “satisfied”.
7. 251 (48.3%) respondents rated that information sought from e-books are “Excellent” while 205 (39.4%) of the respondents rated them as “Very Good”.
8. 280 (53.8%) respondents “Agree” that electronic journals save the time of the user while 219 (42.1%) of the respondents “Strongly Agree”. A miniscule number of 21 (4.0%) respondents “Disagree”.
9. Majority of 337 (64.8%) of the respondents “Agree” that e-resources help them to keep abreast of knowledge; nonetheless, 165 (31.7%) of the respondents “Strongly Agree”.
10. Large number of 286 (55.0%) respondents acknowledged that e-resources expedite their teaching and research process and rated as “Large Extent” while 225 (43.3%) of the respondents rated as “Very Large Extent.”

CONCLUSION

Drastic developments in the technology innovation of Teaching and learning process in Engineering and Technology institutions environment. The teachers have to be known the update their information of their subject for their Teaching and Research. The Government of India invests more funds to provide the facilities in terms of build the Infrastructure under various innovative schemes and projects. The AICTE provide the funds to subscribe the e-collection to the Engineering Institutions in India. The teaching must encourage the students to access the electronic information regularly and get the new academic and research ideas for them career development. The Librarian can give the awareness programme about access the electronic Information. Students need to be accustomed to know about the electronic information available in the Institutions.

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Section 5

Miscellaneous Studies

Chapter 21

Cultural Factors Affecting Information–Seeking Behaviour: Case Study of GCC Universities

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ABSTRACT

This chapter investigates the cultural effects on information seeking behaviour in the Gulf Cooperation Council (GCC) universities. The region's unique conservative and collectivist culture played a great role in students' information seeking behaviour. The study was based on Hofstede's cultural concepts of collectivism versus individualism and power distance. It includes also Hall's concept of time cultural dimension. These concepts are measured by information needs, query formulation, task execution, and interacting with systems. It was found that culture has significant effects on students' information needs, query formulation, task execution, and interacting with systems. Undergraduates are more affected by culture, while graduates and postgraduates showed little impact. Cultural impacts on information seeking activities are valuable in adopting new technologies in the libraries, which should culturally be acceptable for better acceptance, utilisation, and implementation. It is culture that hinders people from using some browsers, interfaces, and even databases.

INTRODUCTION

Information-seeking is primarily triggered by how students behave in fulfilling their needs, is a fundamental question in this part of the study. Probably, people seek information to broaden their understanding in the field and keeping themselves abreast of new development in this rapid information development world. The increase in web-based information accessible via the internet has affected information-seeking behaviour among students, faculty, researchers and even ordinary people in the Gulf States¹. Numerous types of information, as well as abundance search engines in different locations, are available in one place and on one platform (Fidel et al., 1999).

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Today, where the types of information and media along with the language which presents them have become diverse and manifold, offering the users limitless options of information they need. Researchers of either gender are concerned with gathering current information and data to meet their requirements of fulfilling research projects. Information-seeking is an essential activity carried out by everyone and revealed through behaviours (Wilson, 2000). The Gulf States' governments recognise the critical role of information and communication technology (ICT) in social development. The strategic plans emphasise the road map long-term vision of events. These strategic plans aimed to transform the individual country into an information society, building a knowledge economy, curbing the digital divide through the utilisation of ICT infrastructure, and providing information services to the local community.

Few studies are dealing with gender differences in information-seeking behaviour. For Wilson (1997), gender is one of the intervening variables in information-seeking behaviour. Conservative culture has a direct impact on GCC students' various aspects of their lives, including conducting academic research and search for information to complete assignments, etc. For instance, Oshan (2007) insisted that women in the Gulf should be modest, respectful, and seldom engage in social interaction with men or discuss sensitive topics such as politics or health. These cultural norms are predicted to affect both male and female students' information-seeking behaviour and the use of information technology in their studies. It is assumed that females particularly, prefer offline sources of information such as asking family, friend, or instructor when coming to specific personal information, need to comply with cultural norms and values. This study seeks to understand how the collectivist culture of Gulf Cooperation Council countries' academic libraries have affected students' information-seeking behaviour in the region as well as how technology contributes to modifying the perception of information-seeking processes. The study includes cultural dimensions set by Hofstede (1997) collectivism versus individualism and power distance. While on the other hand, it consists of the one cultural dimension by Hall (1976) time dimension.

BACKGROUND

There are relative, few studies dealing with gender-specific differences in information-seeking behaviour. These differences were found in topics such as task execution, interacting with systems, and query formulation. Some studies suggested that due to the socio-cultural background of gender, women may be prone to computer anxiety and feelings of low self-efficacy (Wilson, 1997). Gender differences have also been found in the internet information search and use among students investigated by Dubi and Rutsch (1998). Authors observed that female students lacked self-confidence; they behaved with less certainty than male students in the Internet search. Female students felt less competent in dealing with search engines, more often needed assistance and described the system as very complicated to use. The survey by Xie, Bao, and Morais (2006) on gender differences in tourist information search behaviour of Yellow Mountain and Guilin in China. Authors reported that gender is a factor influencing information-seeking behaviour and process. Authors observed that characterisation of men and women as reasons for different activities in seeking information. Men were self-centred, self-confident, and choosy while the female was less self-confident, comprehensive searchers as well as uncertain with their search results. This behaviour is the reason that women's searches are considered as stereo-type and mostly considered complicated.

According to Whitmire (2003) in a study on gender differences in the purchase of presents, reported that there were significant differences between men and women. They observed that women tended to make an extensive and comprehensive analysis of existing information and searched multiple sources to

reach desired results. On the contrary, men behaved less interested in doing detailed searches. In several gender studies on information-seeking behaviour mainly on students and instructors have been found that men had high average fascinating durations on web search than women (Steinerova, & Susol, 2007), and Lippincott, 2005,). The literature showed that the people of the same culture provide different results in behaviour due to culture. Some researchers consider that gender has a moderating influence on some factors that affect information-seeking behaviour (Urquhart & Yeoman, 2010). According to studies presented earlier, clearly show that women's characteristics have significant effects on their information-seeking behaviour as characterised as complicated, extensive, and stereotypes. Gender differences in information-seeking behaviour are attributed to culture. As mostly, females are more conservatives in their culture than males.

According to Muomen, Morris & Maynard, factors affecting information-seeking behaviour of graduates were found to be environmental and organisational issues, awareness of sources availability, and information literacy. According to Hassan (2017) the emergence of social forums that support the creation of information sharing across the groups and organisations. Students are gathering information from different sources including unevaluated sources of knowledge. Unable to evaluate social forums such as twitter etc. It is from these social forums that collectivist culture slightly deviated learning from elders no longer flowed and instead friends, colleagues and so on came in to teach a person of different culture and society.

ARAB CULTURE AND VALUE

Various cultures exist in the world, which has a wide range of similarities and differences. Culture of any country usually, reflects the people's lifestyle, attitudes, beliefs, norms, traditions, and the way they act in response to the situation. There are various definitions of culture which report different understanding of an individual's actions in the mirror of culture. In this study, the UNESCO (2002) definition of culture is considered as fundamental. The UNESCO defined culture as follows: "culture is a set of distinctive spiritual, material, intellectual and emotional features of society or social group, and it encompasses in addition to art, literature, lifestyle, ways of living together, value systems, traditions, and beliefs...". Traditionally, it had been argued that definitions of culture are dynamic and concluded that culture consists of different aspects that are shared by the group. And that culture acts as an interpretive structure of behaviour (Dahl, 2004). One of the most important developments of the society is the creation of the language. It would be correct to say that language has grown along with people, and it has been perceived as an identity in society. Two standard dimensions of culture identified by Hofstede (1997) collectivism versus individualism is measured in this study. One classic dimension by Hall (1976) is measured in this study too.

One of the most critical aspects of Arab culture is religion and eventually is Islam, which dominates mostly the Arab culture (Kalliny & Gentry, 2007). Islam is considered the factor that not only has shaped Arab culture but generally has shaped Islamic countries' culture. Arabic language, social life, and traditions are rooted too within Islam, which is a complete way of life (Kavoossi, 2000). Islam strengthens specific characteristics of the Arab culture such as honesty, loyalty, flexibility, and trust (Ali & Wahabi, 1995). The Arab culture has its description, which differs from the Western culture Dadfar, 1990; Sabri, 1997). Arabs are more traditional and oriented to their past (Kalliny & Gentry, 2007; Hofstede, 2001). Family structure in the Gulf States is mostly compatible with tribal lineage (Munajjed, 1997).

Culture accompanies the presence of human communities in the regions, villages, towns, or countries. In this case, there are no two cultures that are the same in all aspects. It is made of several elements, such as language, symbols, traditions, norms, and values in which this combination form people's unique culture. Weir (1993) emphasised the unique characteristics of the Arab culture and identified it as a fourth paradigm. The paradigm that represents the management practice in the Arab countries besides the three most well-known paradigms American, European, and Japanese cultural paradigms. He observed that the components of this paradigm are rooted in the Islamic, social, and political life of the Arab countries. However, the main problem in researching Arab culture is the question of whether to deal with all Arab countries as one unit or separately. In this study, all Arab states should be treated as one entity, and some generalisation can be inclusive in this case. Because of the dramatic opening of the Gulf Cooperation Council countries society to the world and globalisation, almost all countries are becoming more economically, politically, and culturally interdependent.

CULTURE AND INFORMATION-SEEKING BEHAVIOUR

Islam is part of Muslim life and is practiced daily by every Muslim. It is a universal religion in Arab countries that comprises the life of individuals, societies, and even the state. Islam strengthens specific characteristics of the Arab culture such as honesty, loyalty, flexibility, and trust (Ali & Wahabi, 1995). Therefore, the Islamic system is based on participation, diffusion of knowledge, creativity, equal opportunities, and consultation. In this case, Arab culture has its description which differs from Western culture mainly because of the religion. It is essential to understand the role that culture plays in the social structure. The Western cultures are associated with an analytic and low-context cognitive pattern, as well as individualism. While the Eastern cultures are associated with a holistic, high-context cognitive pattern, as well as interdependence and collectivist social orientation (Vanum, 2010). Students in the Gulf States are grown up to be modest, shy, and respectful. They should seldom engage in social interactions with unrelated males. Gender segregation is one of the most critical features that deeply influence all aspects of their social life, such as public transport, schools, banking, etc. Therefore, it expected to observe these differences in the student's information-seeking behaviour in the Gulf Cooperation Council (GCC) universities.

According to Case (2012, p. 5), "Information-seeking is a conscious effort to acquire information in response to a gap in knowledge." Recent researchers link information-seeking with knowledge pursuit (Marchionini, 1997; Zhu, Chen and Chern, 2011) considerably than learning knowledge by searching. The term "learning knowledge by searching" means that patrons acquire knowledge for sense-making or problem solving via seeking for information. Several studies examined information-seeking, and information sharing formal learning reported that participants in the age group between 21-30 were significantly positive in their attitude towards information communication technology use in information-seeking (Mills, Knezek and Khaddage, 2014). According to Jae-shin & Hichang (2011), in studying factors affecting the information-seeking behaviour of students. The authors observed that interpersonal social networks, in-out group distinctions, and individual cultural tendencies affect information exchange between groups significantly. However, individuals could not differentiate the quality of information from the sources, whether social networks or academic databases. In this case, there is a clear indication that information-seeking behaviour is activated by information needs and the accessibility of the information sources.

Cultural Factors Affecting Information-Seeking Behaviour

Many information needs are satisfied by sources that the University supplies. Moreover, information also depends on the interpersonal skills that the information seekers have created or organised by themselves. It relies as well on the interpersonal needs, culture (tendencies), and communication ability.

Studies have been examining information-seeking behaviour, and practices reported that sources reputation significantly influences information-seeking and sharing (Jae, [et al.]. And its social presence significantly attracts individual information seekers (Zimmer, 2011). It is also observed that information communication technology (ICT) has changed the way for information-seeking personally, nationally, and even internationally. New technological trends influence information-seeking behaviours in one way or the other. Researchers nowadays use different methods to keep them up to date as well as finding for information (Jamali & Nicholas, 2010). Till this moment, the core of information science remained the same; however, methods and tools for information-seeking continue to change drastically.

Most students in universities use the most straightforward search techniques to get information at the quickest. Their seeking behaviour seems to be influenced by search experience, computer and web experience, perceived self-efficacy and frequency of interacting with electronic sources and by specific personal characteristics (Malliari, Korobili & Zapounidou, 2011). Even Qureish, Jawad, and Khan (2008) stressed that among factors affecting students' behaviour are education and cultural backgrounds. It is found through the literature that several factors are changing the information-seeking behaviour of whether students, faculty, or researcher — societal factors, cultural factors, and of course, the environment. Culture, on its part, can shape the way queries (search terms) are crafted and placed in academic databases or search engines. It can also form the time that individuals spend to search for information on different sources of information. It can influence too, sources to use in executing the tasks. This habit indicates that through culture, society can raise the presence of specific search engines and academic databases that would be popular in certain countries or groups of countries while others got less importance and usage too.

OBJECTIVES OF STUDY

The specific objectives of the study are to investigate the dynamic of culture in shaping information-seeking behaviour of students in the Gulf States. To examine students' information needs and interactions with systems in information-seeking process.

Table 1. Factors affecting information-seeking behaviour

Social Networks	Search Experience
Self-efficacy in computer and web interaction	Cultural backgrounds
Surrounding environment	Information source design

METHODOLOGY

A quantitative approach is used in the study. A preliminary framework to look at the cultural effects on information-seeking behaviour by integrating main themes of information-seeking activities and then to compare them and contrast. A questionnaire was circulated to all students whether undergraduates or graduates.

DATA COLLECTION

An online survey was utilised to collect data from students enrolled in the respected six Gulf States universities. These are Sultan Qaboos University, the United Arab Emirates University, the University of Dubai, the University of Nizwa, the University of Sharjah and Zayed University. The findings presented in this study are based on the online survey conducted for six months. The questionnaire was lengthy to collect as much information as possible. All questions were direct and straight forward without any ambiguity. It was written in both languages, Arabic and English since the targeted students would feel free to respond in either language. Each question had between five and eleven items for information needs, query formulation, task execution, and interacting with systems. Those four information-seeking activities were measured in five Likert scale with the following presenters: strongly disagree (1), disagree (2), neutral (3), agree (4) and strongly agree (5). The reliability was done to test the internal and external strength of our questionnaire by using SPSS version 24 of 2016. Two items in every four information-seeking activities were omitted which brought about high Cronbach's Alpha's result of above >70.

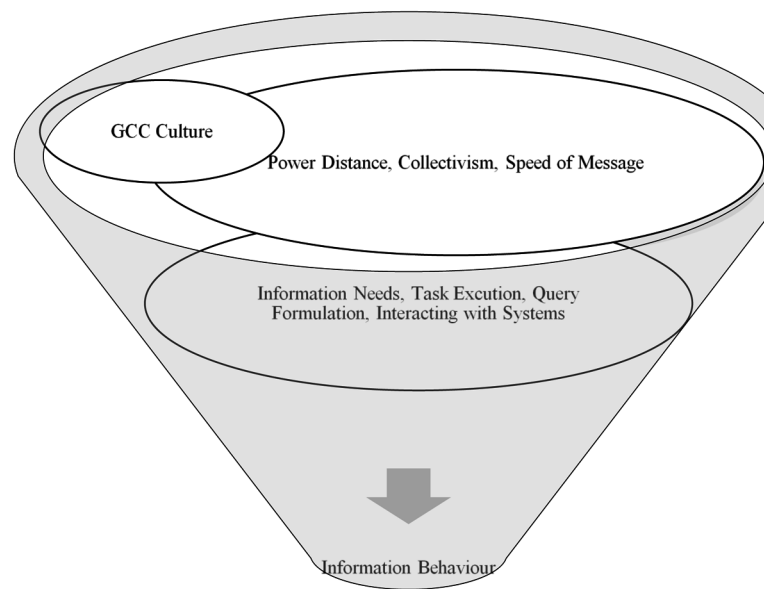
POPULATION SAMPLING

The population sample of this study consists of 2054 students enrolled in different programmes regardless of their levels of education. This study includes a bachelor's degree, Masters and PhD students from the University of Dubai, the University of Sharjah, the United Arab Emirates University and Zayed University on the part of the United Arab Emirates and Sultan Qaboos University along with the University of Nizwa on the part of Sultanate of Oman. The mean age of the participants of the online survey was 28.32 range between 18 and 45. The population consists of 92.5% (N = 1901) undergraduates, 4.3% (N = 89) Master and PhD 3.2% (N = 67), respectively. This population includes different specialisations available in the targeted university such as basic sciences, engineering, computer science, social sciences, health sciences, and medicine. Agriculture was registered only from the University of Nizwa university.

The following research questions guided this study:

- To what extent culture has an impact on students' information-seeking behaviour?
- To what extent four information-seeking activities have impacts on students' information-seeking behaviour?

Figure 1. Information model



FINDINGS

Collectivist Culture

In the course of finding the effects of culture on information-seeking behaviour, this section represents findings relevant to the research questions presented earlier. The descriptive statistics of multiple regression, as shown in Table 2, was conducted to investigate the cultural impacts of culture on information-seeking behaviour in Gulf universities. The single independent variable is measured with the dependent variables to understand the impacts of a single independent variable information-seeking behaviour. Therefore, the degree of variance was examined between collectivist culture and information-seeking activities, namely information needs, query formulation, task execution, and interacting with systems. The dependent variables, which are information needs, query formulation, task execution, and interacting with systems, were examined individually and collectively against the independent variable. Meanwhile, the factors were age, languages (Arabic, English, French, Spanish, Portuguese, and Russian), and level of study. The preliminary assumption testing was conducted to check for normality, linearity, univariate, and multivariate outliers and homogeneity of variance matrices. The findings explain that there was statistically significant indication that the collectivist culture has significant and positive effects on information needs (adjusted $R^2 = .521$, $SD = 0.003$, $p < 0.001$), query formulation (adjusted $R^2 = .708$, $SD \text{ error} = 0.025$, $p < 0.001$), task execution (adjusted $R^2 = .562$, $SD \text{ error} = 0.026$, $p < 0.001$) and interacting with systems ($R^2 = .685$, $SD \text{ error} = 0.030$, $p < 0.001$). According to Field (2013) When the results were considered separately, it indicated that the hypothesis that collectivist culture, has significant and positive impacts on students' information-seeking behaviour. All predictors can be explained by >50% of the variance. Therefore, by these results, the null hypothesis was rejected.

Table 2. Hierarchical regressions results of cultural effects on information-seeking behaviour

Predictors Constant	Coefficient (Std. Error)			
	Information Needs	Query Formulation	Task Execution	Interacting With Systems
Age	-0.058** (0.005)	-2.270*** (0.020)	-0.82** (0.024)	-0.123** (0.014)
Language use	0.128*** (0.002)	-0.161*** (0.009)	0.146*** (0.011)	-0.49***
Educational level	0.120** (0.003)	0.280*** (0.013)	0.228*** (0.015)	0.223*** (0.009)
Collectivism	-0.282*** (0.008)	0.339*** (0.025)	0.459*** (0.026)	-0.380*** (-0.030)
Power Distance	0.439*** (0.007)	0.012 (0.024)	0.006 (0.026)	-0.172*** (0.030)
Time cultural dimension	0.341*** (0.008)	0.260*** (0.024)	0.389*** (0.022)	-0.158*** (0.030)
R-Squared	.523	.728	.512	.686
Adjusted R-Squared	.521	.708	.562	.685
N =	2054	2054	2054	2054

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

The analysis showed significant impacts of language to four information-seeking activities, which could be understood that the language can affect all processes of students' information-seeking behaviour (Beta ranges between -0.49 and 0.128). Age also showed a significant impact on all four information-seeking activities (Beta ranges between -0.123 and -0.2.270). The analysis showed significant differences between students at different study levels. Subsequently, the ANOVA test was performed to examine three levels of study (i.e., undergraduates and graduates). The Bonferroni correlations showed that there are significant differences between undergraduates, graduates, and postgraduates in information-seeking behaviour.

Power Distance Culture

The power distance cultural dimension as an independent variable was measured by using multiple regression analysis to test whether power distance cultural dimension has any significant impact on dependent variables which are information needs, query formulation, task execution and interaction with systems. Meanwhile, the factor was age and language, which consists of Arabic, English, French, Portuguese, Spanish, and others. The results showed that two predictors could be explained by >33% of the variance (see Table 2). The power distance cultural dimension can impact the student's information needs by ($\beta = 0.339$, SD error = 0.007, $p = < 0.001$, and students' interaction with systems ($\beta = -0.170$, SD error 0.030, $p = < 0.001$). However, no significant impacts were found on query formulation and task execution with ($\beta = 0.012$ and 0.006), respectively. Therefore, it indicates that power distance culture can't influence students' behaviour on how to formulate the queries and execute the tasks assigned to a student of any level.

Language at far was found to have a positive impact on student's information needs, query formulation (in terms of vocabulary, and words chosen), and interactions with systems. These results can be interpreted that students are spending ample time searching for information to satisfy their information

needs. The reason for that is because in pre-university, the Arabic language dominantly used as the medium of instruction. While at the university level, the English language used as the medium of instruction in most of the specialisation except few. This surprise language shift (from Arabic to English), students are confronted with a massive amount of information in a language of their less experience to use, less vocabulary to understand and to perform a specific term search too in databases, etc.

Undergraduates spend more time to interact with systems compared to postgraduates who have already familiarised and gained experience with the English language, skills to use the academic databases and conducting searches at the university. They are rich in vocabulary and experienced quick access to the databases or specific webpages (sources of information) that easily satisfy their information needs. In this case, postgraduates spend less time to search for information.

Time Cultural Dimension

The time cultural dimension was measured using different types of scale variables. A chi-square test was performed to determine the dependence between time cultural dimension and students' interaction with systems. Measuring the freedom of relationship, a significant impact was found in the Pearson results, which were, $X^2 = 18,2105.183$, $p = <.001$. The findings indicate that the distribution of sources of time cultural dimension, a left side tailed symmetric were normal. This result also suggests that the means of the variables are relatively higher.

Multiple regression analysis (see Table 2) was conducted to examine whether the time cultural dimension has a significant and positive impact on students' information needs, query formulation, task execution, and interacting with systems. Meanwhile, the factor was languages (Arabic, English, French, etc.), level of study, and age. The results of the hierarchical regression, as shown Table 2, indicate that the four predicted variables could be explained by >24% of the variance. The results show that the information needs, query formulation, task execution, and interacting with systems based on time cultural dimension. It was found that time cultural dimension significantly predicts the information needs ($\beta = 0.241$, SD error 0.008, $p = <0.001$), query formulation ($\beta = -259$, SD error 0.024, $p = <.001$), task execution ($\beta = -289$, SD error = 0.026, $p = <.001$) and interacting with systems ($\beta = -0.158$, SD error = 0.030, $p = <.001$). These results mean that the hypotheses of a significant impact on information needs, query formulation, task execution, and interacting with systems are accurate and subsequently, the null hypothesis is rejected

Table 3. Time cultural dimension

Chi-Square Test			
	Value	df	Asymptotic Significance (2 Tailored)
Pearson Chi-square	2105.184 ^a	18	.000
N of valid cases	2054		
9 cells (30%) have expected count less than 5. The minimum expected count is .26			
Symmetric Measures			
		Value	Approximate Significance
Nominal by Nominal	Cramer's V	.724	.000
N of Value Cases		2054	

DISCUSSIONS

Collectivist Culture

Understanding elements of the information-seeking behaviour of participants are essential but is not an easy task. Regarding the first research question, the descriptive analysis revealed that participants have a high level of conservative culture with its values and norms. It was hypothesised that culture has direct impacts on students' information-seeking behaviour. The results showed that students in GCC would prefer to work collectively in their studies and research practices. Subsequently, collectivist culture has a high impact on the information needs of students regardless of the level of education. Considering the diversity of GCC demography, the culture remained untouched, and it affects their approaches to research needs and sources of information selection. The study suggests that students have collective and collaborative approaches to perform a search in databases, commercial search engines, and even blogs or social networks.

These results maintain the Hofstede (2011) definition that "Culture is the collective programming of the mind that distinguishes the members of one group or category of peoples from others ... p.3." Considering Hofstede's definition, the descriptive analysis revealed that students in GCC observe their social rules, values, and norms, even if they are doing academic research. Undergraduate students rely mainly on family members' feedback while intending to interact with systems. Gradually they prefer to share, seeking information from others before initiating a search (formulate the query). This dependent is part of the collectivist culture, which insists on collaboration with all members of the family, tribe, or even community. It is a feeling that students are obliged to learn from elders, and then turn to knowledgeable people around them at the university level. Amid their studies, students are no longer shying too much to ask a question or speak in-front of unrelated people. Hence, they start to rely on knowledgeable people (faculty members) and librarians 81% and 63% respectively, as stated by students on their dependence on family members' feedback for academic endeavours. This hierarchical pattern of information-seeking is not an isolated incident; it seems to be constructed by the cultural bounds of the society.

Convincingly, students were inclined to use a limited number of databases and commercial search engines as few as three and were not ready to try unknown or unpopular databases or search engines in the society in part of preserving community cultural boundaries. If we look at the power (Government), there are no restrictions to access any academic databases or search engines. Nothing can restrain users from using more databases or search engines except their own conservative culture. Undergraduates are culturally bound to use academic databases and gradually shift to selected search engines (mostly popular ranked by the community) and lastly use specific webpages in information-seeking. This behaviour is administered by power distance culture that hierarchy in learning is mostly from senior to junior.

Ethics is an influential factor of culture, and students in the Gulf States showed that they are very selective about sources of information. There is an indication that culture has a dominant influence on their values and ethics, which contributes significantly to their information-seeking behaviour. It was observed that in each of the six universities, different databases, search engines, and social networks were ranked differently. For instance, in the University of Dubai, ProQuest was ranked first and preferred the database to use, but the case is different in the University of Sharjah, where the Science Direct has rated the first choice for searching. The same can be said between the Sultan Qaboos University and the University of Nizwa in the Sultanate of Oman. In the Sultan Qaboos University, students ranked EB-

SCO as their first database and at the University of Nizwa ranked Science Direct. It has been seen that universities of the same country differed in ranking the databases while those apart related. This could also be affected by the specialisations which the university offers and sources coverage.

Students generally regardless of their level of study, rely on simple search engines such as Google, Internet Edge, and Yahoo to search for what they need and have feelings that specific webpages are very complicated and time-consuming as also revealed by (Daghleis & Hall, 2000; Drabenstott, 2003). The students acquire information from a database or specialised webpages upon the advice of family members before engaging with faculty, supervisors at higher levels of their studies. These results fit the phenomenon discussed by Hofstede (2011) that children learn from their elders in the collectivist community. Student's searching pattern is starting by seeking advice from family members before turning to knowledgeable persons and then end up seeking help from colleagues who are doing research together or sharing a level of studies such as Masters' and PhD level. The last person to be consulted in this pattern is librarian, whose role changed from information provider to information guide.

Interestingly, graduates at PhD level (100%) are searching for information through specialised webpages and few graduates at masters' degrees are tending to use those webpages as much as 42%. Few undergraduate students stated that they use specialised webpages. This result might indicate that graduates are still in transition from the collectivist culture to the individualist self-reliance. On the other hand, undergraduates 49% stated that they placed general queries in commercial search engines. The possible explanation for this behaviour might be, that they perceive specific webpages are very complicated and confusing for extracting information. It seems that students culturally are shying away from revealing that they are not familiar with sources of information. At the same time, they are feeling ashamed to show their inferiority (which is not actually) in front of a stranger (librarian or colleague). Therefore, they opt for the simplest way of getting information through search engines, which is likely to spend more time to find the scholarly needed information or peer-reviewed piece of article or even to get an authentic piece of information. For women mainly, doing research is always considered complex; they are curious about how to do things that produce the expected results. They are embarrassed when they fail to do research works, or their attempts lead to failure. The women's norm of dependence on others for getting information or seeking help is not inferiority at all, but it is their culture that pushes them to perform perfect things and reduce embarrassing situations. This habit might be the reason that 70% of women stated that they start searching for information by working on their own, and 50% start by consulting librarians.

During information-seeking, students think and feel that dependence on faculty, family members, and colleagues have a limit, and eventually, they need to understand how to do things as per the collectivist culture of their respective countries. Therefore, at the graduate level, they try to explore on their own at the age above 35, as stated by 83% of Masters' and 93% of PhD students. This habit of relying on their own is what Rosenberg (2008) stressed that it is essential, to monitor and evaluate electronic resources' application in libraries for better use of the new technologies that eventually conquer information-seeking behaviour. The possible interpretation of this students' behaviour is a shift from collectivism to individualist culture (from Eastern to Western culture) in which each student works by his/her own.

The researchers also found that students have a high level of search confidence, which can be related to the exposure to gadgets from early age pre-school where the internet is used and ultimately use search engines. Therefore, self-efficacy has fostered a belief in students' capability to search for information through search engines. This comfort of using search engines creates other problems, such as authenticity, quality, and a split of information. Arabian Gulf countries, cultural values are derived from specific,

more significant Islamic issues. It is through tolerance that students in GCC universities spend a lot of time helping each other and doing everything collaboratively whether social or professional works. There must be a feeling that if a source is indexed in Google or Yahoo and Internet Edge etc. is authentic and authoritative. Thus, why to search engines 'use is spread from elder to younger and from one individual to another which brought high social ranking in the region. It seems that students prefer visual sources rather than textual, which can easily be found in commercial search engines rather than scientific databases.

Interestingly, the significance of language to some information-seeking activities had been found. When language proficiency increases, students' information-seeking activities increase as well. The search time decrease with the experience in performing search and research along with publishing research papers. Another interesting finding is that the significance of age with information-seeking activities, the information-seeking activities increase with the increase of age as well. Unfortunately, with the experience in interacting with systems, working with other colleagues, students' information-seeking sessions decrease at the age of 35 and above. It can be argued that the elderly leads to the decline in research activities and eventually decline of information needs and interacting with systems.

Technology, on the other side, has conquered Arab culture unnoticed, face to face contact people of the opposite gender is not allowed, especially to those who are not having blood bond relations. However, with technology, women are not feeling any problem whatsoever to contact a person of the opposite gender (male to female or different) electronically. Minor differences were observed in query formulation, which might be considered that undergraduates are not familiar with their field of specialisation, hence their phrases, search terms were not correctly set to what they intend to search. In this case, they always start searching for activity through colleagues. These results also reported in Whitmire's study (2003).

Power Distance Culture

On the other hand, power distance culture has been found to have a significant impact on students' information-seeking behaviour in GCC universities. It has been found that students' information needs and interactions with systems are significantly affected their culture they belong to. Within exception with natural interaction systems with humans, the search web tools are correctly providing high-level support for explicit social interactions while executing search tasks. Although webpages were internationally designed to support joint search tasks where two or more searchers have a common goal. In the GCC, information seekers with personal goals may still engage in momentary collaborative efforts by emailing or calling friends and colleagues for help. With specific questions in mind, students sometimes ask specific colleagues and friends to help one-on-one while interacting with systems.

It was interesting that power distance has no impact on query formulation and task execution. Hofstede (1999) has categorised power distance as a teacher centred context, based on hierarchy structure extending from top to bottom. Around 79% of undergraduates confirmed starting their search for information by asking the knowledgeable person. Then, by asking librarian members by 77% who are available for extended hours both physically and virtually.

Students are likely to access information that they only need for their studies or research need (81% undergraduate & 92% graduates), and they don't have interests in political issues (0.26%). The reason might be those issues are not of much importance in the student's academic life. The other purpose might be their Islamic belief, which emphasises on respecting the leader. In this case, students' access to specific webpages and search engines to get information may be correlated with this culture.

It can be understood that the large portion of online use of academic resources originates from off-campus for all categories or using their devices; as many as 89% of respondents prefer to access information at home. At the same time, 100% identified the university libraries as an essential venue for their academic searches. In either place, culture is in preference in the searches or what you can call privacy. Interestingly, the most uncomfortable place to search for information as stated by respondents is office and internet café with a frequency of 7% and 2% respectively. It can be argued here that the Hofstede's category of uncertainty avoidance (Western culture) doesn't work in the GCC universities.

Computer-mediated communication tools on specific group processes and outcomes of information-seeking behaviour may depend to some extent on culture (Chung and Adams (1997); Quaddus and Tung (2003)). The values of power distance show preference in this study and suggest that certain national cultures are maybe more liable to different types of groups dysfunctions than others. Computer-Mediated communication tools may be targeted to neutralise the negative influences of culture. The cultural values examined showed that power distance, is likely to play a significant role in an artificial environment, particularly among the group of equals such as students, faculty, and librarians. Or between the leaders and people. It is this artificial environment that students in the Gulf states' universities showed that they are unsure of locating reliable sources of information. While students are confident in their ability to evaluate sources of information. This may also be the possible reason for students using heavily search engines with favourite social rank such as Google, Yahoo, Internet Edge, social media, etc. to get liability of the sources of information then they start their search from that point.

The use of information communication technology (ICT) is perceived as insensitive in the Arab world; its adverse social effects could reduce the positive impact of the use of ICT. However, students like face-to-face contact to technology-facilitated contacts (Ali, Pascoe and Warne, 2002). It can be argued here that, Gulf states which have high power distance, its students likely to inhibit modes of information exchanges. Students like to use the sources that have a social presence (Zimmer, 2011), and this might be the possible reason for having specific information sources such as ProQuest was highly preferred at the University of Dubai, United Arab Emirates. But the same database was not the first preference for other universities such as the University of Sharjah, Zayed University and Sultan Qaboos University which EBSCO scored higher. Meanwhile, the users at the University of Nizwa ranked the Science Direct as their first preferred databases for search. These differences show the impacts of culture on daily students' academic life.

One of the exciting findings in this study is that, as the student progresses in their studies, they become more independent from knowledgeable people (faculty) and family members. They also prefer to maintain relations with colleagues for collaboration or a shining future in studies and later research collaborations. It can be understood that colleagues are highly valued and ranked for research collaborations, publishing, and even information sharing. All these cultural demands, norms, and values affect students' information-seeking behaviour.

Time Cultural Dimension

Arabs are known by polychronic culture, which refers to attitudes toward the use of time in performing tasks and search activities in parallel. This dimension suggests that students would perform multi-tasks at a time (Hall, 1976). Putting in mind Hall's categories of time in the cultural dimension, it was found that GCC students are among those who perform multiple tasks simultaneously. It was hypothesised that time cultural dimension has an impact on students' information-seeking behaviour. It defined the time

orientation as a measure of people's consideration of the culture; being comfortable with sacrificing now for the long-term benefit (Hofstede & Bond, 1988) or focused on immediate results. It has been found that Arabs frequently perform multiple tasks at a time to achieve the required goals. At the same time, they are easy to sacrifice for a friend to keep long term relations. Mostly, sacrificing their time to stay long-term relations with colleagues, faculty, and friends. It was found too, that time cultural dimension has a direct impact on information needs, query formulation, task execution, and even interactions with systems. As previously noted, students spend more time around 10.70 hours a week, searching for information relevant to their specialisations. This is an adequate time average for Gulf region universities where it was said that in childhood only a few minutes are spent reading to children a year. The students stated that they do not bother to perform multiple tasks while searching for information with a mean of ($M = 3.71$, $SD = 1.0$). The results support the polychronic nature of the people of the Gulf Cooperation Council countries.

The attitudes of Arabs towards time, differ from that of Western culture, which considers "time is money." It is usual for Arabs to spend considerable time to help colleagues, friends, and relatives. It is seldom to see a student expressing impatience even after a substantial period of searching for information. Many have revealed that the time in executing a task is not so important, but achievement matters for more than anything else. They have feelings of being ashamed if they would reveal the failure of their efforts to achieve a goal.

The study of Hawi (2012) pointed out the Arabs spend 4 hours daily on the internet and more females by around 59% than males, both involved in messaging and communication. Mostly, they are interested in interactive discussions and social networks. On the contrary, they are not interested in instructive communications, such as information searches and research applications. The younger generation aged 15-24 years, uses the internet more than the adults, especially those over 50 years. It has been observed that first-year students use the internet for educational purposes than senior students. The internet (technology) is making use of people who think that they are making use of the internet, the former is quite right. Many users are wasting reasonable hours on social networks than in research except a few.

It was reported that respondents from the polychronic culture such as Egypt and Peru have a habit of being less concerned with websites response speed than those from the monochronic culture such as the United States and Finland (Rose, Evaristo, and Markus, 2003). These results might sound correct, as, in the Gulf States, there was no complaint suggested regarding the speed of the internet in their respected universities. It might be either their internet infrastructure is high bandwidth, or the only culture made them overlook those minor delays. Strangely, undergraduates indicated that they like quick access to information with the least as possible efforts. Then, after being familiarised with the university environment, undergraduates are encouraged by the conveniences of the sources, interfaces, places of performing searches, and privacy.

A few undergraduate students raise concerns on the quality and accuracy of information sources they use as few as 10%. Many expressed that they mostly, tossed the queries into social networks, and any response received is acceptable for them if their terms used in the question are included. On the contrary, the graduate students expressed their concern about the quality, accuracy, and authenticity of sources of information. This situation shows the maturity of those students and experience to research different levels of their studies. Between undergraduates and graduates, there are two ideas. It might be undergraduates, due to their past experiences of using the internet at the pre-university level, it seems complicated for them to indulge in academic research activities as they use commercial search engines when they think of seeking for information. As was found that they are heavily using industrial such engines mostly and

less use of academic databases or specific webpages. While graduates are well experienced in conducting academic research, and therefore, they mostly use academic databases and dedicated webpages. In this case, authenticity and accuracy of information are given priority and consume fewer efforts and time searching for information.

The study showed that women are likely to spend long online sessions a day performing searches compared to men who effortlessly skimmed the pages. While students use commercial search engines, they are confronted with too much-unevaluated sources which they are not familiar with much by unknown authors and certainly mostly not peer-reviewed. They thought that they are saving their time getting information at a reasonable time, but instead, they spend too much time looking at the relevance of those sources and the quality of the data. Many students enter the query in search engines or databases; they likely to accept the results of the search term entered is included in the results. These users became commercial search engine users because many of them have been brought up around computers and the internet at an early age in school in which self-efficacy has been pre-dominants. It is evident that in school, no databases used for studies, and students seldom conduct academic researches. They mostly use dictionaries and other most popular references.

Undergraduates often spend frustrating hours searching for information they need. Students instantly access information through smartphones, tablets, laptops, and so on, and tend to delay the use of scientific sources that are required. In this case, students are surprised by the abundance of information retrieved. Subsequently, librarians play a significant role to guide students to reliable sources, whether academic databases or specific webpages. Tremendously, convenience and time savings have been significant factors in information-seeking. Students expressed that they use search engines such as Google, Yahoo, internet Edge for their convenience in getting information in which webpages and academic databases are considered as an inconvenience and very complicated. This is the results of those students who learn on their own how to search for information through their gadgets. The amount of time spent in seeking for information always depends on the amount of time students have on hand. They do not have a particular time frame in a week or month dedicated to search for information. This aberration of information-seeking behaviour students has moved into contradiction to their culture, technology, misuses their energy, lining their health, social interactions, social solidarity, and continuous changing habits.

CONCLUSION

The survey instrument developed for the study uncovered the differences related to culture, language proficiency, age, and academic degrees. Cultures are merging, information technology is changing the way communication, and globalisation is inserting higher demands on information systems. Culture dynamism has opened the doors to be broken apart, sensibly, and unnoticed by information technology. According to Breivik (1998: 2) “in the 21st century, an educated graduate will no longer be defined as one who has absorbed a certain body of information. But as one who knows how to find, evaluate, and use the needed information.” It is hoped in this research; culture will be considered as part of life, and the library will find ways to provide better services to different cultural oriented patrons by delivering relevant and customised information literacy training to assist the user in performing quite well in their research needs. There is a need for marginalising the use of open information sources which are unstandardized, unauthorised, not quality assured or un-peer reviewed in academic institutions. Social factors may also act as barriers to access to information and therefore, frustrates male and female information-

seekers alike. The technology has aberrated the role of librarians intensely from information providers to information resource guides; systems user-friendly guarantors and to perform complicated searches to patrons.

This research finds support for the collectivist and power distance cultural dimensions promoted by Geert Hofstede (1980) regarding information-seeking behaviour. Subsequently, these dimensions can affect how students ask questions, seeking information, interacting with systems, and formulating queries. The information-seeking involves intensive search processes; consequently, it is crucial to understand the role culture plays in information-seeking behaviour to serve the patrons better. This holistic, interdependence, collectivistic (Hofstede, 1980) and high context (Hall, 1976) culture of Arabs need to be addressed in libraries to help to build knowledge society regardless of gender.

Poor information-seeking skills should be curbed by libraries to effectively prevent slipping to where information technology is pulling patrons to the complex digital environment. One of the conclusions is that students have rapidly adopted electronic resources to their natural workflow, although their behaviour varies according to the field of specialisation. Students should be lifelong learners if they want to master new technologies and skills in education to survive the information age revolution. Culture does not change technology or against it, but it changed users' behaviour towards technology. Culture does not prevent people from seeking information, but it deviated the way people interact with systems, the way they use the information, and the way communication initiatives presented. Culture guides towards the better selection of data and systems for the betterment of humans and the society.

Language, cultural values, norms, beliefs, rituals, and myths inspire human interpretations and actions towards the use and acceptance of information technology. Typically, cultural values and norms are the best to forecast user satisfaction in any library, along with information technology implementation success. At times happens that the same information technology consequences different outcomes when used in different cultures, in which some we see it friendly, and others would complicate it. Designing any interface, cultural values should be considered thoroughly for better utilisation.

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ENDNOTE

- ¹ Gulf Cooperation Countries include Bahrain, Kuwait, Kingdom of Saudi Arabia, Qatar, Sultanate of Oman and the United Arab Emirates.

Chapter 22

Designing a Framework of Ethnomedicinal Plant Knowledge Integration Using OSS

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ABSTRACT

Indigenous knowledge refers to the knowledge, innovations, and practices of indigenous communities. Ethnic groups are repository knowledge of herbal medicine. Many indigenous people use several plants for medicinal preparations, and these medicines are known as ethnomedicine. It has developed from experience gained over centuries. Species of ethnomedicinal plants are threatened in most of nations due to overexploitation, habitat loss, destructive harvesting techniques, unsustainable trade, and deforestation. Documented indigenous knowledge on ethnomedicine forms part of the documentary heritage of the nation. The chapter will provide a framework for design an information retrieval system for ethnomedicine or knowledge on medicinal plants that are used to manage human ailments. The framework will be prepared, established on the open source software (OSS), and is appropriate not only for documentation but also beneficial for retrieving domain-specific knowledge. The model provides a framework for resource integration digitally using Greenstone Digital Library (GSDL) software.

INTRODUCTION

Development of human being as their culture and civilization has been associated and related intentionally or unintentionally with their surrounding environment, more strongly to the plant kingdom. Long-long ago man lived very much near to the nature, mainly depended on surrounding environment for their survival which becomes an integral part of lives of indigenous communities surviving in and depending on them. From the very beginning of human civilization dependency on nature, made them knowledgeable about various economic and medicinal properties of nature and natural resources by trial and error process. The

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history of medicine indicates that almost every major civilization and culture has developed their own system for curing diseases. This acquired, undocumented, unique knowledge which are very useful for their livelihood is known as Indigenous knowledge and the people associated with are called Indigenous people. Ethnomedicine is a good example of indigenous knowledge (IK) which has affected the lives of both the indigenous community as well as the global community also. Accordingly, indigenous people in India, has a rich culture of traditional medicine, well known as “tribal” or “Adivasi”, become the repository of information and knowledge, which is exclusively belongs to a specific culture or society and basically tacit knowledge that is confined in human mind and not written elsewhere. They enrich through generations and transferred on from one generation to other, without any written documents. An efficient documented information system in any discipline is very important for its development and also useful to other people who are wish to depend on their cultural believe for healthiness, Ethnomedicine is not an exception. In view of this, it becomes effective to design an information retrieval system to accumulate traditional knowledge on different plants, helpful to controlling disease and wellness, under single umbrella, through which information will reach to the hands of their potential users.

ETHNOMEDICINE CONCEPT

Regardless of the advancement of synthetic chemistry and biotechnology, tribal knowledge and their use for mankind are still useful for community healthcare and drug development in the present and future era as well as for integration of cultural heritage and biodiversity. World Health Organization (WHO), stated that demand of ethnomedicine has increased in all provinces of the developing and less developed world and its use is rapidly expanding in the industrialized countries also. Today nearly 80% of the world's populace has faith in primarily on plants and plant extracts for healthcare (Modern Ghana, 2013).

Ethnomedicine, in general, the communal medicine which is concerned with the treatment and prevention of health diseases and ailment that are generally consider for play a beneficial role in health care. Ethnomedicine refers to the study of traditional medical practice which is concerned with the health, diseases and illness and also addresses the healthcare seeking process and healing practices (Krippner, 2003). Medical beliefs and practice of indigenous community is called Ethnomedicine. Indigenous community means peoples inhabitant of a specific territory or geographical region having a historical continuity belief in a specific culture that developed on their territories, consider themselves distinct from other sectors of the societies now existing on those territories (Indigenous Peoples at the UN, n.d.). They form at present non-dominant sectors of society and are determined to preserve, develop and transmit to future generations their ancestral territories, and their ethnic identity, as the basis of their continued existence as peoples, in accordance with their own cultural patterns, social institutions and legal system. The sum-total of innovation, talent and observation based on the theories, way of life and experiences of indigenous community to different cultures, where explainable or not, used in the anticipation, identification, enhancement or treatment of substantial and overall health may called ethnomedicine. Ethnomedical practitioners generally receive their education through a long apprenticeship, and may administer the therapy in a ritual and evoke the help of a deity. Ethnic medical practice is waning in cultures influenced or colonized by Western civilization.

The term ethnomedicine appears in academic literature is somewhat in a different meaning. In the American anthropological literature the medicine in ethnomedicine usually refers to knowledge and ideas about health and healthcare. In European and biological literature the medicine tends to refer to

medication or treatment practice (Singer and Erickson., 2014). Ethnomedicine is a practice or believe of the traditional practitioner of various ethnic groups, and especially by indigenous communities. The word ethnomedicine is also every so often used as a synonymous term for traditional medicine. (“American Journal of Ethnomedicine”, n.d.)

IMPORTANCE OF ETHNOMEDICINAL KNOWLEDGE INTEGRATION

At the early stage of civilization, human livelihood was mainly going in nearby environment; they used plants for food, shelter, medicines etc. Using that knowledge, many of the modern drugs today have been derived from plant sources. The root of ethnomedicine is ancient conventional written source, of course, along with awareness and experience that has been passed away orally over the centuries (Stoller., 1984).

Designing a framework for integration of traditionally developed ethnomedicinal knowledge by the tribal regarding the use of medicinal plants in digital environment has its communal importance. To implement effective mechanisms for Ethnomedicinal knowledge, the present framework or outline, facilitates to use it as a platform for the preservation and management of the knowledge of ethnomedicine digitally and this, in turn, will integrate the knowledge of ethnomedicine into the existing knowledge systems for the benefit of society. The web-based digital resource integration on the selected domain, ethnomedicine, has various advantages over traditional resource integration service and few have been listed below:

- Providing full-text searching, i.e., general information about each plant species and their region of occurrence etc. is available in a single window;
- Global access to medicinal use of specific plant species in real time by remote users may make available through database;
- Browsing facility through various fields, e.g., plant name, disease name, made available as per potential user requirements;
- Instant access over the web through a common user interface;
- Up-to-the-minute updated access to newly added data;
- Dynamic updating of the digitized collection from any location;

ETHNOMEDICINAL KNOWLEDGE INTEGRATION: USING OPEN SOURCE SOFTWARE

Framework is used to draw possible courses of action or to present a preferred approach to an idea or thought. It is stated as a set of reference which is widely accepted enough to serve as the guiding principles of research within a particular discipline. The present framework for integration of ethnomedicinal knowledge is important as it designs for understanding of different phases of tasks associated with the documentation of ethnomedicine in digital environment. It provides structures approach to the organization of information on one or other aspects of ethnomedicine.

A reference framework is designed here to incorporate Ethnomedicinal resource that has been developed by using Green Stone Digital Library (GSDL) software which is a free Open Source Software (OSS). It provides autonomy & advantage to collection building within multilingual & multimedia information.

It is cost effective also. This software creates beautiful ways to integrate and distribute document digitally. It supports to publish digital collections on the Internet or on CD-ROM of Ethnomedicinal objects. This, in turn, enables one to build full-text search indexes and browsing classifiers for any collection of Ethnomedicinal objects. It describes or works to present an idea or thought to build a greenstone digital library software comprehensive, open source system for construction and maintain digital collection.

To build up this collection first of all data on various medicinal plants, their use by the traditional healer for treated various disease, are collected with the help of Data Collection Schedule, interview and observation methods. Domain specific comprehensive data are collected through Data collection schedule on two broad groups: *(I)Domain specific comprehensive data relating to Ethnomedicinal plants* (Generic Information, Availability of Plant, Perspective of Plant Use, Remedial Perspective, Mode of Administration) and *(II)Data on the use of medicinal plants on the tribal populace* (data on name, age, sex, level of education, occupation, ethnicity, source of experience, Experience period, diseases treated). Information related to 60 medicinal plant species has been collected on the basis of observation and interview of 22 informants or traditional healer which are arrange systematically. On the basis of this collected information we design a digital collection with the help GSDL software.

STEPS FOR COLLECTION BUILDING WITH THE HELP OF GSDL SOFTWARE

Step 1: Installation of Software

Greenstone Digital Library (GSDL) is accessible for different operating system (e.g., Windows, Linux), for the present work GSDL is installed in Windows XP operating system.

Steps for install GSDL are as follows:

- One can download GSDL and its associate software from <http://www.greenstone.org/> or <http://greenstonesupport.limk.ac.in/>. People mostly download windows operation system from <http://www.greenstone.org/>, they provide the latest version of software.
- As a pre-requisite to run GSDL we need JAVA to download which can be download from <http://java.sun.com>.
- Select the language to installation (we select English as language). GSDL 2.86 software is installed in computer by choosing the Local Library mode and just chooses the default options in the installation wizard.
- To work with collection of image we need “Imagemagick” which can download from <http://www.imagemagick.org>, which is required software for building ethnomedicinal collection.

After the finalization of installation process, check whether it is done properly by Click on Start → Programme → Greenstone Digital Library → Greenstone librarian interface. We get two interfaces of GSDL, one is librarian interface and another one user interface.

Step 2: Incorporation of Metadata into Software

In GSDL to incorporate newly created metadata (e.g., scientific name, use of plant, disease treated, etc.) open *Metadata Set Editor (GEMS)* and follow the steps.

Start → all programme → Greenstone digital library → Metadata Set Editor (GEMS) → File → New

Step 3: Collection Building

The easiest way to start a new digital library collection we have to use *Greenstone's Librarian Interface*. To start a new collection, file → new ... Our intention is to create digital integration of ethnomedicine, 60 records have prepared and build separately, at first in Microsoft word format and then converted those into HTML web page documents format. Each record describes each Ethnomedicinal plants and related information and must gather them in a single named file which will constitute the collection.

To build up a fresh collection after opening *Greenstone's Librarian Interface (GLI)* require to perform the following steps (Mukhopadhyay, 2005) one by one:

1. **Gather:** Gather information on the topic for construct the collection
2. **Enrich:** Each object should be encoded by using own-developed schema
3. **Design:** Construct the information, as per its appearance, requirement and the access facilities of the end user
4. **Format:** Customization the manifestation of user interface for searching and browsing
5. **Create:** Collection building on ethnomedicine

Step 3.1. Collection Building on Ethnomedicine Using GSDL

To create a digital library collection on ethnomedicine is to use *Greenstone's Librarian Interface (GLI)*, a component of Greenstone Digital Library software (Open the GLI from the Start → Programme → Greenstone Digital Library → Greenstone Librarian Interface).

Now click on GSDL Administrator → File → New pop-up window appear and Put the name of the collection against *collection title* (e.g., Ethnomedicine) and a brief description about the collection against *description of content* (e.g., Integration of Ethnomedicine). Now choose New Collection on the *Base this collection on* dialogue box and click "Ok". Now the collection is ready by a name which can be changed, modified time to time.

Figure 1. New collection screen

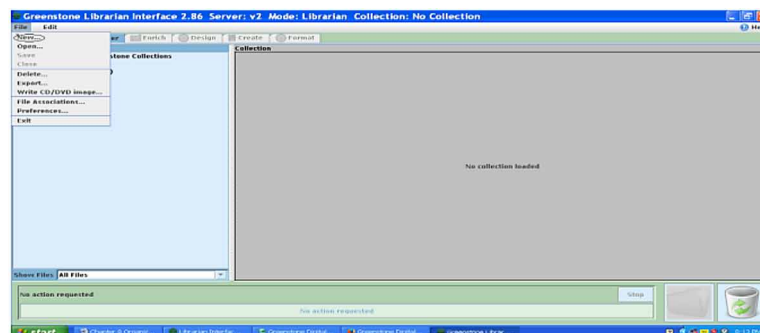
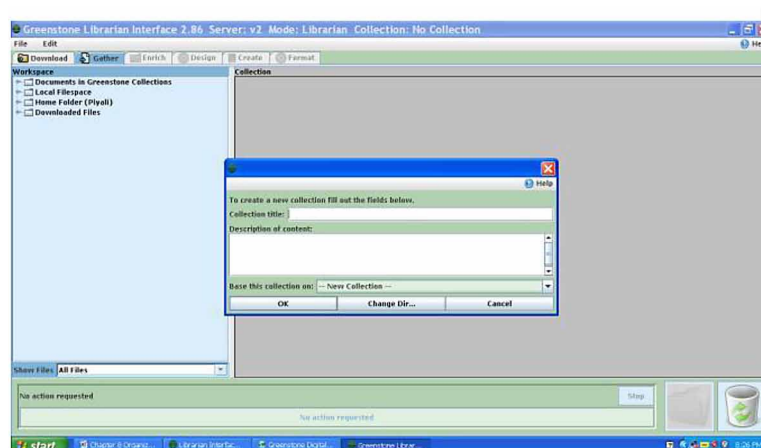


Figure 2. Creation of new collection in GSDL



Step 3.2. Gather

Now in the “gather” panel navigate to the folder in local file space that contains the file(s) we want to use and it consent to the user to gather the require information by exploring the entire computer. After that, select the directory appear in left hand panel (e.g., Records on Ethnomedicine) → Select the files (e.g., record1, record2, record3, etc.) → Drag and drop the collection into right hand panel from left hand panel (drag the information either individually or as set of information from folders or subfolders).

Step 3.3. Enrich

After gathering all document (related to Ethnomedicine) then next step is to enrich each documents through addition of metadata. Click on ‘Enrich’ tab and it will bring up a panel. Left side of the panel under Collec- tion tab shows the files. Here selects the individual document one by one and add metadata to each selected individual record (such as, Scientific Name, Family Name, Vernacular Name, disease treated, etc.,) manually.

Figure 3. Gathering document by exploring the computer

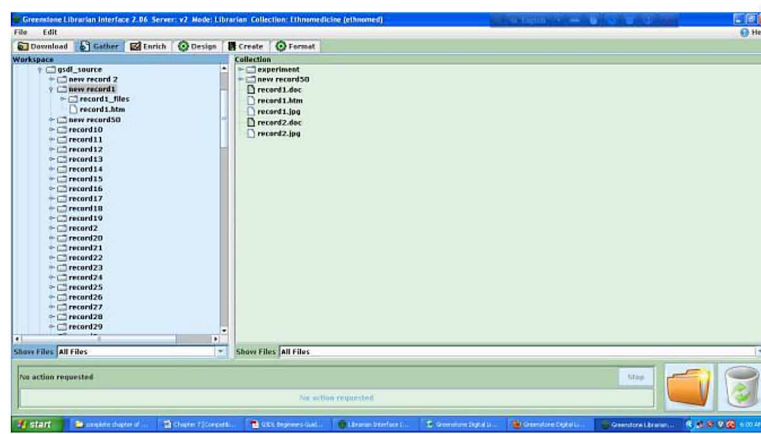
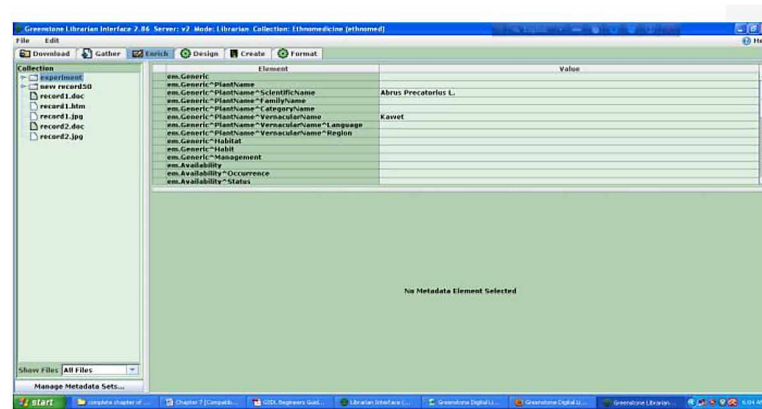


Figure 4. Assigning metadata using the enrich view



Step 3.4. Design

Now design the entire collection by choosing the desired features specified in the Design menu. In the collection design menu there are so many facets which are given in the left hand side panel, such as, Document Plug-ins (All plug-ins, required for manage common documents, at the time of installation by default they are loaded in a specific way), Create Search Indexes (for creating *Search Indexes*, appear just below the Document Plug-in,), Browsing classifier (must set up a Browsing Classifier because it helps to browse by a selected metadata element).

To insert the necessary Plug-ins wanted to convert the document into the given document format (greenstone archive format), click on Document Plug-ins, essential for Greenstone. All plug-ins, needed for handling common documents, will be loaded by default at the time of installation. Search Indexes indicate that whether the search is restricted within to paragraph or the entire text or to the chapter of the entire document. To create *Search Indexes*, click on the Search Indexes, given just under the Docu-

Figure 5. Plug ins

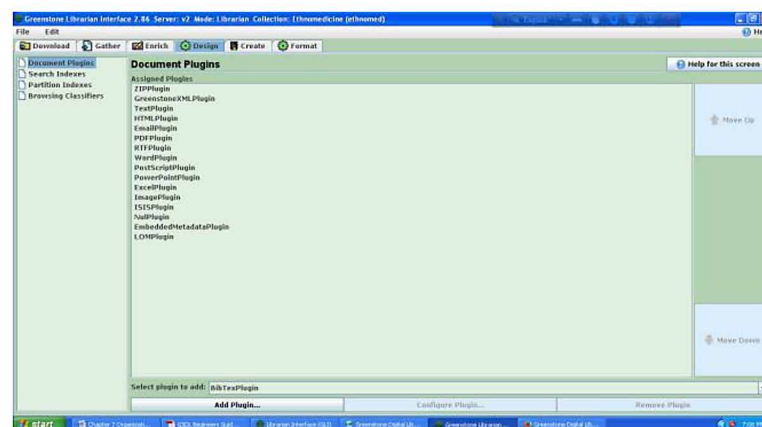
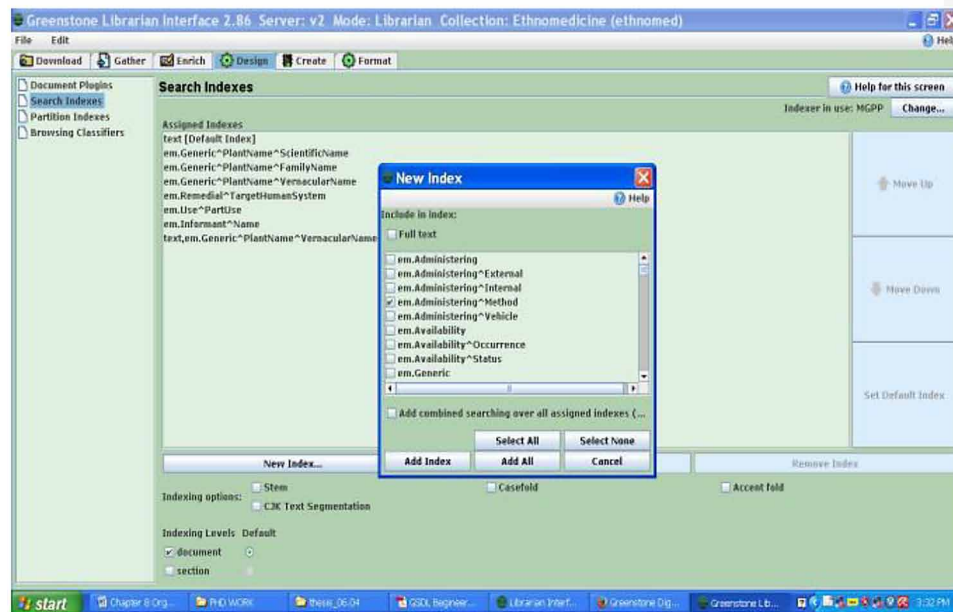


Figure 6. Adding indexes



ment Plug-in button. Default indexes can be removed through selecting the index description under *Assigned Indexes* and then click on the Remove Index button. By the same technique we can add new index, through clicking on new index button.

Step 3.5. Format

Format Features allow unlimited choices in adapting the appearance of the entire collection. The page-display of the collected works including the display-page of the collection or the main menu page that comes after clicking on the browsing classifiers button or on making a search, are created by the features provided under the Format tab.

To make available general information about the collection we have to select “*general*” in the format tab. If you wish to introduce a logo or icon of the collection in the homepage, select a picture and click on “*about page*” and “*home page*”, then click *browse* button. After select the picture, the full path of the picture will appear in the address box lying against the Browse button.

Format feature helps one to change or edit any format by choosing the suitable feature from the *Choose Feature* option. One can also able to add new format string in the *Format Features* by click on the *Add Format* button.

Format feature → Choose feature → Put the HTML Format string value. (Choose feature according to browsing classifier).

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Figure 7. Designing the collection: general information

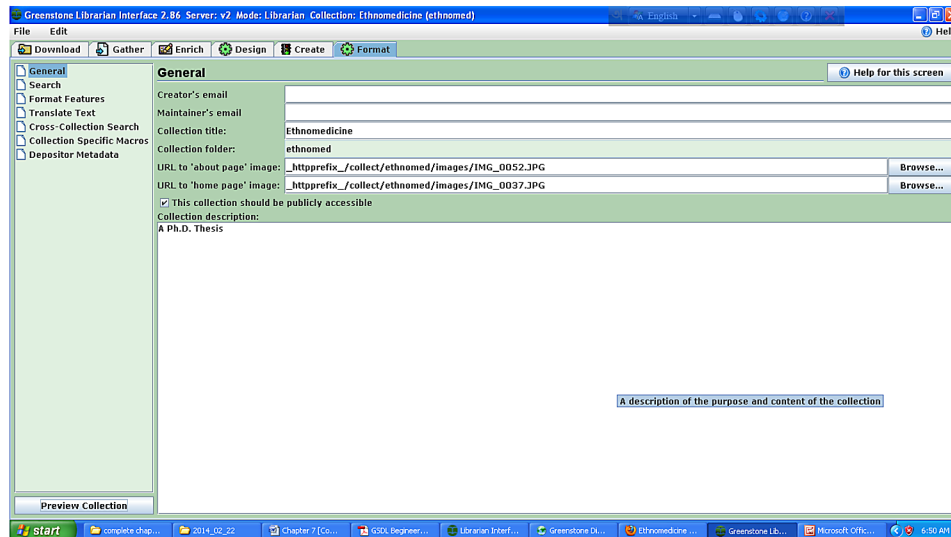
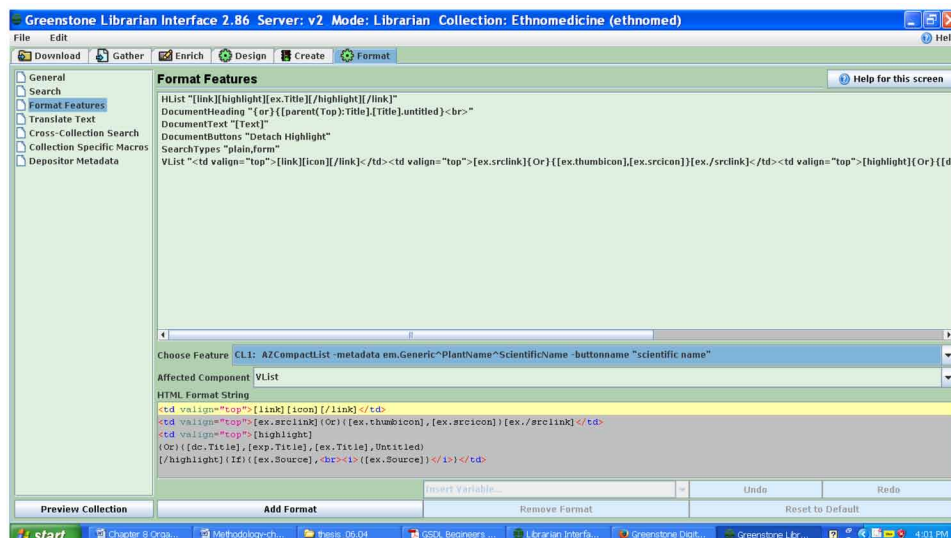


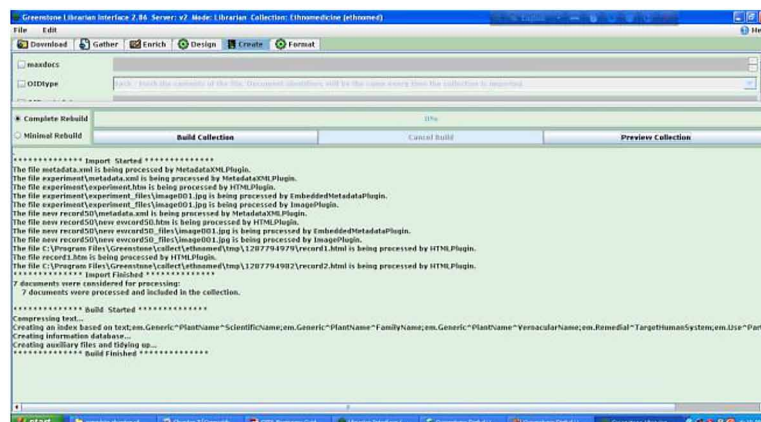
Figure 8. Modifying the format features



Step 3.6: Create

In *Create* panel, click on the *build collection* button and the progress in building the collection will shown by progress bar. To view the buildup collection, after the completion of the building process, click on the *Preview Collection* button.

Figure 9. Building a collection



Step 4: Collection Make Available on CD-Rom

The Greenstone Digital Library Software can be used to available the whole collections over the WWW. GSDL software has a beautiful feature that if one wishes to transfer Greenstone application into an installable CD-ROM for sharing in the middle of large number of audience it allows to do that. The CD-ROMs work under every versions of the windows operating system. It requires the zip file which is to be extracted from C:\Program Files\gsdl\bin\windows. Now to make available the collection into a CD-ROM gives a name to the CD-ROM, tick the check box pertaining to the collection to be exported and click 'Write CD/DVD image' button and at the end click *close* button. Now write the content of the folder (C:\ProgramFiles\Greenstone\ tmp\ "Ethnomedicine") into a blank CD-ROM to create self-installing windows CD-ROM.

SEARCH AND BROWSING

To prepare a accessible and searchable search engine on Ethnomedicine by using GSDL, the methods and mechanism which are describe previously step by step is applied.

The GSDL make available search and browsing facilities both simple and in advance manner search methods. Users '*select the collection*' from homepage to go into the user interface. From there user can select any searching keywords like, Local name, part use, and browse by click on button.

At the same way we can decrease the recall value with the help of advanced search mode. If one desires to search medicinal species name whose 'leaves' is used as medicine or remedy in 'Fever', a list of plants appeared as search result:

In case of browse by required field can be accessed by clicking the required field button. This brings up a list on documents stored in alphabetical order. If one wishes to know plants available in newly created digital library by browsing with field "Scientific name" it is displayed as bellow:

In same way we can browse by other parameters such as family name, part use, target human system, region and Informants.

Figure 10. Main user interface

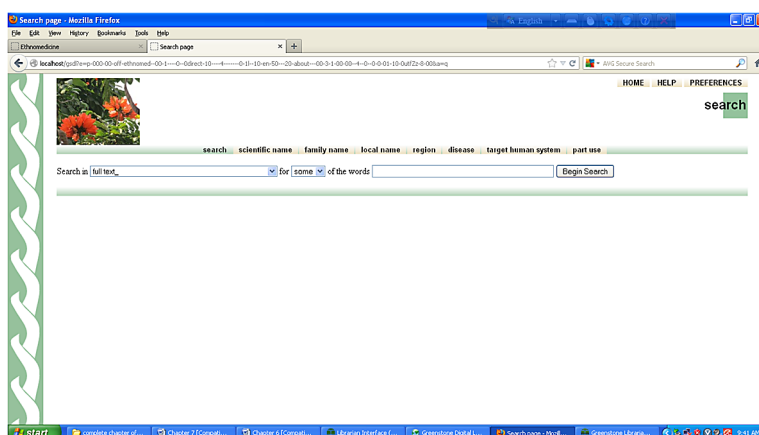
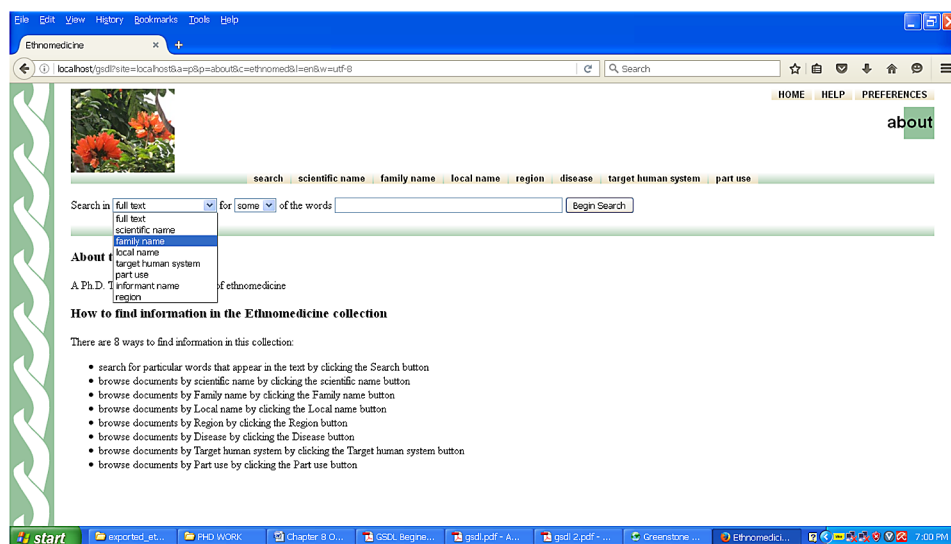


Figure 11. Search the collection



CONCLUSION

Healthiness and other related infirmities are foreseen throughout everyday life and have driven man to find ways by which they could be dealt with. Plants have dependably been an effective wellspring of cure from nature. Such practice is as old as human presence (Andersen, 1991). Present collection may be work as a replica to retrieve desire information rapidly and helps to get it in few minutes and also be used to integrate, organize and disseminate of information on Ethnomedicine to the end user.

At the present digital era librarians are trying to find out inventive ways to serve information in a lucid way to help users generate knowledge from the information, more promptly as they have always gathered in the non-digital or traditional environment. To cope up with the information needs with speed and relative accuracy and reliability, the digital library has emerged as the most pro active and reliable

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Figure 12. Display of advance search: 'leaves' is used as medicine in 'fever'

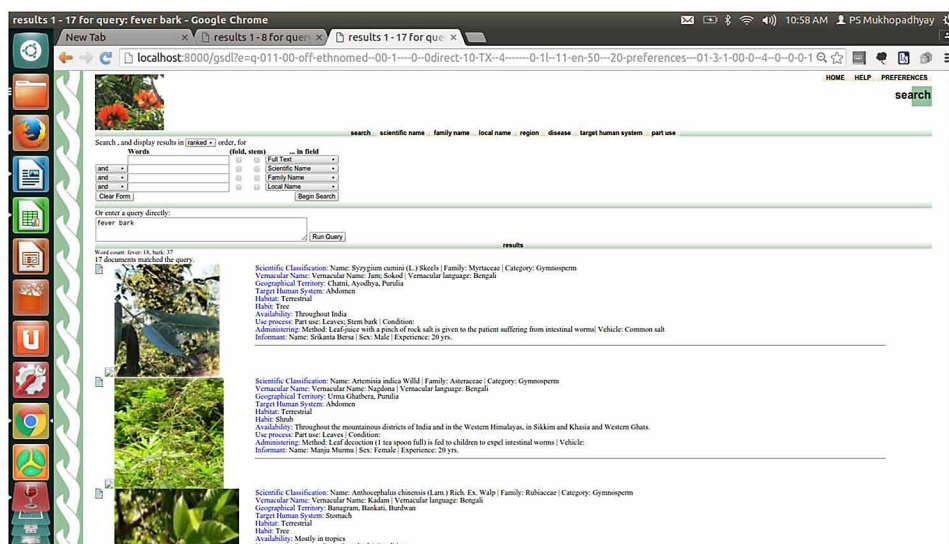
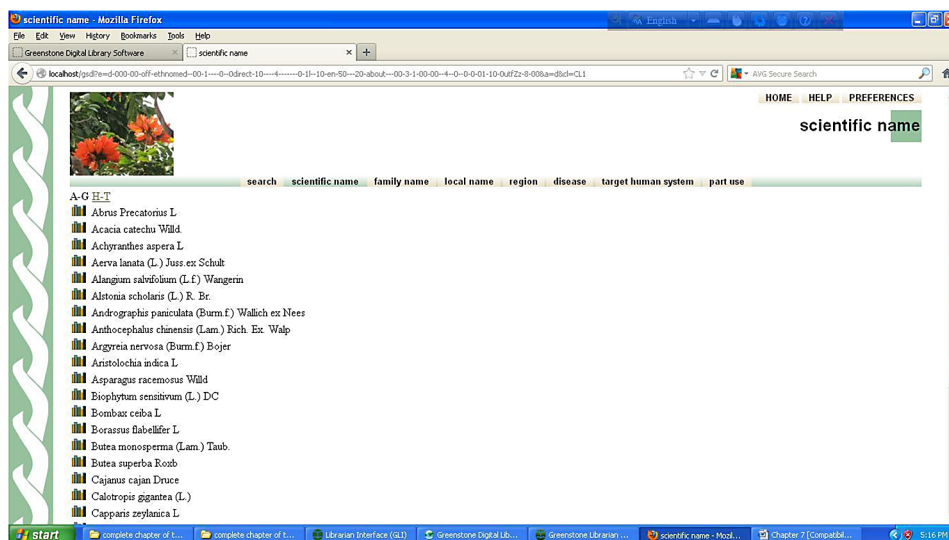


Figure 13. Display the result browses by 'scientific name'



alternative source, and so knowledge discovery in these type of libraries becomes a predominant factor. Under such circumstances, this reference framework of integration of Ethnomedicinal knowledge by applying GSDL can provide a solution to create domain specific digital library. We hopeful to that this framework may well be extended to design and provide information services accessible to the ultimate beneficiary through web and also as datasets on CDROM.

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Chapter 23

Analysis of International Patent Applications for Inventions Like Traditional Herbal Medicines

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ABSTRACT

Numerous applications have been filed for patents based on bio-inventions in the Indian patent office. Although there is not any international patent, there is a system of international patent applications whereby the applicant may designate name of countries where they wish to file application for patents nationally. According to international patent classification, the concern class for such a patent applications is A61K36/00. More particularly, the international class (IC) A61K36/00 relates to medicinal preparations of undetermined constitution containing material from algae, lichens, fungi or plants, or derivatives thereof (e.g., traditional herbal medicines). International applications filings under patent cooperation treaty (PCT) for patent purposes can be accessed at the Patentscope (patent search tool of WIPO). All international patent applications for such TK-based inventions have been accessed online at Patentscope using the classification code A61K36 for this study.

INTRODUCTION

Patents are exclusive rights granted to inventors that prevent others from making, using, selling or importing the patented invention, for a term of at least 20 years. The criteria for granting patents are novelty, inventiveness and industrial applicability. Now days patents are considered barometer of scientific research & development of a person or country.

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The PATENTSCOPE database provides access to international Patent Cooperation Treaty (PCT) applications in full text format on the day of publication, as well as to patent documents of participating national and regional patent offices. The information may be searched by entering keywords, names of applicants, international patent classification and many other search criteria in multiple languages (Patentscope, n.d.)

RESEARCH QUESTIONS

Whether patent applications for bio-inventions based on traditional knowledge considered for patentability criteria as being the traditional knowledge per se considered part of public domain and lacking novelty.

Whether the applicant and inventors in such patent applications are from the indigenous societies maintaining such knowledge since time immemorial?

What are the trends of filing such applications for patents?

What are the top applicants, top inventors, top years of such publications in the subject?

LITERATURE REVIEW

Herbal drugs are gaining worldwide prominence due to their distinct advantages. Developing countries have started exploring the ethno-pharmacological approach of drug discovery and have begun to file patents on herbal drugs. The expansion of R&D in Indian herbal research organizations and presence of manufacturing units at non-Indian sites is an indication of the capability to develop new products and processes. The present study attempts to identify innovations in the Indian herbal drug sector by analyzing the patenting trends in India, US and EU (Sahoo et al., 2011) .

With the emergence and re-emergence of infectious diseases and development of multi-drug resistance, there is a dire need to find newer cures and to produce more drugs and vaccines in the pipeline. To meet these increasing demands biomedical researchers and pharmaceutical companies are combining advanced methods of drug discovery, such as combinatorial chemistry, high-throughput screening and genomics, with conventional approaches using natural products and traditional knowledge (Gupta et al., 2005) .

Ayurveda is getting its due recognition as a rationale system of medicine worldwide despite the fact that medical and scientific fraternity of the globe has very strong opposite opinion regarding safety and efficacy of Ayurvedic medicines. Meanwhile, provisions of Intellectual Property Rights under World Intellectual Property Organization (WIPO) and Patents have attracted many individuals and organizations to explore possibilities of commercial benefits with Ayurvedic traditional knowledge. Although rules are not favoring to grant a patent on prior published knowledge, biopiracy managed grant of Patent on knowledge of Ayurvedic medicinal plants which has been successfully checked with references of data base of Traditional Knowledge Digital Library (TKDL). Current provisions of the Patent law of India are obstructive in nature for getting patent on Ayurvedic medicines. If we have to invite researchers from basic science to ensure quality, safety and efficacy of Ayurvedic medicines, there is an urgent need to amend laws of patent with pragmatic promotional policies. This will encourage more patents on numerous pharmaceutical, nutraceutical and cosmaceutical products based on Ayurveda. As every action of today's world is based on economic criteria so why stakeholders of Ayurveda should be deprived of it. New inventions would drive acceptance of Ayurveda as a global system of medicine (Chaudhary and Singh, 2012).

Medicinal plant formulations have been used in traditional medicines for thousands of years. Plant-based medicine is still a major source of new drug leads and herbal treatments are highly lucrative in the international marketplace. The intellectual property issues for medicinal plant formulas are complicated for numerous reasons. Many of the patents are attempting to emulate the pharmaceutical model of composition patents that as we will discuss, is usually not an appropriate approach for medicinal plants. This paper does not seek to be an exhaustive review but rather provide an overview of the many aspects of medicinal plant patents, a topic of considerable future growth. Our experience has been that the merging of modern and traditional knowledge leads to unexpected correlations, elucidations and insights with tremendous potential for patentable discovery. A continuation of the dialogue on indigenous intellectual property rights will benefit from the inclusion of an increased diversity of voices that have the ability to recognize the mutual and often complementary abilities of traditional and modern sciences. The question is not how to simplify the complexity but rather how to embrace the complexity from the traditional medicine worldview with the tools of science (Pennyroyal et al., 2011).

According to Lin I-Hsin, chairman of the Committee on Chinese Medicine and Pharmacy at the Department of Health: “Taiwan has the potential to become the world’s largest supplier of herbal medicines in the future. Currently it ranks in the top three, alongside Japan and Germany for R&D, manufacturing and quality control of herbal medicines in compliance with the international Good Manufacturing Practice (GMP) standards (Chung, 2004) (Hsiao, 2007).

We exploit a natural experiment to study how codifying information about prior innovation affects subsequent innovation. A codified database of traditional Indian herbal formulations was adopted by the European Patent Office (EPO) and the U.S. Patent Office (USPTO) at different points in time. The database, the Traditional Knowledge Depository Library (TKDL), was created by state-owned Indian R&D labs to provide patent examiners searchable “prior art” drawn from ancient Indian medicinal texts. Using a unique dataset of herbal patents filed between 1977 to 2013, we find that adoption of the TKDL affected the level of herbal patent filings and grants, and shifted the nature of patenting away from pure herbal formulations similar to those in the ancient texts toward combinations of herbs and synthetic compounds that were less similar to the prior art and apt to be less contestable (Choudhury and Khanna, 2014).

The three sites at which this significant development is unfolding are: (1) the digitization of traditional medicinal knowledge through India’s traditional knowledge digital library (TKDL) project; (2) a recent attempt at incorporating innovations in Chinese Herbal Medicine (CHM) in Taiwanese patent law; and (3) efforts to enshrine disclosure of origin requirements (DRs) in patent applications, and developments around geographical indications (GIs) (Oguamanam, 2008).

Article 27 of Trade related aspects on Intellectual Property Rights (TRIPS) of World Trade Organization (WTO) establishes what can be patented and the scope for exceptions:

Subject to the provisions of paragraphs 2 and 3 of the Article 27, patents shall be available for any inventions, whether products or processes, in all fields of technology, provided that they are new, involve an inventive step and are capable of industrial application. ... Patents shall be available and patent rights enjoyable without discrimination as to the place of invention, the field of technology and whether products are imported or locally produced.

The TRIPS Agreement has some provisions like for protection of geographical indications etc which having limited application to the protection of Traditional Knowledge.

A note by the CBD Secretariat, (UNEP/CBD/COP/3/19). *Knowledge, Innovations and Practices of Indigenous and Local Communities: Implementation of Article 8(j)*. It was concluded that there were “no international legal instruments or standards which adequately recognize indigenous and local communities’ rights over their knowledge, innovations or practices” It is observe that “...current systems of intellectual property rights alone are not sufficient to ensure that benefits flow back to indigenous and local communities (CBD Secretariat, n.d).

OBJECTIVES

To find out whether patent applications for bio-inventions based on traditional knowledge considered for patentability;

To test whether the traditional knowledge considered part of public domain or not;

To observe whether the applicant and inventors in such patent applications are from the indigenous societies maintaining such knowledge since time immemorial;

To establish the trends of filing such applications for patents;

To find out the top applicants, top inventors, top years of such publications in the subject

METHODOLOGY

International patent applications for inventions like medicinal preparations of undetermined constitution e.g., traditional herbal medicines filed from top countries including India and the scientometrics study of the same is done using Patentscope. The data collected since 20.10.1978 (the date PCT having Data Coverage) till 04.04.2018. From this collection patents applications in the subject inventions like medicinal preparations of undetermined constitution e.g., traditional herbal medicines only were selected. The patent applications in the subject have been accessed at Patentscope using the search criteria wherein the international class(IC):”A61K36/00”; Office(s): all and Language: EN (English). Analysis was performed to identify filing trends, major applicants, and major inventors filing such applications.

RESULTS AND THE DISCUSSION

Indian patent office tags such application under “traditional knowledge biotechnology”. The patent applications under this tag can be accesses at the official website of the Indian patent office. India represents one of the richest biodiversity Nation; however, the data here indicates the representation of India in terms of patent in the related subject is not significant. Section 3 of the patent Act of India indicates things expressly which are not invention and so not patentable including discovery of living things or non living substances in nature; Plants and animals in whole or any parts thereof other than micro-organisms but including seeds, varieties and species; Essentially biological processes for the production or propagation of plants and animals; Any Process for the medicinal, surgical, curative, prophylactic, diagnostic or therapeutic or other treatment of human beings or animals to render them free of disease or to increase their economic value or that of their products; New use or new property of known substance; Methods of agriculture or horticulture; Traditional knowledge. Section 3(p) excludes from patentability as it says

“an invention which, in effect, is traditional knowledge or which is an aggregation or duplication of known properties of traditionally known component or components.”

Whether a patent is new in its particular field of technology is tested against the existing body of knowledge in that field. In the light of this newness requirement, it is surprising that over the past few years, some developed countries like USA has granted patents over inventions already known in other parts of the world as lacking availability of information documented electronically. With the access of traditional knowledge digital library (TKDL) of India, patent examiners internationally have improved access to prior-art examining the application for novelty criteria of patentability helping them no wrong grant of patent like well known case of neem, haldi, basmati etc in the subject.

Further, India has enacted the Biological Diversity Act to address the issues of prior informed consent (PIC), disclosure and access and benefit sharing (ABS). This Act primarily aims at regulating access to biological resources and associated traditional knowledge so as to ensure equitable sharing of benefits arising out of their use.

In view of huge bio-prospecting of traditional herbal medicines and other related inventions, this present work analysing international patent applications in the subject and found that total 275,362 international patent applications were found using Patentscope dated 04 April 2018 using the said search criteria. Further, the data regarding such international patent application analyzed country-wise, applicant-wise, inventor-wise, year of publication-wise.

The top countries from where such applications filed are China, United States, Japan, Republic of Korea etc and the position of India is eleventh.

As per the data, it is noted that there is a gradual increase in patent filing through the years however in last year 2017 such filing significantly reduced.

The data indicates year 2016 is top year in term of international patent filing and the trend indicates that although in last year 2017 the number of filing reduced but since 2008 it grows continuously.

Regarding the top applicants, no individual person as applicant among the top but the legal entities only. AmorePacific Corporation is the top applicants in the subject patents. It is a South Korean beauty and cosmetics conglomerate, operating 33 health, beauty, and personal care brands including Etude House, innisfree, Laneige, Lolita Lempicka, and Annick Goutal. Other top applicants are SHISEIDO CO LTD, KAO CORP, Yu Neixun etc. No applicants from India among the list of top applicants.

Regarding the inventors, it is noted that most of the inventors have waived the right to be mentioned in the patent applications. Further all top inventors are from the China and none from India among the list of top inventors in the subject.

India: The number of such international patent applications filed from India was 1751 dated 04 April 2018.

In India, it is noted that there is a gradual increase in patent filing and year 2016 is top year in term of international patent filing and the trend indicates that although in last year 2017 the number of filing reduced.

Regarding the applicants in the subject, the top applicant is ITC Limited; among the Indian government agencies, CSIR is top applicant; among the Indian Universities, AMITY University is top applicant. In India, many individual inventors file patent application every year and some are among the top applicants like Dr. Manish A. Rachchh, Aditya Narayan Singh.

Analysis of International Patent Applications for Inventions Like Traditional Herbal Medicines

Table 1. Top countries filing international patent applications in IC A61K36

Top Countries	No
China	190246
United States	17586
Japan	16752
Republic of Korea	11405
PCT	7852
European Patent Office	7820
Australia	4940
Russian Federation	2906
Canada	2529
France	2479
Spain	2037
India	1751
United Kingdom	1226
Brazil	1087
Germany	785
Mexico	709
Denmark	706
Portugal	643
Indonesia	538
Malaysia	317
Philippines	255
Singapore	171
EAPO	158
Viet Nam	149

Table 2. Publication years and no. of international patent applications in IC A61K36

Year of Publication	No
2008	12694
2009	12697
2010	13029
2011	13674
2012	16378
2013	19478
2014	29257
2015	34783
2016	40168
2017	24617
2018	982

Figure 1. Publication years and no. of international patent applications in IC A61K36

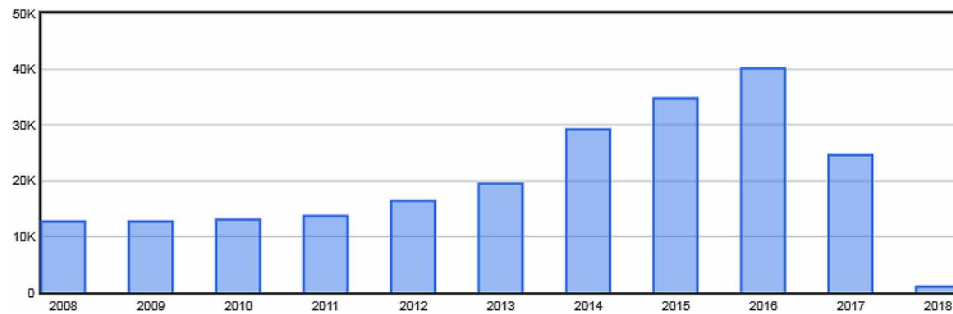
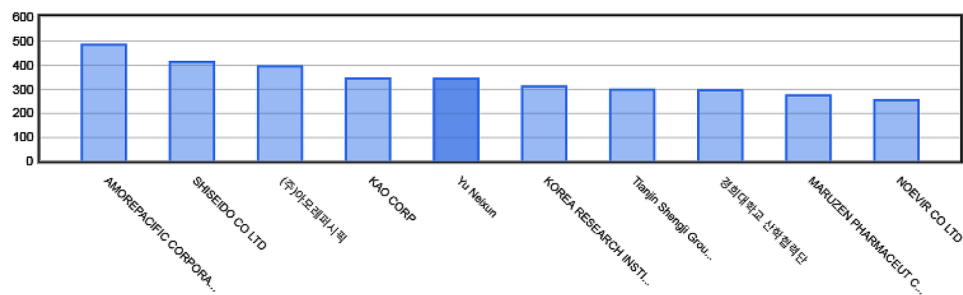


Table 3. Top applicants filing international patent applications in IC A61K36

Top Applicant	No
AMOREPACIFIC CORPORATION	483
SHISEIDO CO LTD	411
(주)아모레퍼시픽 (AmorePacific Corporation) - a South Korean beauty and cosmetics conglomerate	393
KAO CORP	342
Yu Neixun	341
KOREA RESEARCH INSTITUTE OF BIOSCIENCE AND BIOTECHNOLOGY	309
Tianjin Shengji Group Co., Ltd.	296
경희대학교 산학협력단 (Kyunghee University Industry-Academy Collaboration Foundation)	293
MARUZEN PHARMACEUT CO LTD	272
NOEVIR CO LTD	253

Figure 2. Top applicants filing international patent applications in IC A61K36



Analysis of International Patent Applications for Inventions Like Traditional Herbal Medicines

Table 4. Top inventors filing international patent applications in IC A61K36

Top Inventors	No
the inventor has waived the right to be mentioned	3355
不公告发明人 (No announcement inventor)	1388
Wang Xinsuo	838
Zhu Wei	603
Liu Xinzhuang	540
CHEN GUANQING	343
Yu Neixun	341
Zheng Yongfeng	313
XIA YU	312

Figure 3. Top inventors filing international patent applications in IC A61K36

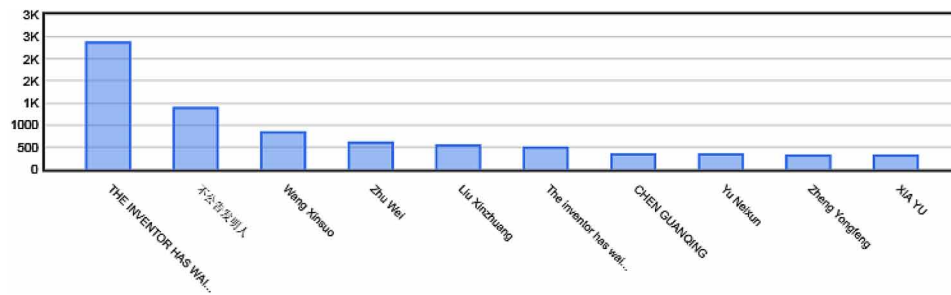


Table 5. Publication years and no. of international patent applications in IC A61K36 from India

Year of Publication	No
2008	78
2009	95
2010	172
2011	127
2012	138
2013	105
2014	211
2015	193
2016	245
2017	229
2018	16

Analysis of International Patent Applications for Inventions Like Traditional Herbal Medicines

Figure 4. Publication years and no. of international patent applications in IC A61K36 from India

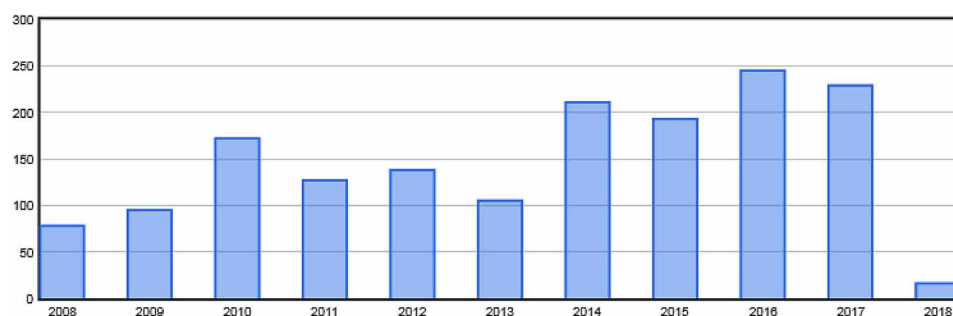


Table 6. Top applicants filing international patent applications in IC A61K36 from India

Top Applicants	No
ITC LIMITED	33
INDENA S.P.A.	27
COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH	23
AMITY UNIVERSITY	21
(language unable to understand, unable to write in English)	19
DIRECTOR, CENTRAL COUNCIL FOR RESEARCH IN UNANI MEDICINE	9
Dr. Manish A. Rachchh	9
LAILA NUTRACEUTICALS	8
PLANT LIPIDS PRIVATE LIMITED	8
SINGH ADITYA NARAYAN	8

Figure 5. Top applicants filing international patent applications in IC A61K36 from India

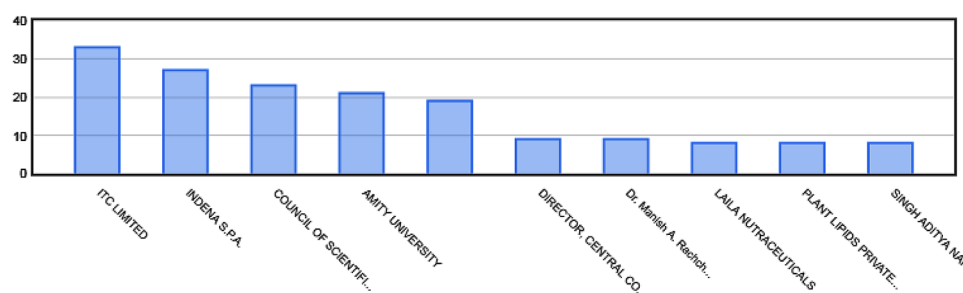
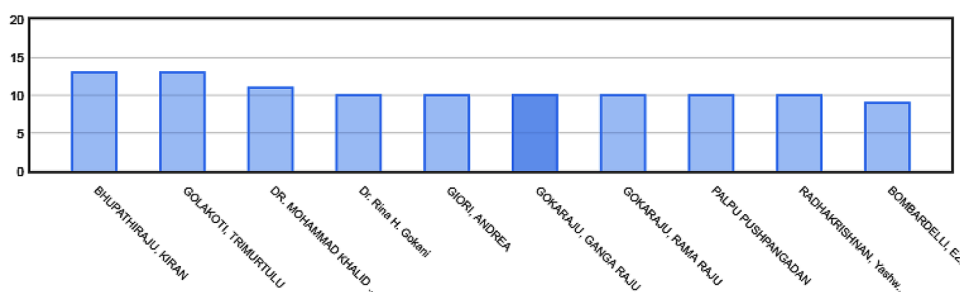


Table 7. Top inventors filing international patent applications in IC A61K36 from India

Top Inventors	No
BHUPATHIRAJU, KIRAN	13
GOLAKOTI, TRIMURTULU	13
DR. MOHAMMAD KHALID SIDDIQUI	11
Dr. Rina H. Gokani	10
GIORI, ANDREA	10
GOKARAJU, GANGA RAJU	10
GOKARAJU, RAMA RAJU	10
PALPU PUSHPANGADAN	10
RADHAKRISHNAN, Yashwanth	10
BOMBARDELLI, EZIO	9

Figure 6. Top inventors filing international patent applications in IC A61K36 from India



CONCLUSION

With the increased industrial application of bio-resources, there has been a steep rise in the economic and commercial utility of such bio-inventions including inventions based on TK. TK as such by its nature seems cannot be protected appropriately under any of the IPR; rather, a sui-generis system may protect and help to manage and commercialized it well. Inventing new products or process based on some sort of TK should be protected under IPR particularly the patent.

In view of above data, it is confirmed that many patent applications for bio-inventions based on traditional knowledge considered for patentability and therefore, granted patents on the part of atleast some value additions. Traditional knowledge per se considered part of public domain and the inventions based on it may be patentable if fulfill the required criteria like novelty, non-obviousness etc. It is noted that the applicant and inventors in such patent applications are not from the indigenous societies who worked on TK and invented some new products or process. Regarding the trends of filing such applications for patents, the data is self explanatory as the number of filing is going up each year. Further, the top applicants and top inventors in the subject are from China in view of the international patent applications in the subject.

Like TKDL, some sort of database of person maintaining TK may be created and application on the subject may be required to refer the source of related TK either by the applicant or the concern patent office which later on implemented for benefit sharing once the patented invention been commercialized.

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Chapter 24

The Value of Employee Engagement to Enhance Work Performance and Customer Service in Public Libraries

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ABSTRACT

The organizational culture of a public library plays an important role in the successful achievement of its purpose and mission. Effectively serving patrons and the larger community is an overarching strategic goal of public library systems, and public library leaders who are supportive of workers and committed to promoting a culture of employee engagement hold the potential for enjoying numerous positive individual and organizational outcomes such as effective service work performance and increased customer service and satisfaction. This chapter highlights the benefits of fostering an environment of employee engagement and its enhancement on service work performance and customer service in public libraries.

INTRODUCTION

Employee engagement has been described as the level of involvement and commitment employees express in their roles within an organization. Engaged employees are committed, dedicated, motivated, energetic, enthusiastic, engrossed in their work, and they exhibit positive attitudes, pride in their organizations, and effective customer-oriented behaviors (Babcock-Roberson & Strickland, 2010; Pimpakorn & Patterson, 2010; Rana, Ardichvili, & Tkachenko, 2014; Rich, Lepine, & Crawford, 2010; Simon, 2011). Engaged employees connect with their work emotionally, cognitively, and physically (Kahn, 1990), and

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they exhibit high performance habits. High performing employees put in extra hours, speak highly of the organization, assist colleagues, share knowledge, and participate in organizational dialogue (Popli & Rizvi, 2017).

High levels of employee engagement are associated with a number of positive individual and organizational outcomes including improved service work performance, increased customer service and satisfaction, higher levels of customer engagement, customer loyalty, and customer satisfaction (Macey, Schneider, Barbera, & Young, 2009; Menguc, Auh, Yeniaras, & Katsikeas, 2017; Mone & London, 2010; Radda, Majidadi, & Akanno, 2015; Wantara, 2015). In contrast, disengaged employees not only lack the extra-role attitudes and behaviors that lead to exceptional individual outcomes, but they impact organizations negatively through their lack of vigor and productivity. Disengaged employees are disconnected, detached, and lack motivation and enthusiasm for their work, resulting in poor service performance, higher turnover rates, and decreased customer satisfaction (Abu-Shamaa, Al-Rabayah, & Khasawneh, 2015).

Understanding the benefits of employee engagement as well as the detrimental impact of disengaged workers is crucial for public library administrators and managers because of the implications on a wide range of individual and organizational outcomes including service work performance, customer service, and satisfaction. Public libraries are service-based institutions and as such, the employees at all levels of the organization need the capacity to build strong relationships with one another. Establishing effective and sustaining relationships with public library stakeholders is not possible without engaged employees who care about the organization, one another, and those they serve. Highly engaged employees approach challenges without fear of reprisal, willingly help customers and peers quickly, ask questions proactively, and listen carefully to determine how they can best serve others (Liao & Chuang, 2004). Engaged employees have a positive outlook and are more dedicated and enthusiastic when carrying out their job tasks as compared to disengaged workers (Menguc et al., 2017). Engaged employees go beyond in-role expectations to provide excellent service, make a positive impression on customers, and establish goodwill within a community. The most successful libraries have employees who display high levels of service work performance, and effective library administrators, directors, and managers are committed to creating a positive work climate for employees and service-minded culture for all stakeholders, including patrons.

Service work performance in a public library, or the ability to consistently meet the needs and expectations of patrons, is fundamental to the effectiveness of public libraries. While satisfied patrons may not be directly linked to increased profits in the library setting, excellent service performance can improve perceptions of effectiveness in serving the cultural and educational needs of a community (Casper & Lopez, 2018). Effective service work performance can also help to mitigate issues related to rising costs of public library services as well as meet the demands of changing expectations of library patrons (Macmillan, 2011). Excellent service work performance can also foster a spirit of lifelong learning (Miao & Mia, 2007), build an environment of organizational learning (Sinclair, 2017), and establish community by connecting individuals to each other and to the wider community (Goulding, 2009).

Public library administrators, directors, managers, and staff need to be responsive, strong in delivering core services, and adaptable enough to redirect efforts in response to changing conditions and expectations (Huber & Potter, 2015). Library workers, whether administrators, managers, or library service staff are more likely to display these characteristics and contribute positively to the vitality of the organization when they are engaged and satisfied in their work. In public libraries, Macmillan (2011) argues, "staff engagement has become essential for survival" (p. 5). Many members of the library staff work directly

with patrons, and some of these patrons represent vulnerable and marginalized community members. It can be challenging for library workers to perform the daily work of connecting genuinely, authentically, and respectfully with patrons who may be homeless, disconnected from family, experiencing mental illness or drug addiction, at risk youth, or seniors (Seleb, 2017).

Library directors and administrators need to create positive organizational culture and work climate in order to reach their highest levels of success. Leading by example is paramount in the library work setting. It is important for library leaders to model the types of attitudes and behaviors that they hope to see workers extend to patrons. Unfortunately, the literature reveals that today's public libraries are "becoming increasingly dysfunctional places to work" (An, 2019, p. 27). While it is easy to understand how incivility and dysfunction in libraries may be the result of the emotional labor of public facing work with patrons (Matteson & Miller, 2013), it may be surprising to learn that much of the bullying, mobbing, and workplace incivility takes place in the workroom, and supervisors are often the bullies (Kim, Geary, & Bielefield, 2018). When library staff are not supported and fear the outcome of interactions at work, it takes a toll on service work performance as well as the wellbeing of employees in terms of physical and mental health (An, 2019; Kim et al., 2018). Popli and Rizvi (2017) explain, "In the service industry, the employee plays a significant role in creating, communicating, and delivering customer value" (p. 296). Frontline employees have the most direct contact with customers and are responsible for supporting the customer's experience with each interaction with the organization or utilization of its services (Bersin, 2014). Public facing employees need to experience perceived organizational support and received the benefit of supervisory resources in order to perform well.

The most effective library administrators, directors, and managers possess emotionally intelligent leadership skills, which makes it possible for them to provide the necessary organizational and supervisory support to employees. Emotional intelligence (Goleman, 2001) is an aspect of social intelligence (Thorndike, 1920), which is required for successful and effective relationships development, especially at work. It is essential for library leaders to focus on providing supervisory support to staff level employees, and they need to proactively engage in internal marketing, which is a management practice of promoting the organization to employees, with the goal of increasing employee engagement, satisfaction, work performance, and ultimately customer service (An, 2019; Kim, Knutson, & Han, 2015). Internal marketing and supervisory support initiatives can be specifically addressed through employee engagement programs that inspire employee involvement and increase service work performance behaviors in order to foster a culture and climate of mutual respect, which then enhances customer service and customer satisfaction.

In this chapter, a theoretical and conceptual framework of employee engagement is presented in order to offer insights to public library leaders and administrators on the value of employee engagement and its influence on service work performance and customer satisfaction.

BACKGROUND

When libraries were generally regarded as repositories of information where workers organized and provided access to print media, the traditional library environment represented a simpler organization, and library administrators were capable of effectively managing using monitoring and controlling activities. Today, the public library no longer has a functional monopoly on information, and people have different reasons for visiting the public library and for utilizing public library services. Public libraries provide a variety of benefits to patrons and the community. In the modern day, an effective organizational

library culture is one where service, love of learning, and desire to help patrons as the forefront (Henry, Eshleman, & Moniz, (2018).The public library is a context where researchers are beginning to explore the value of employee engagement on work performance and customer satisfaction.

Many library workers are directly supervised by library directors or branch managers, and these middle level leaders typically want to perform well, which is often measured by key performance indicators that relate more to budget and task behaviors than culture, climate, and relationships management. Additionally, many library leaders are challenged by the changing demands of patrons and community, managing diverse employees, and “increased burden of duties” (Mullins & Linehan, 2006, p. 139) that takes a toll on them. As such, they may be overly focused on getting the job done, which may result in the utilization of a coercive or pacesetter style of leadership. The objective of coercive leadership is immediate compliance and the aim of pacesetter leadership is prioritizing performance tasks over relationships (Goleman, 2001), and these styles of leadership tend to negatively impact the culture of an organization. In order to engage employees, branch managers and public library administrators need to display higher levels of emotional awareness and develop emotional intelligence skills such as listening and diplomacy, so they are more “caring, sympathetic, compassionate, encouraging, and empathetic” (McKeown & Bates, 2013, p. 474).

Emotionally intelligent library leaders use a leadership style that has a positive impact on workplace climate (Goleman, 2001). Some organizational scholars have referred to this style of leadership as visionary, transformational, or charismatic (e.g., Avery, 2004; Bass, 1985). Visionary leaders have high levels of emotional intelligence, and they appeal to the needs of their followers (Zhang, Avery, Bergsteiner, & More, 2014). In a study of public library branch managers, Haycock (2011) distinguished between ordinary and extraordinary branch managers identifying exceptional branch managers as experienced individuals with emotional intelligence, the capacity to inspire and guide change, and possessing effective communication skills. Therefore, the modern public library requires administrators, leaders, directors, and managers, who can inspire the workforce through their leadership, develop engaged employees, and enhance service work performance and provide exceptional customer service.

EMPLOYEE ENGAGEMENT

Employee engagement refers to the measure of an individual’s involvement in an organization (Gupta, 2015). The employee engagement concept was first introduced by Kahn (1990) who suggests an individual’s psychological conditions along with other specific factors influences the involvement and commitment of an individual to the organization. In other words, the psychological experiences of an employee influences “moments of personal engagement and disengagement” (Kahn, 1990, p. 702). Kahn identified three psychological conditions that are key contributors to employee engagement: psychological meaningfulness, psychological availability, and psychological safety.

Meaningfulness is experienced when employees feel worthwhile and valuable to the organization, and meaningfulness is influenced by work that either provides incentives or disincentives for self-investment (Kahn, 1990). Other markers of psychological meaningfulness include being trusted with challenging work, creative license, autonomy, and not having work taken for granted. Additionally, meaningful work relates to many positive outcomes, such as, job satisfaction, intrinsic motivation, productive behavioral outcomes, increased work performance, and low absenteeism (Rana, Ardichivili, & Tkachhenko, 2014). Meaningful work has a strong social impact, allowing employees to fulfill life goals and values, providing

a sense of accomplishment, offering adequate compensation, rewards, and recognition, and providing work that aligns with their highest work goals (Crawford, Rich, Buckman, & Bergeron, 2014; Farlie, 2001; Saks, 2006). According to Radda, Majidadi, and Akanno (2015) "People want to find meaningfulness at work and will employ discretionary effort in their job roles if the conditions are right" (p.17).

Psychological availability is another important dimension of psychological conditions that influence engagement or disengagement at work. Availability is experienced when employees have the physical, emotional, and cognitive energy to invest themselves in their work with freedom to fully express themselves. The level of belief that employees hold regarding their capacity, their perceived fit with the organization are also important influences (Kahn, 1990). In addition to personal capability, to function effectively in organizations, employees must also perceive sufficient organizational resources and support (Schaufeli & Bakker, 2004).

Psychological safety is a third key psychological component of employee engagement. Psychological safety is experienced when workers feel secure, believe the leaders in the organization are trustworthy, and have a sense that the environment is predictable (Kahn, 1990). Employees who are able to express themselves at work without fearing negative career or professional consequences and without blows to their personal status or self-image are able to fully engage in their roles within an organization. In order to enhance psychological safety, employees need to be encouraged to voice their ideas, knowing they will be met with constructive, rather than destructive, feedback (May, Gilson, & Harter, 2004).

Employee engagement is closely linked with a number of positive employee outcomes such as a positive attitude towards and pride in the organization, a belief in the organization's products or services, altruistic and team-oriented behaviors, dedication and enthusiasm in their work, customer-oriented behaviors, an understanding of the organization's mission, and a willingness to go beyond in-role expectations (Babcock-Roberson & Strickland, 2010; Pimpakorn & Patterson, 2010; Rana, Ardichvili, & Tkachenko, 2014; Rich, Lepine, & Crawford, 2010; Simon, 2011). The benefits of engagement also extend to positive organizational outcomes including, improved work performance, increased customer service and satisfaction, and high levels of customer engagement and loyalty (Menguc, Auh, Yeniaras, & Katsikeas, 2017; Radda, Majidadi, & Akanno, 2015; Simon, 2011). Employee engagement is vital to the productivity, profitability, and ultimate success of both employees and their organizations. "Without engagement organizations cannot hope to retain their best talent" (Simon, 2011, p.66).

In order to achieve high levels of employee engagement administrators and organizational leaders must be willing to invest in their employees. Engagement starts from the top. If administrators and organizational leaders are unable to inspire engagement among their senior and middle managers, these managers will struggle to inspire and engage their employees. According to Radda, Majidadi, and Akanno (2015) "Leadership is the primary driver of engagement" (p.24). Leadership that provides both trust and support for employees positively correlates with engagement and with the psychological safety that allows employees to invest fully in their work roles (Xu, 2011).

Praise, recognition, and effective communication are additional aspects that influence employee engagement in work environments. Administrators and organizational leaders who recognize employees for their contributions signal to the employee and their co-workers that their work is worthwhile and valued, and recognition boosts physical, emotional, and cognitive energy, as well as provide employees with a culture where they can develop a sense of psychological safety. (Khan, 1990; Tomlinson, 2010). Internal communication is another important factor contributing to the level of engagement among employees. Improved communication supports transparency and it helps employees to feel involved and informed about the goals and inner workings of the organization. Investing in employee development also

proves to be an important part of achieving high levels of engagement. Non-management and frontline employees who receive training in support of their role, career development, and their aspirations tend to be more engaged and perform at higher levels than employees who do not receive training (Tomlinson, 2010). Additional workplace and leader characteristics that result in high levels of employee engagement include trust and integrity, rich and involving job tasks, effective direct supervisors, supportive direct supervisors, career advancement opportunities, leaders who contribute to organizational success, and supportive colleagues and team members (Zhang, Avery, Bergsteiner, & More, 2014).

EMPLOYEE DISENGAGEMENT

Employee disengagement describes workers who lack vigor, motivation, and enthusiasm for work. Kahn (1990) explains, “in disengagement, people withdraw and defend themselves physically, cognitively, or emotionally during role performances” (p. 694). These employees are disconnected, detached, and may impact organizations negatively through poor work performance, decreased customer satisfaction, and higher turnover rates. Disengaged employees go through the motions of work tasks, and they are not likely to be engaged in creative thinking regarding problems or design innovations to help the organization achieve greater levels of success in the marketplace. Van Maanen and Schein (1979) liken the behavior of disengaged employees to custodians of work more so than innovators of work.

Wolff (2019) posits employee disengagement plagues most companies which proves to be costly in regards to productivity, profitability, and stress. According to Gallup (2017), two-thirds of U.S. workers are not engaged and worldwide, 85% of employees are not engaged or are actively disengaged. Based on these survey results, analysts at Gallup estimate that “active disengagement costs the U.S. \$450 billion and \$550 billion per year” (Gallup, 2013, p.9). These numbers cannot be taken lightly because companies with high levels of engagement are 17% more productive and 21% more profitable than companies with employees expressing low levels of engagement.

Wolff (2019) shares insights regarding the learning journey, Acme Corporation experienced as they addressed serious issues of employee disengagement. The conditions at Acme Corporation were serious with a 41% turnover rate and 85% of the workforce disengaged. Acme’s disengaged employees were described as apathetic, complaining, and cynical and traditional approaches to improve morale failed. They tried team building exercises, social events, and pay raises to reduce turnover and improve engagement, but results were short lived. Determined to uncover the root causes of employee disengagement, the leaders at Acme Corporation began examining culture. The Acme leaders discovered appealing to individuals may result in short term solutions, but longer-term solutions for improving disengagement needs to be addressed at a cultural level starting at the top of the organization. The best chance at engagement occurs when administrators and managers align their actions with the psychological needs of their employees. Culture change to improve employee engagement requires organizational leaders who are open to listening and considering employee opinions. Taking this stance, employees can express themselves in their work roles without fear of punishment, especially if they hold a contrasting view. When leaders listen to their employees and recognize their talents, managers can increase engagement and productivity of the workforce by aligning an employee’s roles and responsibilities with their skills and talents. This level of consideration of employees by administrators and managers identifies and addresses the root cause of disengagement.

Wolff (2019) posits identifying and authentically addressing the root cause of a disengaged culture is the only way to improve engagement, stating emphatically, anything less is “doomed to fail” (p.24). Next, leaders must examine the messages they send to employees as they communicate. Rather than saying, “look at this nice thing we just did for you,” leaders need to say “this is how we value you as a human being” (Wolf, 2019, p.24). Leaders can only capitalize on ‘nice things’ such as team building exercises, social events, and office updates for a short time before enthusiasm fizzles out. However, if leaders focus on truly valuing their employees, they can expect to see excellent work performance, increased customer service and satisfaction, community building, and increased customer engagement and loyalty.

PUBLIC LIBRARY EMPLOYEES

Employees working in public libraries serve various functions for patrons and the larger community, but library workers also perform acts of service for one another, which underscores the importance of balancing support for internal and external constituents. In order to staff the public library workforce with employees capable of providing internal and external service, Shaffer (2018) explains it is important to support the workforce, maintain open communication, and recognize and interact with employees and teams on a routine and regular basis. One of the best ways to support the workforce is to employ appropriate vetting processes during the hiring process followed by effective onboarding, socialization, and ongoing training throughout the duration of the employee’s career.

Service is a fundamental concept for public libraries. “As centers of innovation and information, and cultural stewards, libraries play a vital role in citizens’ lifelong learning, therefore, it is important that libraries incorporate high standards of customer service” (Miao & Mia, 2007, p.53). In most public libraries, the circulation and reference desk workers have the most direct contact with patrons. As these workers engage with patrons, they have the opportunity to share numerous treasures within the library such as books, movies, magazines, newspapers, local history archives, digital resources, computers, copy and fax machines, and more. A library with an extensive collection of print and digital resources holds little use for a community without knowledgeable and friendly staff to assist them and provide excellent service and an enriching experience.

To ensure library workers are prepared to serve the community, library administrators and managers can best support the workforce by developing an engaged culture. Culture has been described as shared understanding and experiences within an organization (Canessa & Riolo, 2003), built upon values and beliefs, and made evident by the way tasks are performed (Chattopadhyay, 1991; Rai, 2016). The culture of an organization influences the way people communicate and how people make decisions (Cooke & Rousseau, 1988; Fisher, 2000). Sirisetti (2012) argues that organizational leaders play a key role in creating a culture of engagement and recommends that managers build positive relationships, seek employee input, discover what matters to employees, and support the growth and development of employees.

Research suggests that organizational cultures where there is a high level of employee engagement are linked to a number of positive organizational outcomes including increased job and task performance, organizational citizenship behavior or voluntary behaviors and actions that go beyond an employee’s in-role expectations, productivity, discretionary effort, commitment, and customer service (Christian, Garza, & Slaughter, 2011; Fleming & Asplund, 2017; Nazir & Islam, 2017; Rich, Lepine, & Crawford, 2010; Richman, 2006; Macey & Schneider, 2008; Mone & London, 2010; Holbeche & Springett, 2003;

Leiter & Baker, 2010). For these reasons, it is beneficial for public libraries to consider the benefits of establishing a culture of engagement through strategic and tactical approaches to managing the workforce.

Library administrators and managers can engage employees through involving employees in activities such as creating a service mission statement (Miao & Mia, 2007). Frontline employees have direct contact with patrons every day and, as a result, these employees have “valuable input on the service policies, procedural issues, possibilities and limitations for the organization” (Miao & Mia, 2007, p.56). By including library workers in crafting a service mission statement, employees are viewed more as partners with the institution, and as partners, each party supports one another in achieving goals (Sirisetti, 2012). This supportive relationship between administrators and employees directly impacts the employee’s level of engagement and the quality of their service performance (Lee, Patterson, & Ngo, 2017). When employees are engaged, they tend to perform better than disengaged employees, as they are prone to feeling happy, joyful, enthusiastic, energetic, and engrossed in their work (Bakker, 2008; Lee, Patterson, & Ngo, 2017; Pimpakorn & Patterson, 2010). These positive emotions from feeling engaged enables employees to be more productive and have higher level of service performance (Fredrickson, 2001). Overall, these positive feelings and experiences contribute to the establishment and maintenance of an engagement culture within the organization.

SERVICE WORK PERFORMANCE

Organizational leaders attempt to achieve goals through employee performance (Noronha, Aquinas, & Manezes, 2018). Employee work performance is defined as the outcomes and accomplishments an employee achieves at work (Anitha, 2014). Employee performance is typically determined by ability (knowledge, skills, and abilities to engage in high performance), motivation (desire and willingness of the employee), and opportunity (contextual enablement of action and support) (Jiang, Lepak, & Bear, 2012). Wang and Xu (2017) argue in service-oriented organizations, development programs are necessary to improve service-related knowledge, abilities, and skills, appropriate performance appraisal and compensation systems are necessary to stimulate employee motivation, and jobs need to be designed in a way that provides involvement opportunities.

While many public libraries provide service-related knowledge training, many do not design jobs in a way that encourage employee engagement beyond traditional services to customers. Public library administrators, directors, and managers may be overly focused on how well the employee serves patrons and less focused on how well they design jobs, compensation systems and provide opportunities for involvement. Library workers may be trained to greet patrons quickly, ask questions, help patrons locate a book, newspaper, movie, or videogame, navigate databases, assist with computer or microfilm readers, help patrons scan a document. However, every task a library employee performs at work, even without a patron in front of him, is linked to service performance and holds the potential to contribute to the development of an engagement culture. The engagement culture may be high or low based upon these service work performance expectations and opportunities. For example, if library workers notice bureaucratic challenges for patrons, the employee may suggest an improvement or change when working in a high engagement culture organization. On the other hand, when library workers are chastised for exercising employee voice and suggesting improvements, it is likely the organization is a low engagement environment. In low engagement environments, workers learn to do their jobs by following protocols even if those policies and procedures create challenges for patrons. Furthermore, when employee perfor-

mance is appraised based on how well rules are followed, workers will tend to go along with managers and supervisors to get along and avoid unnecessary risk of poor performance appraisals.

Often patrons and customers wonder why workers are severely strict in following rules and less inclined to go above and beyond to help them, and they may consider their interactions with library workers as low quality service performance. Ironically, these same individuals may be the employees continually promoted within the library system for following rules and enforcing policies. What is deemed poor service work performance to the patrons may be considered high service work performance to library administrators, directors, and managers. Defining service work performance based upon proficient completion of tasks and policy adherence without simultaneously encouraging opportunities for employee involvement and support for employee engagement may yield efficiencies but may have consequences on customer satisfaction.

CUSTOMER SERVICE

It is important for public library administrators, directors, and managers to include customer service in the strategic plan in order to ensure that service work performance is not simply rule-based but rather customer focused. If the mission of the public library only considers providing access to articles, books, and other media without a focus on patrons, it is likely the core values of the organization will be deficient in meeting the needs of the community. Customer service is vital in public libraries.

Customer service is defined as “an organizations ability to consistently meet the needs and expectations of its customer” (Miao & Mia, 2007, p.54) through work activities that support an organization’s core purpose. Library worker job tasks include answering questions, taking orders, resolving billing issues, handling complains or scheduling maintenance or repairs (Zeithaml & Bitner, 2003). In public libraries, customer service is performed by answering patron questions in person or over the phone, checking out or renewing items, helping patrons navigate the collection, placing items on hold, ordering books or media items from other libraries, assisting patrons on the computers and teaching patrons how to use online databases and library apps to access digital materials. Public libraries are customer focused organization and, as a result, “all strategies are developed with an eye on the customer, and all implementations are carried out with an understanding of their impact on the customer (Zeithaml & Bitner, 2003, p.27).

A customer orientation does not mean library workers need to be disregarded. On the contrary, genuine customer orientation requires library administrators, directors, and managers, to empower the workforce in order to serve patrons well. If public library administrators implement changes with only patrons in mind but no consideration on the impact on employees, the changes will likely fail. If employees have an increasingly difficult time carrying out the changes, the customer will be negatively affected. Employees must be considered and included in strategic initiatives and organizational changes order to ensure employees are able to maintain excellent customer service.

Frontline employees have the most direct contact with patrons and, as a result, these employees are aware of how changes may impact patrons. When there is a customer gap or a “difference between customer expectations and perceptions” (Zeithaml & Bitner, 2003, p.32), excellent service is not provided. Closing the gap between what patrons expect and their actual service experience is key to the success of public libraries. Zeithaml and Bitner (2003) identified four gaps service organizations must address/ close in order to meet customer expectations. The first gap is not knowing what customers expect. It is both the responsibility of frontline staff and administrators to understand what level of service a customer

expects when they walk into a public library. Administrators must inspire engagement and motivate employees to understand and care about meeting patron's expectations. If employees are not engaged and do not feel valued, they will not be inclined to rise to meet customer expectations. Rather, they will simply go through the motions and put in the hours until they can leave for the day. Alternatively, engaged employees will see great value in providing excellent customer service. These employees know what customers expect, and they are motivated to consistently meet or exceed patron expectations.

The second gap Zeithaml and Bitner (2003) identified is "not selecting the right service designs and standards" (p.32). An engaged employee can identify and execute an effective service design or service standard, and they will carry out service standards, ask questions when necessary, and make suggested improvements when flaws are identified in the service designs and standards. Disengaged employees will not consistently meet service standards, and they will not strive to make improvements to flawed service designs.

The third customer gap is "not delivering standards...there must be systems, processes, and people in place to ensure that service delivery actually matches (or is even better than) the designs and standards in place" (Zeithaml & Bitner, 2003, p.32). Library administrators who engage their employees and inspire them to meet and exceed the outlined service standards set the entire organization up for success. Alternatively, if library administrators do not see the value in their employees and expect them to work for a paycheck and nothing more, library workers will not be inspired to deliver the service standards these administrators put into place. The effectiveness of systems and processes and their effect on customer service depends heavily on the level of engagement in frontline staff. Employees who feel they are supported and valued will, in turn, support and value patrons. Employees who believe administrators disregard the workforce will then disregard patrons. Thus, the golden rule for public library administrators is, treat your employees how you want your employees to treat your patrons.

Finally, Zeithaml and Bitner (2003) identify "not matching performance to promises" (p.32) as the fourth gap to excellent service. For instance, if the public library promises that books can be placed on hold for patrons to pick up when the item is available, the patron expects this to be true. When a patron asks for a book to be placed on hold, an engaged library worker will search the catalog for the item, ask the patron where they would like to pick up the book if the library has multiple branches, place the hold, and then check their work to make sure the hold was placed correctly. The engaged employee may even check the patrons contact information to ensure the patron will be notified at the correct phone number or email address when the item is available. Alternatively, a disengaged employee may find the book and place it on hold, but the item may be sent to the wrong location, the patron may have outdated contact information and thus will not be notified, or, since the employee did not check, the hold may not have been placed at all. In any of these three scenarios, the employee's performance did not match the libraries promises. It is important to close these four gaps and ensure that library workers know what customers expect, what the best service designs and standards are, deliver to service standards, and match their performance to the organizations promises. Engaged frontline employees are essential in closing these gaps to provide excellent customer service.

CUSTOMER SATISFACTION

Customer satisfaction can be defined as how well a customer perceives that their needs or expectations were met by a product or provided services (Khiralah, 2005; Wanara, 2015). Jones and Sasser (1995)

explain that most service organizations make it their main goal to achieve customer satisfaction because increasing customer satisfaction increases profits, referrals and recommendations, as well as the image and survival of service organizations. What customers expect in terms of services is influential in their satisfaction with the organization. Teas (1993) describes service expectations on a scale from ideal expectations to minimum tolerable expectations. Ideal expectations are based on desires. For example, if a friend tells you that the local public library has friendly staff and a lot of great books and movies to check out, you will have high expectations based on a desire to have the same ideal experience. If that same friend had told you how the staff at the local library was not very friendly, but at least the books and movies are free, you would have low expectations. However, as long as these minimum expectations are met, you will visit the library even if you know it will not be an ideal experience.

Engaged employees are capable of providing a high level of service that meets or exceeds a patron's ideal expectations. Engaged employees understand the importance of the patron experience and the need to provide excellent service to everyone who visits the library. Alternatively, disengaged employees are not committed or inspired to meet or exceed customer expectations. Rather, they provide the bare minimum service. Patrons may continue to come to the library in spite of these disengaged employees, but the customer experience and perception of the library will not be positive. This highlights the value of employee engagement initiatives. Inspiring your employees to provide excellent customer service will translate into satisfied patrons who frequently use and promote the library. Alternatively, disengaged employees may cause patrons to limit their trips to the library, and they will likely share any negative experiences with others.

A perception of quality and fairness is paramount in public libraries. Public libraries service a wide-range of community members from all backgrounds. It is vital for library workers to set aside any judgements or biases in order to provide the same level of service to all patrons. Engaged employees understand the importance of the library and the necessity to make everyone who visits feel valued and welcome. Engaged employees treat the homeless patron with the same respect as the CEO, while disengaged employees may lack the interest or motivation to suspend their biases in order to provide an equal, high-quality level of service to all.

Adaptability, or an "employee response to customer needs and requests" (Zeithaml & Bitner, 2003, p.105) defines the level of service that is generally regarded as ideal in public libraries. Engaged employees are knowledgeable and flexible, strive to serve patrons well, problem solve, and think innovatively, and they adapt to meet patron needs or requests. Disengaged employees may be rigid and unwilling to explore all avenues to assist patrons.

Impromptu or extra-role behaviors by library employees, fosters customer satisfaction. For instance, an engaged employee who listens and takes an interest in frequent visitors, may come across authors or movie titles of interest to a particular patron. Sharing these thoughtful suggestions with the patron on their next visit will be a pleasant surprise that will reflect well on the library. Alternatively, a disengaged employee would not hold a level of interest in the patron or carry out any extra effort in order to exceed the patron's expectations.

A library employee's response to service failures and patron complaints also plays a vital role in the customer's satisfaction and perception of the library. Engaged employees will listen to the patron, empathize with their frustrations, and attempt to rectify the situation. Engaged, high performance service workers help restore the patron's trust in and perception of the library, while a disengaged employee may not listen carefully to the patron's problem or explore all avenues to correct the situation. Disengaged employees may pass the patron to another employee or fail to solve the patron's problem.

CULTURE'S CONSEQUENCES ON ENGAGEMENT

India is considered one of the most densely populated countries in the world, and libraries in India provide a variety of lending services with collections of newspapers, journals, and books for many different types of patrons including professionals, researchers, families, and children. There are also e-resources available with online books, journals, and reference databases. Library leaders and library staff are faced with many similar challenges and opportunities as leaders and staff from other libraries across the globe.

It has been argued that managers and leaders, as well as the people they work with, are part of national, professional, and organizational societies, and in order to understand the organizational behavior of these individuals, we need to understand their societies (Hofstede & Hofstede, 2005). The way people interact with authority figures, the way they behave as individuals and in groups, and how they handle uncertainty and ambiguity are factors that influence the way employees approach work tasks and how they engage within the workplace (Hofstede, 1980).

Organizations are social systems of people with shared values and somewhat predictable attitudes and behaviors that are learned and generally identified as culture. These patterned ways of thinking are shared among people in groups that form national culture, corporate culture, and vocational or professional culture. Marquardt, Berger, and Loan (2004) explain culture as a “distinct manner of thinking and acting” (p. 29) where people share “common values and behaviors” (p. 29).

Marquardt et al. (2004) recommend that leaders need to take national culture into consideration when designing human resource development programs and activities, such as employee engagement initiatives. For example, library workers in India may be comfortable with a high power distance, the extent to which leaders hold more power than workers, and leaders may need to be more directive to library staff when implementing employee engagement initiatives. Library leaders will need to give clear directions of what is expected in order to foster a sense of psychological safety. Library leaders may also need to continually communicate with workers in order to provide the support and encouragement needed to fully adopt an engagement culture.

While national culture does exert an influence on the way people think and act, other scholars suggest that vocational culture is becoming even more important. Vocational culture, also referred to as professional culture, refers to the shared attitudes and behaviors among individuals in the same field of study or professional career, such as public libraries. Professional culture orientations are generally developed through professional education while attending colleges, universities, and professional training and development conferences and seminars (Bloor & Dawson, 1994). Likewise, corporate culture is often influenced by the way strategic leaders design organizations. Strategic leaders from one library system observe and learn from other library leaders and systems. As a result, libraries across the globe begin to share similarities in the way they address issues such as membership, lending, advancing technologies, employee performance, and customer service.

There are consequences of culture on the way libraries operate including the influence of national, professional, and corporate culture on employee behavior, employee engagement, employee performance, and customer service. As more and more library leaders interact and share best practices, more and more shared values and practices will emerge within the field of library science. As such, these library leaders are participating a form of employee engagement among their peers on a global, national, and professional level.

RECOMMENDATIONS

Library leaders need to be on the lookout for people performing with high levels of engagement. When they catch people doing the right things, it is important for them to praise employees publicly. Library leaders also need to handle mistakes with care, share decision-making authority, help employees grow, recognize employees as individuals, invest resources in their best people, and involve employees in crafting a mission statement will see a number of positive organizational outcomes such as, excellent service performance, higher levels of customer service and satisfaction, and an increase in customer engagement and loyalty (Menguc, Auh, Yeniaras, & Katsikeas, 2017; Patkin, 2014; Radda, Majidadi, & Akanno, 2015).

There are distinct feelings of stress and embarrassment when employees need performance improvement, and it is best when leaders are clear, concise, and respectful. Otherwise, employees will not feel psychologically safe at work. Patkin (2014) explains “If you don’t want your team to dread your presence in their workspace, you need to start each day with the intention of catching as many people as possible doing well” (p.14). Praising employees reflects positively on the leader, boosts morale, and encourages employees to continue working hard. Employees tend to be more engaged when they receive rewards and recognition for their work (Rothmann & Welsh, 2013). Library administrators and managers should make a point to seek out opportunities to praise their employees every day. The benefits of praise are further exemplified through publicly praising employees. Employees will feel supported and appreciate being recognized for their good work in front of their peers. They will be inspired to further engage in their work and they will continue performing at high levels (Delaney & Royal, 2017; Patkin, 2014).

Administrators and managers can inspire engagement in their employees by handling mistakes with care. Mistakes are inevitable and must be addressed by leaders. However, the way mistakes are handled makes a significant impact on employee’s performance and morale. Patkin (2014) acknowledges that lambasting an employee who has made a mistake may help the leader feel better in the moment, but the employee’s self-confidence, and relationship with and feelings for the leader and the organization will be negatively affected for much longer. In the public library setting, if an employee accidentally creates a duplicate record, where a single patron has two library accounts/cards, the leader’s response to this mistake will drastically impact the outcome for the employee and the library. Knowing the challenge and inconvenience of merging two records, the library administrator or manager could chastise the employee, citing procedures and precautions that must be followed in order to avoid these mistakes and questioning what led the employee to create such a problem. This reaction would likely cause the employee to lose confidence in his ability to perform even the most basic job tasks, and he may question himself and become hesitant to make routine decisions for fear of further negative repercussions. Furthermore, the employee may carry around guilt and shame for days or months, and he may view the leader and the library negatively as a result of the intense criticism. Alternatively, if the leader emphasizes the benefits of the precautions taken to ensure duplicate records are not created, explains the problems that arise when two records are created, encourages the employee to be more cautious in the future, and praises the employee for past successes, the result will drastically differ. In this case, the employee will likely feel badly about the mistake, but the leader addressed the issue, gave suggestions on how to ensure the mistake is not made again, and instilled faith and confidence in the employee, knowing he will take more care in the future. Rather than being stripped of his self-confidence, knowing his manager has faith in his success, the employee is inspired to perform at a high level in the future.

Library administrators and managers can encourage employee engagement by sharing decision-making authority. When employees are given inflexible tasks or directions with no choices or opportunity for input, they feel like cogs in a machine. Unsurprisingly, these employees will be uninspired and unengaged. In order to inspire and engage employees, leaders must give employee's choices and involve them in decisions, as this leads employees to believe they are valued by their organization and also that they are able to influence and contribute to the decision-making process (Ahmand, Rizvi, & Bokhari, 2017). If library administrators or managers ask for or are open to opinions, ideas, and preferences, employees will feel valued and engaged in their work. If employees feel they have an active role in the decision-making process, they will feel empowered and will be invested in the success of the organization (Gyu, Sik, Yoon & Joo, 2017).

Training and mentoring represent additional ways library administrators, directors, and managers can encourage engagement among their employees. Library leaders are busy people, but taking time to foster the professional growth of employees is a worthy investment and a crucial part of the success of individual employees and of the library as a whole, as "the successes or failure of your business depends on the people who show up each day to do the work" (Patkin, 2014, p.16).

Recognizing employees as individuals is an important part of engagement. An employee who is treated like a job description will be far less productive and engaged than an employee who is valued as an individual and is seen as key to the success of the organization. By treating employees as unique individuals, administrators and managers can develop the talents of their employees into strength for the organization (Rothmann & Welsh, 2013). Each library employee has a set of tasks outlined in his or her job description when first hired. However, each employee brings unique skills and perspectives to the job. Capitalizing on the talents and ideas of individual employees will benefit employees, patrons, and the library as a whole. Wolff (2019) expands on this concept by explaining, "We all bring a substantially higher energy and engagement (and productivity) when we do work that we like and are good at" (p.24).

Library administrators and managers can engage employees through training their best people. Often times, leaders tend to focus on training their lowest performing employees. However, their efforts would be better spent by reinvesting in their top employees. With additional encouragement and guidance already high performing employees will be even more impressive (Patkin, 2014). Many companies, including Intel, Harley-Davidson, Nokia, and Toyota encourage and train their employees to add and upgrade their skills, as they recognize the link between investing in their best people and the increase of productivity and improved performance that contributes to exceptional organizational outcomes (Martel, 2003). In the public library setting, administrators and managers can identify their best employees and offer to train them in areas that match their talents and interests. For instance, if a frontline library worker is very organized and skilled at performing multi-step processes, it may be beneficial to train them on the more advanced tasks such as processing materials or preparing reports. Similarly, if an employee has a talent for engaging young patrons, they may benefit from story time training or assisting with outreach programs for children. By expanding and improving their skills, these library workers become more engaged, perform at higher levels, and will become greater assets to the library.

FUTURE RESEARCH DIRECTIONS

In conducting the research for this essay, a preponderance of literature exists demonstrating that one of the most influential factors on employee engagement in the workforce is the impact of leadership on

the leader/follower relationship and the way leaders empower and encourage employees to fully express themselves on the job. Due to the evidence supporting the conceptual relationship between leader influence on follower behavior, a future exploration of the types of leadership as well as the depth of emotional intelligence possessed by the leader would be beneficial. While many of these types of empirical studies have been administered within a variety of organizational settings, more specifically focusing on public libraries as the context within which employee engagement occurs is important. An empirical study on the extent to which emotional intelligence mediates or moderates the relationship between employee engagement, work performance, and customer service may be beneficial. It may be interesting to explore the directional framework through structural equation modeling.

CONCLUSION

Engaged employees express high levels of involvement and commitment in their work roles. These employees exhibit a number of positive individual and organizational outcomes including improved service work performance, increased customer service and satisfaction, higher levels of customer engagement, customer loyalty, and customer satisfaction (Macey, Schneider, Barbera, & Young, 2009; Menguc, Auh, Yeniaras, & Katsikeas, 2017; Mone & London, 2010; Radda, Majidadi, & Akanno, 2015; Wantara, 2015). Alternatively, disengaged employees are disconnected, detached, and lack motivation and enthusiasm for their work. Disengagement among employees impacts organizations negatively through poor service performance, high turnover rates, and decreased customer satisfaction (Abu-Shamaa, Al-Rabayah, & Khasawneh, 2015).

Public library administrators and managers must understand the benefits of employee engagement as well as the detrimental impact of disengaged workers because of the wide range of individual and organizational outcomes including service work performance, customer service, and satisfaction. As service-based institutions, public libraries need to build strong relationships between employees at all levels. Employees must care about the organization, their fellow employees, and the wider community in order to build effective and sustaining relationships with the public.

The most successful public libraries have effective library administrators, directors, and managers who encourage engagement, high levels of service performance, and create a positive work culture for employees, stakeholders, and patrons. Administrators, directors, managers, and staff must be responsive, committed to effectively delivering core services, and adaptable in response to changing conditions and expectations (Huber & Potter, 2015). Additionally, library directors and administrators have a responsibility to create a positive organizational culture and work climate in order to achieve high levels of success. Library leaders must model attitudes and behaviors they hope to see workers extend to patrons. Surprisingly, much of the dysfunction and incivility library workers face takes place in the workroom with supervisors often acting as bullies (Kim, Geary, & Bielefield, 2018). When library staff are not supported and fear these negative interactions at work, service work performance and the employees' physical and mental wellbeing suffers (An, 2019; Kim et al., 2018). Frontline employees have the most direct contact with patrons and are responsible for the patron's experience with the organization (Bersin, 2014). For this reason, frontline library employees must experience perceived organizational support in order to perform well.

Library leaders must focus on providing support and practicing promoting the organization to employees with the goal of increasing employee engagement, satisfaction, work performance, and ultimately

customer service (An, 2019; Kim, Knutson, & Han, 2015). Inspiring employee involvement and increasing service work performance will foster a climate of mutual respect that benefits employees and enhances customer service and customer satisfaction.

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Chapter 25

Contextualizing the Disagreement of Intellectual Property Rights and Open Innovation Systems in Realizing the Goal of Innovation Society in India

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ABSTRACT

Innovation has always been the creative endeavor throughout the history of human civilization. With the inception of intellectual property rights (IPR) to protect the innovations almost 500 years back, the free flow of knowledge was obstructed, and further advancement of knowledge is somehow stunted. Emerging open innovation system with the sharing of knowledge beyond geographical boundaries has opened a new door to many possibilities. India, with her vast pool of scientists and engineers, can become an innovation society with a judicious combination of IP and open innovation systems. This chapter seeks to contextualize the trajectory evolves due to philosophical conflict that arises among intellectual property rights (IPR), open innovation systems, innovation society formation in India. It inquires to find a realistic sustainable path.

INTRODUCTION

Dispersed physically but connected by technology, workers are now able, on a scale never before even imaginable, to make their own decisions using information gathered from many other people and places... For the first time in history, technologies allow us to gain the economic benefits of large organizations, like economies of scale and knowledge, without giving up the human benefits of small ones, like freedom, creativity, motivation, and flexibility. – Thomas Malone, Writing In: Future of Work, MIT Sloan School of Management

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Why do we innovate? Why should we protect our innovation? What is the rationale behind such protections? Should we seek an alternative path of innovation for universal access and sharing of it? Innovation is the way mankind has forwarded, excelled and sustained in every corner of the world. Research has found that for an average of 3000 raw ideas, only one of them reaches the last stage of profitable commercialization. Inventors need to cross the valley of death and burn their midnight's oil to innovate so protection of their creative pursuit is natural and justified. It takes both effort and resources to develop and add value to these ideas so that they become marketable. However, even the allocation of additional resources to support further development may not guarantee the desired results. The degree of success of the innovation and commercialization process is dependent on a wide variety of other factors. The recent upsurge in patents and other form of IPR, in almost all countries and all domains, paradoxically has helped to draw the attention of scholars to the importance of openness for innovation's development. The Global Innovation Index (GII) has ranked India as the 57th most innovative nation in the world. The country has improved its ranking from 60th position last year. But India still needs miles to go to be called an innovation society in true sense.

INNOVATION SYSTEM IN INDIA: ARTICULATION TO THE CURRENT STATE OF THE ART

At present, becoming innovation society is the most desired goal for any nation across the continents. If we go back to the ancient age, when men used his knowledge to collect food, to boil food or water or to make shelter we find that it was never meant to possess but the opposite one was correct. All achieved invention and innovative knowledge and idea and its application to solve various problems in life were shared among all the members of the society. If that knowledge would not have been shared, present stock of knowledge could have never been evolved.

Innovation society based on open innovation system along complying with the principle of IPR is not only one of the greatest challenges for the economically poor or developing nations but also distracts us from the basic objective of human existence and society. Rationale behind owning knowledge and thus protecting and controlling flow of knowledge by the various forms of IPR from industrialized nations to other corners of the world appears to be market driven only. The Uruguay Round of the GATT (General Agreement on Tariff and Trade) (1994) is the landmark in the world history where protection of knowledge by various forms of IPR were sought by the member countries. The Trade Related Intellectual Property Right (TRIPS) agreement has become obligatory to all signatories. This clause was included by the pressure of US Multinational Corporations. It must be complied and followed by the signatory member countries. Its outcome is quite clear. One distinct kind of market driven strategy is being driven in the name of promoting innovation where every atom or even sub-atomic level of knowledge is protected by the various forms of intellectual property rights. As a result worldwide free flow of knowledge the basic ingredient of our development is perennially obstructed.

Innovation involves thinking differently, creatively and insightfully to create solutions that have an impact in terms of social and economic value. Scientific research utilizes various resources including money to generate knowledge and by providing solutions innovations convert knowledge into wealth or value. India has declared 2010-2020 as "Decade of Innovation". The Govt. of India has emphasized the need to bring out a policy and established National Innovation Council (NInC) in 2010. NInC has enacted Science, Technology & Innovation Policy 2013. This policy focused on many new things including

world class infrastructure, capacity building, encouragement for scientific career, innovation in Public-private-partnership (PPP) model, enabling research output for societal and commercial applications, triggering change in the mindset and value system to recognize, reward performances of S & T activity that creates wealth, patent culture and creation of robust national innovation system. Innovations are country and context specific. According to Global Innovation Index published by the World Intellectual Property Organization (WIPO) in the last 6 years from 2013 to 2018, India's rank slips nine positions from 66 in 2013 to 57 in 2018. No doubt, India is innovating and India is advancing but not at the pace of China or other South-east Asian nations. These inefficiencies are reflected in the country's current low R&D expenditure in cutting-edge technology and basic sciences, its low rate of commercialization of technology, and its inadequately skilled workforce.

REVIEW OF LITERATURE

Open innovation is not a new concept. Industry has relied on shared innovation communities since Victorian times (Harhoff et al., 2003). Open innovation or citizen science expands public participation in science and supports alternative models of knowledge production including strengthening scientific research by engaging with a variety of topics and information sources, and fostering cross- or trans-disciplinary knowledge production (Hecker et. al., 2018). Lessig (2001, 2004), proponent of Creative Commons, investigated that a piece of knowledge is open only if it is made available to for free (strong definition), or under conditions that and not prohibitive (weak definition). All interested parties must be given access to the knowledge, which is therefore not retained in the hands of one or several individuals who could control access to it.

Some experts like Pierre Bonnard of ideXlab opine that between Intellectual property Rights and Open Innovation the contradiction starts with the definitions. innovating with partners by sharing risk and sharing reward is the basic philosophy of open innovation. But sharing doesn't mean giving away it exclusively. Literatures on the issue suggest that a great discord between 'exclusivity' and 'sharing'. Open Innovation and Intellectual Property coincide particularly well when organizations realize that they shall capitalize on opportunities rather than only on properties. Pisano (2015) contextualised that that innovation fails not because of patents but due to poor innovation strategy.

DISAGREEMENT UNDERNEATH

Research and development in developing nations like India suffer greatly from quality contents and resources which are primarily protected through various forms of Intellectual Property Rights (IPR) around the world. In this context, sharing knowledge and experience through collaboration has become an important issue. But it becomes paradoxical when innovators claim their ownership on their innovations and try to protect it by patents or by other forms of IPR. Claiming inventor ship by the inventors through patenting system is quite legitimate but at the same time the underlying philosophy of open knowledge badly injures and blocks the innovation. And thus impedes India's dream to become innovation society.

Becoming an innovation society is not a one time achievement rather a continuing process. Realizing the full potential of all kind of socio-economic and cultural sectors in the developmental process and its application, valuing traditional knowledge and wisdom, bridging the gap of haves and have-nots, percola-

tion of every drop of benefits of the knowledge entangled development even to the marginalized people, Participation of common man in the growth process and holistic approach to face any challenge be it economic, be it social or cultural, be it scientific and technological may pave the roads for India towards a innovation society with a human face. In the present world scenario, India cannot afford to grow in an isolated manner but at the same time India cannot forgo its own priority of developments either. India needs to develop a well thought sustainable path highly synchronized with our international obligations.

CLOSED INNOVATION AND OPEN INNOVATION

The basic principle of Open Innovation is to open up the innovation process to all active players so that knowledge can circulate more freely and be transformed into products and services that create new markets, fostering a stronger culture of innovation. Open innovation implies an innovation ecosystem where ideas and knowledge flow across firm boundaries. In the book that introduced this term to the business world, Chesbrough (2003) defined open innovation as follows:

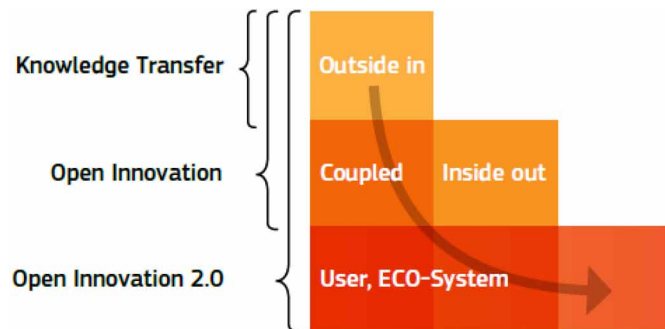
“Open innovation is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology” In contrast, Intellectual Property Rights (IPRs) are generally designed to exclude others from using a inventor’s ideas and inventions. At first glance the two concepts (open innovation and IPR protection) seem irreconcilable. That is, open innovation implies a willingness to allow knowledge produced within the firm to spill over to others (possibly in with the expectation of receiving knowledge spillovers from others in return) whereas IPR protections enable a firm to exclude others from using that knowledge. The concept of Open Innovation is constantly evolving and is moving from linear, bilateral transactions and collaborations towards dynamic, networked, multi-collaborative innovation ecosystems. Innovation can no longer be seen as the result of predefined and isolated innovation activities but rather as the outcome of a complex co-creation process involving knowledge flows across the entire economic and social environment. Traditional innovation promotes closed innovation. Research, in modern economies innovation is less and less undertaken in-house, in a closed and integrated way, but is open in the sense that many actors are involved in the different steps of the innovation process.

OPEN INNOVATION: A DYNAMIC CONCEPT

In fact, open innovation cannot be defined precisely because it’s highly dynamic and context dependent mechanism. It can be realized in many ways but the prominent ones are:

- *Outside-In* is associated to the acquisition of external knowledge to innovate for knowledge exploration.
- *Inside-Out* refers to opening up the innovation process for knowledge exploitation.
- *Joint Innovation* involves making a combination of Outside-In and Inside-Out knowledge to innovate.

Figure 1. Open innovation 2.0



Now in the open innovation, user has a great to play in a new innovation ecosystem which is termed as Open Innovation 2.0 (fig.1) that allows co-creation and eco-system relevant stakeholders are collaborating along and across to co-create solutions to socio-economic and cultural challenges.

OPEN INNOVATION WITH SHARED RISKS: A NEW INNOVATION ECOSYSTEM

Within the innovation endeavor, risk rears its head in the form of: financial risk, having to pay for things before success is assured; technical risk, some ideas don't actually work; and execution risk, it would have worked, but the endeavor was done ineffectively. In a closed innovation system, all of these risks are borne solely by the innovating organization. It must pay for projects whether they ultimately succeed or fail. In an open innovation system, these risks may be shared with partners enabling their more effective management and permitting risky portfolios to be increased in size—the same budget will pay half the costs for twice as many projects—providing diversification and lowering the risk of the portfolio yielding an excessive number of failures. Even more significant than simply the sharing of risk is the observation that risk itself is asymmetrical. That is, the amount of risk offloaded by one party may be considerably greater than the amount of risk the other party assumes. This calls for a new innovation ecosystem where risk will be shared by all co-creators instead of one. Hence, the dimensions and perspectives are completely redefined which needs to be adopted as well as adapted by all participating stakeholders.

INCLUSIVENESS IN OPEN INNOVATION

Historically, innovation opportunities have been available to a minority of the population, particularly privileged staff in the research and development sections of major firms or public sector institutions. In contrast, open innovation offers innovative potential at the science-society interface by drawing in many millions of participants worldwide. Research is literally 'opened' up to members of society and they often become part of the whole process, thus making science more inclusive. This allows members of the public to learn about, understand and discuss scientific methods, standards and values, developing their overall scientific literacy. This can increase public awareness of the value of scientific research in addressing problems faced in everyday life as well as global challenges. Thus it can positively influence

society by providing opportunities for learning, empowerment, enjoyment of nature, social engagement or enhanced scientific capital. Open innovation thus truly becomes citizen science. Ideally, therefore, citizen science can contribute to good citizenship and, in turn, progressive societies.

Collaboration with members of society also offers the opportunity for scientists to make their research more relevant and to extend its impact. Citizen science practitioners are given the chance to become ambassadors for science as they interact directly with members of society while at the same time benefiting from participants' expertise, knowledge and engagement.

CHALLENGES AHEAD

With the inherent strength and weakness, India has to choose a single innovation system or a judicious combinations of closed and open innovation systems which will meet nation's interest, fulfill international obligations particularly in the field of intellectual property rights, value our value systems, serve citizens in the progress and above all pave the roadmap towards innovation society. Argument one, is that no single organization is able to develop all the technology it needs internally. The second, is that the products they produce need to work well with those produced by other organizations, even including direct competitors and firms with very different economics models. In this setting, it is essential that institutions develop new ways to ensure that fusion of internal and external knowledge can bring out the best innovation. IP rights can be used defensively to negotiate cross licenses with others in the industry who hold complementary technologies, thus avoiding mutual litigation. But there are limits to IP as a tool for organizing open innovation.

An innovation or an invention can only be sustained, appreciated and rewarded by a good IPR system. It is the basic system that makes an innovation system alive and flourishing. Any irrationality in the IPR system will be reflected by faulty innovation system and strategy. To make an IPR system innovation-friendly, socio-economic and cultural factors of the concerned country should be considered including local innovation and traditional knowledge.

I argue, innovation society cannot be realized in an isolated fashion rather we should aim for holistic development. Yes, roads are not smooth as there are many socio-economic and cultural impediments but we still need to find out a sustainable path for it if we are really aiming for true innovation society.

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